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Trinidad Food Producers' Training Needs for Food Security and Implications for Extension

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Keywords

food security; needs assessment; Caribbean; Trinidad and Tobago; agricultural producers; farmer knowledge

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The purpose of this study was to explore farmers' knowledge of food security issues in Trinidad. Such information can be used to develop appropriate extension training interventions. Using a Borich (1980) methodology, a total of 300 agricultural producers in Trinidad were surveyed with an instrument that consisted of two parts: (a) personal demographic and farm related questions, and (b) indicators of knowledge and importance of 27 food security issues derived from The National Food Production Action Plan 2012 – 2015. Overall, the top five issues identified by producers were: (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. All 27 food security issues varied in at least one of the categories assessed: 22 issues varied by location; 18 issues varied by farm type; 5 issues varied by farming status; and 19 issues varied by education level of the farmer. These results can guide extension programming in Trinidad and also be informative for policy makers.

Keywords: food security; needs assessment; Caribbean; Trinidad and Tobago; agricultural producers; farmer knowledge

Introduction

In a world of about 7.2 billion people, 842 million were said to be suffering from chronic hunger in 2012-2013 (Food and Agriculture Organization, FAO; International Fund for Agricultural Development, IFAD; and World Food Programme, WFP, 2013). To better illustrate this: one person in every eight is regularly not getting enough food to lead an active life. This is a significant portion of the population. Since 2012, efforts to increase food security around the world have led to 26 million fewer food insecure people; however, about 12 percent of the global population still did not have enough food for an active and healthy lifestyle (FAO, IFAD, & WFP, 2013). Developing regions all around the world struggle to meet the dietary needs of their people. In 1996, the World Food Summit defined food security as existing "when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2008, p. 1). In a world where a significant number of people are uncertain about their next meal, there is restlessness and conflicts often arise which can result in loss of lives. Moreover, hungry persons cannot truly attain their fullest potential. The world has taken notice of these developments and governments and development organizations are mobilizing to make a difference.

For a nation or people to be considered food secure, three dimensions of food security must be met. As defined, the three areas or pillars of food security are: availability, access, and the appropriate utilization of food (World Health Organization, 2012). Not every food insecure person or nation is faced with challenges in all three pillars. However, all three are interrelated. Availability of food addresses the supply end of food security. It is determined by how much food is being produced. Access, on the other hand, is related to whether people can get to the food. This involves market access, food prices, expenditure, and food policies. The third pillar is appropriate food utilization. How a person uses food is a result of good feeding practices, food preparation, diversity in the diet, and intra-household distribution of food (FAO, 2008). A fourth dimension has also been added to include stability (FAO, 2008). Stability means having stable access, availability, and proper utilization of food on an everyday basis. Stability can be impacted by adverse weather, political instability, or economic factors (FAO, 2008).

Caribbean nations are not exempt to the challenge of food security. In 2011-2013, 7.2 million people were estimated to be undernourished (FAO, IFAD, & WFP, 2013). Since 1990, Latin America and the Caribbean, as well as Africa, have experienced the widest fluctuations in food supply as well as variability in food production per capita (FAO, IFAD, & WFP, 2013). Shocks such as swings in food and input prices, production, and supply impact the ability for developing nations to make long term progress towards stability in food security. These shocks have been attributed to the unpredictability of weather patterns, which cause extreme events like hurricanes and flooding. These severely impact Caribbean nations.

Shocks to the production of food have far reaching impacts throughout a country. Small scale producers must cope with fluctuating highs and lows in input and output making them extremely vulnerable. Increases in vulnerability can lead to higher risk aversion, thus lowering their likelihood to adopt and invest in new technologies. Small scale producers are less likely to take

the risk in investment when they are unsure of the return. This ultimately leads to lower overall production (FAO, IFAD, & WFP, 2013). As mentioned above, more frequent and stronger extreme shocks coupled with increased farmer risk aversion, lead to losses in production and lowered income in vulnerable regions (FAO, IFAD, & WFP, 2013).

In 2007, it was estimated that about 17% of the population in Trinidad and Tobago lived below the poverty line (CIA, 2007). With very little agricultural production, Trinidad and Tobago import a significant amount of manufactured goods, food, and live animals. From 2005 to 2009, about 29 percent of the total import bill of Trinidad and Tobago was staple foods (Ministry of Food Production, Land, and Marine Affairs, 2012). Additionally, only 8% of the required staple foods are actually grown locally. In Trinidad and Tobago, agriculture accounts for only 0.3% on the total national gross domestic product (GDP) and 3.8% of the labor force (CIA, 2012). Notwithstanding, agriculture is the primary source of income for farmers and agricultural laborers in rural areas (Rosen, 2008).

Agricultural producers are faced with many challenges as they try to meet the food needs of Trinidad and Tobago. In 2012, the Ministry of Food Production, Land, and Marine Affairs (MFPLMA), now the Ministry of Food Production (MFP) created a plan to increase the country's food security. The plan was aimed at increasing local production of quality (safe and nutritious) and affordable foods in sufficient amounts to ensure food and nutritional security (MFPLA, 2012). By doing this, the Ministry also hoped to provide an attractive and profitable livelihood for agricultural producers. This mandate was envisioned to take place from 2012 to 2015. The country of Trinidad and Tobago is looking towards the agricultural producers to enhance food security.

Renwick (2010) proposed Caribbean farmers, including those in Trinidad, are at the mercy of government whims and policies when making decisions regarding their production practices. Enhancing food security is an immense task for farmers to undertake. However, little is known about the knowledge of the agricultural producers in Trinidad concerning food security. As the agency charged with providing relevant knowledge to farmers, the MFPLMA Extension services must provide relevant and timely information that addresses the needs of the farmer while simultaneously addressing larger policy mandates. This study was conducted to identify and prioritize gaps in farmer knowledge related to food security that can be used to guide extension programming.

Several other researchers have examined agricultural producer knowledge in Trinidad and the Caribbean. Wynn, Coppedge, and Strong (2013) examined farmer knowledge of integrated pest management (IPM) technologies. They noted a lack of a coordinated effort from the government contributed to non-adoption of IPM technologies. Ganpat and Bekele (2001) explored how the type of farm influenced the training needs of farmers in Trinidad. The researchers discovered sufficient diversity exists to warrant targeted extension programming even in small-scale farms. Ganpat and Bholasingh (1999) also examined how perceptions of farmers in Trinidad might differ based on characteristics of the farmer or farming system. They found no differences based on gender, ethnicity, and land tenure status.

The theoretical framework is based on the conceptual framework proposed by Lindner and Dolly (2012). In this work, Lindner and Dolly proposed effective extension systems must:

> be institutionalized, well-defined, and well-funded; address important/contemporary issues/problems; be sufficiently nimble and flexible in order to address emerging issues; be a credible and unbiased source for information/education and solutions/research; understand the needs of its customers; embrace participatory and integrated approaches; recognize that little happens in isolation and create regional/global sustainable partnership/linkages with governments, NGOs, researchers and educators; be excellent stewards of resources acquired; recognize that return on investment (ROI) from its research and outreach must be well-documented; and allow for decentralized decision-making and action when warranted. (p. 6)

This study specifically was conducted under the assumption that the public extension system in Trinidad must "address important/contemporary issues/problems" (Lindner & Dolly, 2012, p. 6), the issue of food security in this instance, by "understand[ing] the needs of its customers" (Lindner & Dolly, 2012, p. 6).

Purpose

The purpose of this study was to explore farmers' knowledge of food security issues in Trinidad. Such information can be used to develop appropriate extension training interventions. Two research questions guided this inquiry:

1. Which food security issues are in greatest need for additional training for agricultural producers in Trinidad?
2. Do producer needs vary based on geographic location, farm type, farming status, or level of education?

Methodology

The administration of farming in Trinidad is based on three levels: regional, county, and district. It is estimated there are about 19,000 farmers in Trinidad, equally split across the north, central, and south farming regions. A total sample of 300 farmers was selected for this study. This was deemed a large enough sample to provide suitable comparisons on demographic and farm characteristic variables. The sample consisted of 100 farmers each from north, south, and central regions of Trinidad. In each region, farming locales were randomly selected from lists provided by the county extension offices in the three regions. In each locale, 10 farmers were randomly selected based on lists provided by the district extension officer. The survey was conducted in December of 2013 and farmers were interviewed using a structured questionnaire administered by trained interviewers. Due to the data collection protocol, a 100% response rate was achieved.

The instrument consisted of two parts: (a) personal demographic and farm related questions and (b) 27 food security issues derived from *The National Food Production Action Plan 2012 – 2015* (MFPLA, 2012). Personal demographic and farm related questions included geography (north, central, south), farm type (commercial or semi-commercial), farming status (fulltime, part time), and education (primary, secondary, tertiary, undergraduate). Using procedures proposed by Borich (1980), for each of the 27 issues, producers were asked to indicate: (a) their current level of knowledge of the issue and (b) the importance they attached to the issue.

Borich's procedure allows a researcher to prioritize training needs by considering both the knowledge and importance of an issue. Thus, the most important items with the least level of knowledge have the highest priority. Responses options for level of knowledge included: *Extremely knowledgeabl*e =5; *Very knowledgeable* = 4; *Somewhat knowledgeable* =3*; Slightly knowledgeable* = 2; and *No knowledge*=1. Response options for importance included: *Extremely important* = 5; *Very important* = 4; *Moderately important* = 3; *Slightly important* = 2; and *Not important* = 1.

Content validity of the instrument was assessed by using *The National Food Production Action Plan 2012 – 2015* (MFPLA, 2012). Face validity was established by having an expert panel familiar with survey design review the instrument. Additionally, five agricultural producers in Trinidad also reviewed the instrument for face validity. Reliability for each scale was assessed post hoc for internal consistency. The knowledge scale yielded an alpha of .94. The importance scale yielded an alpha of .95. The instrument was deemed a valid and reliable tool to collect the required data.

Data were analyzed following procedures outlined by Borich (1980). To begin, mean weighted discrepancy scores (MWDS) were calculated as follows. First, a *discrepancy score* was calculated for each item by subtracting the knowledge level from the importance level. Next, a *weighted discrepancy score* was calculated by multiplying the discrepancy score by the mean importance rating for that item. Finally, the MWDS were calculated by averaging the responses from all participants for the weighted discrepancy scores for each item. Weighted discrepancy scores in this study ranged from -14 to 17.

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 factors of geographic location, farm type, farming status, and level of education of farmers who participated in the study.

Results

Training Needs of Producers

This question was answered using MWDS between the score farmers placed on their current knowledge level for each item and the score they placed on the importance that respective item held to them as a food producer. The items with the highest MWDS represent the food security issues with the greatest need for additional training.

As shown in Table 1, the five food security topics that were rated highest in in need based on MWDS were: an incentive program that is focused on outputs (5.66); research and development for both livestock and crop farmers (5.36); partnerships between public sector agencies, research institutions, and the private sector to provide suitable capacity to deliver all food production programs (4.98); postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety (4.98); and technology packages (of information) to help farmers improve yield, quality, and availability (4.95).

Table 1

Overall Mean Weighted Discrepancy Scores for Food Security Issues

Food Security Issue	MWDS	*SD*
1. An incentive program that is focused on outputs.	5.66	3.63
2. Research and development for both livestock and crop farmers.	5.36	3.75
3. Partnerships between public sector agencies, research institutions, and the private sector to provide suitable capacity to deliver all food production programs.	4.98	3.76
4. Postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety.	4.98	3.95
5. Technology packages (of information) to help farmers improve yield, quality, and availability.	4.95	3.75
6. Research and development in product development and value-added processing.	4.91	3.66
7. Promotional programs to encourage consumers to eat healthy local foods.	4.67	3.32
8. Local foods initiatives (programs that encourage consumers to buy foods grown locally).	4.64	3.52
9. A place to store up-to-date and accurate data and statistics for the agricultural sector.	4.46	3.83
10. Post-harvest storage facilities strategically located near farms.	4.36	3.78
11. Incentives for people in the agricultural sector to develop new knowledge and innovations.	4.17	4.51
12. National-level legislation that addresses production, land use, health, safety, human resources, and trade.	4.08	3.99
13. Water management and flood control systems such as on-farm ponds, irrigation systems, and rainwater harvesting systems.	3.95	3.88
14. Using modern Information and Communication Technologies to improve communication, efficiency, and effectiveness.	3.89	3.28
15. Private sector involvement along the value chain to increase market access.	3.86	3.10
16. Well-maintained farm access roads.	3.83	3.87
17. National-level policies for production, land use, health, safety, human resources, and trade.	3.80	4.17
18. On-farm security to minimize the sale of stolen produce.	3.56	4.06
19. Linkages between public and private sectors.	3.53	3.42
20. Specialized loan products for agricultural producers.	3.29	3.40
21. Extension services to build capacity and transfer technologies to farmers.	3.12	3.57
22. Training farmers in Good Agricultural Practices (GAP).	3.09	3.62
23. Land distribution program focused on small and large farms.	2.52	3.56
24. Farm certification system.	2.27	3.60
25. Young people entering careers in the agricultural sector.	2.14	4.08
26. Semi-skilled labor force to meet the labor needs of the agricultural sector.	2.11	3.62
27. Home gardening, especially for vegetable production.	-2.61	3.94

Note. Issues were numbered to aid readability of the table.

Food security issues that required moderate attention for further information included: incentives for people in the agricultural sector to develop new knowledge and innovations, national-level legislation that addresses production, among other issues, water management and flood control systems, using modern Information and Communication Technologies and private sector involvement along the value chain (see Table 1).

Food security issues rated as least important for additional information were: land distribution program focused on small and large farms, farm certification system, young people entering careers in the agricultural sector, semi-skilled labor force to meet labor needs of the agricultural sector, and home gardening (see Table 1).

Variance in Training Needs of Producers

All 27 food security issues varied in at least one of the categories assessed: 22 issues varied by geography; 18 issues varied by farm type; 5 issues varied by farming status; and 19 issues varied by education level. Specific differences for each issue are discussed below.

As shown in Table 2, several items indicated as being of high priority for training needs varied significantly by several factors. The perceived need for additional information on an incentive program that is focused on outputs varied significantly by farming status $F_{(1,298)} = 3.87$; $p = .05$. The need for information on research and development for both livestock and crop farmers varied significantly by geography, $F_{(2,297)} = 17.11$; $p = .00$ and farm type, $F_{(1,298)} = 24.47$; $p = .00$. The perceived need for information for partnerships between public sector agencies, research institutions, and the private sector to provide suitable capacity to deliver all food production programs varied significantly by geography, $F_{(2,297)} = 11.10$; $p = .00$, farm type, $F_{(1,298)} = 8.39$; $p = .00$, and level of education, $F_{(3,296)} = 4.63$; $p = .00$. The perceived need for additional information on postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety varied significantly by geography, $F_{(2,297)} = 20.52$; $p = .00$, farm type, $F_{(1,298)} = 4.28$; $p = .04$, and level of education, $F_{(3,296)} = 9.77$; $p = .00$. The perceived need for additional information on technology packages (of information) to help farmers improve yield, quality, and availability varied significantly by farm type, $F_{(1,298)} = 11.04$; $p = .00$ and level of education, $F_{(3,296)} = 2.90$; $p = .04$. Finally, the perceived need for additional information on research and development in product development and value-added processing varied significantly by geography, $F_{(2,297)} = 5.81$; $p = .00$, farm type, $F_{(1,298)} = 15.67$; $p = .00$, and education , $F_{(3,296)} = 6.00$; $p = .00$.

Table 2

Differences in Food Security Issues Based on Geography, Farm Type, Farming Status, and Education

	Geography			Farm Type		Farming Status		Education			
	North (*SD*)	Central (*SD*)	South (*SD*)	Com (*SD*)	Semi (*SD*)	Ftime (*SD*)	Ptime (*SD*)	Pri (*SD*)	Sec (*SD*)	Ter (*SD*)	UG (*SD*)
Issue	*n* = 100	*n* = 100	*n* = 100	*n* = 251	*n* = 49	*n* = 245	*n* = 55	*n* = 2	*n* = 153	*n* = 136	*n* = 9
1	5.08	5.73	6.17	5.82	4.84	5.47	6.53	8.00	5.65	5.59	6.33
	(2.04)	(4.02)	(4.36)	(3.57)	(3.89)	(3.46)	(4.24)	(.00)	(4.18)	(2.77)	(5.57)
	F = 2.30; *p* = .10			*F* = 3.03; *p* = .08		*F* = 3.87; *p* = .05		*F* = .40; *p* = .76			
2	5.36	3.88	6.83	5.81	3.02	5.25	5.82	8.00	5.22	5.56	4.00
	(2.43)	(4.04)	(4.00)	(3.62)	(3.61)	(3.89)	(3.06)	(.00)	(4.43)	(2.85)	(3.46)
	F = 17.11; *p* = .00			*F* = 24.47; *p* = .00		*F* = 1.02; *p* = .31		*F* = .92; *p* = .43			
3	6.36	4.10	4.47	5.25	3.57	5.02	4.76	4.00	4.28	5.85	3.89
	(2.13)	(4.04)	(4.34)	(3.70)	(3.81)	(3.70)	(4.04)	(.00)	(3.90)	(3.24)	(6.17)
	F = 11.10; *p* = .00			*F* = 8.39; *p* = .00		*F* = .22; *p* = .64		*F* = 4.63; *p* = .00			
4	6.92	4.08	3.94	5.19	3.92	4.84	5.60	.00	4.14	6.18	2.22
	(2.72)	(3.90)	(4.33)	(3.85)	(4.28)	(3.92)	(4.04)	(5.66)	(4.06)	(3.33)	(4.94)
	F = 20.52; *p* = .00			*F* = 4.28; *p* = .04		*F* = 1.66; *p* = .20		*F* = 9.77; *p* = .00			
5	5.08	4.48	5.28	5.26	3.35	4.85	5.38	.00	5.07	5.06	2.22
	(2.19)	(4.59)	(4.06)	(3.60)	(4.11)	(3.54)	(4.57)	(.00)	(4.05)	(3.09)	(6.04)
	F = 1.24; *p* = .29			*F* = 11.04; *p* = .00		*F* = .91; *p* = .34		*F* = 2.90; *p* = .04			
6	5.32	3.91	5.49	5.27	3.06	4.74	5.64	.00	4.44	5.68	2.22
	(2.79)	(4.17)	(3.70)	(3.52)	(3.76)	(3.75)	(3.14)	(.00)	(3.88)	(3.16)	(4.06)
	F = 5.81; *p* = .00			*F* = 15.67; *p* = .00		*F* = 2.70; *p* = .10		*F* = 6.00; *p* = .00			
7	5.24	4.92	3.84	4.86	3.67	4.54	5.24	8.00	4.37	4.97	4.44
	(2.59)	(4.09)	(2.95)	(3.18)	(3.82)	(3.33)	(3.25)	(.00)	(3.79)	(2.69)	(3.13)
	F = 5.02; *p* = .01			*F* = 5.33; *p* = .02		*F* = 1.99; *p* = .16		*F* = 1.49; *p* = .22			
8	5.12	4.77	4.04	4.86	3.51	4.46	5.45	6.00	4.50	4.91	2.67
	(2.90)	(4.38)	(3.04)	(3.32)	(4.29)	(3.61)	(3.02)	(2.83)	(3.95)	(2.96)	(3.46)
	F = 2.47; *p* = .09			*F* = 6.17; *p* = .01		*F* = 3.60; *p* = .06		*F* = 1.39; *p* = .25			
9	4.94	3.37	5.08	4.73	3.12	4.26	5.36	5.00	3.90	5.14	3.67
	(2.30)	(4.40)	(4.22)	(3.85)	(3.48)	(3.81)	(3.82)	(2.83)	(4.40)	(3.06)	(2.78)
	F = 6.36; *p* = .00			*F* = 7.32; *p* = .01		*F* = 3.75; *p* = .05		*F* = 2.70; *p* = .05			
10	4.84	5.64	2.60	4.46	3.84	4.13	5.38	4.00	4.00	4.71	5.33
	(2.30)	(4.44)	(3.61)	(3.58)	(4.69)	(3.55)	(4.57)	(.00)	(4.33)	(2.83)	(6.00)
	F = 19.57; *p* = .00			*F* = 1.13; *p* = .29		*F* = 5.00; *p* = .03		*F* = 1.05; *p* = .37			
11	6.61	4.76	1.13	4.20	4.00	3.91	5.33	-2.00	2.53	6.21	2.44
	(2.54)	(4.14)	(4.70)	(4.58)	(4.13)	(4.50)	(4.40)	(2.83)	(4.65)	(3.19)	(6.29)
	F = 51.07; *p* = .00			*F* = .08; *p* = .79		*F* = 4.52; *p* = .03		*F* = 21.40; *p* = .00			
12	6.96	3.28	1.99	4.20	3.45	3.95	4.64	2.00	2.79	5.66	2.44
	(1.95)	(3.52)	(4.28)	(4.11)	(3.24)	(4.10)	(3.39)	(2.83)	(4.01)	(3.44)	(3.09)
	F = 57.78; *p* = .00			*F* = 1.45; *p* = .23		*F* = 1.33; *p* = .25		*F* = 15.02; *p* = .00			
13	4.24	3.29	4.33	4.26	2.37	3.77	4.76	4.00	3.89	4.14	2.22
	(3.31)	(3.99)	(4.25)	(3.71)	(4.37)	(3.83)	(4.07)	(.00)	(4.17)	(3.62)	(2.91)
	F = 2.22; *p* = .11			*F* = 10.06; *p* = .00		*F* = 2.95; *p* = .08		*F* = .71; *p* = .55			
14	5.91	2.39	3.37	4.12	2.69	3.89	3.91	4.00	2.76	5.24	2.67

	Geography			Farm Type		Farming Status		Education			
	North (*SD*)	Central (*SD*)	South (*SD*)	Com (*SD*)	Semi (*SD*)	Ftime (*SD*)	Ptime (*SD*)	Pri (*SD*)	Sec (*SD*)	Ter (*SD*)	UG (*SD*)
Issue	*n* = 100	*n* = 100	*n* = 100	*n* = 251	*n* = 49	*n* = 245	*n* = 55	*n* = 2	*n* = 153	*n* = 136	*n* = 9
	(2.02)	(3.62)	(2.95)	(3.27)	(3.12)	(3.33)	(3.13)	(.00)	(3.40)	(2.70)	(2.00)
	F = 38.21; *p* = .00			*F* = 7.95; *p* = .01		*F* = .00; *p* = .96		*F* = 16.34; *p* = .00			
15	5.16	3.64	2.79	3.99	3.20	3.74	4.40	4.00	3.37	4.49	2.67
	(1.73)	(3.62)	(3.17)	(3.08)	(3.15)	(3.13)	(2.97)	(.00)	(3.17)	(2.86)	(4.30)
	F = 16.53; *p* = .00			*F* = 2.66; *p* = .10		*F* = 2.02; *p* = .16		*F* = 3.68; *p* = .01			
16	3.95	2.95	4.59	4.23	1.80	3.71	4.36	2.00	4.03	3.70	2.78
	(3.03)	(4.02)	(4.32)	(3.73)	(4.03)	(3.80)	(4.17)	(2.83)	(4.51)	(3.04)	(3.67)
	F = 4.66; *p* = .01			*F* = 17.01; *p* = .00		*F* = 1.28; *p* = .26		*F* = .56; *p* = .64			
17	6.86	2.98	1.57	3.88	3.43	3.64	4.51	3.5	2.26	5.64	2.33
	(2.09)	(3.60)	(4.46)	(4.33)	(3.22)	(4.30)	(3.45)	(14.85)	(3.94)	(3.48)	(4.03)
	F = 60.43; *p* = .00			*F* = .47; *p* = .49		*F* = 1.94; *p* = .17		*F* = 19.11; *p* = .00			
18	5.84	2.91	1.93	3.72	2.76	3.72	2.85	.00	2.74	4.46	4.78
	(3.43)	(4.63)	(2.85)	(3.95)	(4.51)	(4.08)	(3.89)	(.00)	(3.72)	(4.08)	(6.24)
	F = 30.07; *p* = .00			*F* = 2.32; *p* = .13		*F* = 2.05; *p* = .15		*F* = 5.31; *p* = .00			
19	4.63	3.27	2.69	3.71	2.59	3.31	4.53	5.50	2.97	4.18	2.89
	(1.79)	(3.94)	(3.81)	(3.25)	(4.07)	(3.30)	(3.76)	(2.12)	(3.62)	(2.92)	(5.30)
	F = 8.95; *p* = .00			*F* = 4.47; *p* = .04		*F* = 5.83; *p* = .02		*F* = 3.41; *p* = .02			
20	3.56	3.04	3.28	3.52	2.12	3.13	4.00	6.00	3.32	3.29	2.22
	(2.72)	(3.65)	(3.75)	(3.32)	(3.57)	(3.39)	(3.36)	(2.83)	(3.72)	(3.00)	(3.53)
	F = .59; *p* = .56			*F* = 7.10; *p* = .01		*F* = 2.93; *p* = .09		*F* = .72; *p* = .54			
21	4.08	3.40	1.88	3.36	1.88	2.91	4.07	4.00	2.54	3.82	2.22
	(3.01)	(4.15)	(3.09)	(3.61)	(3.07)	(3.65)	(3.03)	(5.66)	(3.72)	(3.33)	(2.11)
	F = 10.63; *p* = .00			*F* = 7.26; *p* = .01		*F* = 4.87; *p* = .03		*F* = 3.45; *p* = .02			
22	4.15	3.56	1.57	3.21	2.51	3.00	3.53	5.50	2.39	4.03	.44
	(2.29)	(3.16)	(4.54)	(3.68)	(3.23)	(3.61)	(3.66)	(2.12)	(4.19)	(2.57)	(3.13)
	F = 15.30; *p* = .00			*F* = 1.52; *p* = .22		*F* = .97; *p* = .33		*F* = 7.33; *p* = .00			
23	4.40	2.01	1.14	2.75	1.31	2.35	3.25	.00	1.54	3.71	1.78
	(2.73)	(3.76)	(3.32)	(3.55)	(3.41)	(3.53)	(3.66)	(.00)	(3.64)	(3.13)	(3.53)
	F = 26.24; *p* = .00			*F* = 6.90; *p* = .01		*F* = 2.91; *p* = .09		*F* = 10.25; *p* = .00			
24	4.10	.74	1.96	2.53	.90	2.16	2.75	.00	1.50	3.31	.11
	(2.32)	(4.00)	(3.44)	(3.52)	(3.72)	(3.52)	(3.94)	(.00)	(3.50)	(3.35)	(5.01)
	F = 26.12; *p* = .00			*F* = 8.70; *p* = .00		*F* = 1.19; *p* = .28		*F* = 8.01; *p* = .00			
25	4.42	1.69	.32	2.35	1.08	2.18	1.98	2.00	1.06	3.39	1.78
	(2.43)	(3.78)	(4.62)	(4.19)	(3.35)	(4.11)	(4.01)	(2.83)	(4.36)	(3.48)	(2.91)
	F = 31.44; *p* = .00			*F* = 4.00; *p* = .05		*F* = .11; *p* = .75		*F* = 8.43; *p* = .00			
26	4.27	1.23	.82	2.25	1.39	1.96	2.75	.00	.89	3.51	2.11
	(2.30)	(3.67)	(3.70)	(3.60)	(3.68)	(3.62)	(3.61)	(5.66)	(3.60)	(2.99)	(5.13)
	F = 32.82; *p* = .00			*F* = 2.32; *p* = .13		*F* = 2.10; *p* = .15		*F* = 14.49; *p* = .00			
27	-.46	-.28	-7.08	-2.90	-1.08	-2.64	-2.45	-7.00	-3.71	-1.37	-1.56
	(2.80)	(2.13)	(2.04)	(4.12)	(2.31)	(3.91)	(4.11)	(.00)	(4.06)	(3.50)	(2.13)
	F = 272.54; *p* = .00			*F* = 9.01; *p* = .00		*F* = .10; *p* = .31		*F* = 10.45; *p* = .00			

Note. Food security issues are described in Table 1. Significant differences are shaded.

Several issues of moderate need varied significantly by several factors. Promotional programs to encourage consumers to eat healthy local foods varied by geography, $F_{(2,297)} = 5.02$; $p = .01$ and farm type, $F_{(1,298)} = 5.33$; $p = .02$. Local foods initiatives (programs that encourage consumers to buy foods grown locally) varied by farm type, $F_{(1,298)} = 6.17$; $p = .01$. A place to store up-to-date and accurate data and statistics for the agricultural sector varied by geography, $F_{(2,297)} = 6.36$; $p = .00$, farm type, $F_{(1,298)} = 7.32$; $p = .01$, and level of education, $F_{(3,296)} = 2.70$; $p = .05$. Post-harvest storage facilities strategically located near farms varied by geography, $F_{(2,297)} = 19.57$; $p = .00$ and farming status, $F_{(1,298)} = 5.00$; $p = .03$. The perceived need for incentives for people in the agricultural sector to develop new knowledge and innovations varied significantly by geography, $F_{(2,297)} = 51.07$; $p = .00$, farming status, $F_{(1,298)} = 4.52$; $p = .03$, and level of education, $F_{(3,296)} = 21.40$; $p = .00$. The perceived need for national-level legislation that addresses production, land use, health, safety, human resources, and trade varied significantly by geography, $F_{(2,297)} = 57.78$; $p = .00$ and level of education $F_{(3,296)} = 15.02$; $p = .00$. Water management and flood control systems such as on-farm ponds, irrigation systems, and rainwater harvesting systems varied by farm type, $F_{(1,298)} = 10.06$; $p = .00$. The perceived need for using modern Information and Communication Technologies to improve communication, efficiency, and effectiveness varied significantly by geography, $F_{(2,297)} = 38.21$; $p = .00$, farm type, $F_{(1,298)} = 7.95$; $p = .01$ and level of education $F_{(3,296)} = 16.34$; $p = .00$. The perceived need for private sector involvement along the value chain to increase market access varied significantly by geography, $F_{(2,297)} = 16.53$; $p = .00$ and level of education, $F_{(4,296)} = 3.68$; $p = .01$. The perceived need for information on well-maintained farm access roads varied significantly by geography, $F_{(2,297)} = 4.66$; $p = .01$ and farm type, $F_{(1,298)} = 17.01$; $p = .00$.

Finally, several issues emerged as being of low importance for additional information, varied significantly by several factors. National-level policies for production, land use, health, safety, human resources, and trade varied by geography, $F_{(2,297)} = 60.43$; $p = .00$ and education level, $F_{(3,296)} = 19.11$; $p = .00$. On-farm security to minimize the sale of stolen produce varied by geography, $F_{(2,297)} = 30.07$; $p = .00$ and education level, $F_{(3,296)} = 5.32$; $p = .00$. The perceived need for linkages between public and private sectors varied significantly by geography, $F_{(2,297)} = 8.95$; $p = .00$, farm type, $F_{(1,298)} = 4.47$; $p = .04$, farming status, $F_{(1,298)} = 5.83$; $p = .02$, and level of education, $F_{(3,296)} = 3.41$; $p = .02$. Specialized loan products for agricultural producers varied by farm type, $F_{(1,298)} = 7.10$; $p = .01$. The perceived need for extension services to build capacity and transfer technologies to farmers varied significantly by geography, $F_{(2,297)} = 10.63$; $p = .00$, farm type, $F_{(1,298)} = 7.26$; $p = .01$, farming status, $F_{(1,298)} = 4.87$; $p = .03$, and level of education, $F_{(3,296)} = 3.45$; $p = .02$. Training farmers in Good Agricultural Practices (GAP) varied by geography, $F_{(2,297)} = 15.30$; $p = .00$ and level of education, $F_{(3,296)} = 7.33$; $p = .00$. Land distribution program focused on small and large farms varied by geography, $F_{(2,297)} = 26.24$; $p = .00$, farm type, $F_{(1,298)} = 6.90$; $p = .01$, and level of education, $F_{(3,296)} = 10.25$; $p = .00$. The perceived need for farm certification system varied significantly by geography, $F_{(2,297)} = 26.12$; $p = .00$, farm type, $F_{(1,298)} = 8.70$; $p = .00$, and level of education, $F_{(3,296)} = 8.01$; $p = .00$. Finally, the perceived need for young people entering careers in the agricultural sector varied significantly by geography, $F_{(2,297)} = 31.44$; $p = .00$, farm type, $F_{(1,298)} = 4.00$; $p =$

.05, and level of education, $F_{(3,296)} = 8.43$; $p = .00$. Semi-skilled labor force to labor needs of the agricultural sector varied by geography, $F_{(2,297)} = 32.82$; $p = .00$ and level of education, $F_{(3,296)} = 14.49$; $p = .00$. Home gardening, especially for vegetable production varied by geography, $F_{(2,297)} = 272.54$; $p = .00$, farm type, $F_{(1,298)} = 9.01$; $p = .00$, and education level, $F_{(3,296)} = 10.45$; $p = .00$.

Conclusions, Recommendations, and Implications

Results indicated an incentive program focused on outputs is of highest priority to producers for additional information. This is aligned with the theoretical position that effective Extension systems must address important contemporary issues or problems (Lindner & Dolly, 2012). At present, the incentive program is based on inputs, and is cumbersome to administer and often results in late payments to farmers further exacerbating their challenges. Clearly producers desire more information on a system based on farm production, which may move the country closer to meeting food security goals.

Food producers also stated research and development in livestock and crop production is of second highest need for additional information. At present, there are multiple intuitions in Trinidad and Tobago engaged in agricultural research and developmental activities. These organizations include the Ministry of Food Production, the Caribbean Agriculture Research and Development Institute (CARDI), the Inter-American Institute for Cooperation on Agriculture (IICA), and the Centre for Agriculture and Biosciences International (CABI). These agencies are sometimes involved in field research with farmers and then communicate the relevant findings to extension services. The extension service would then communicate these findings to farmers who would use such findings to mitigate risks, increase production, or reduce costs.

In reality, the links between the public extension service and research organizations are broken (GFRAS, 2013). Research undertaken is rarely communicated to farmers and extension continues to provide mainly administrative services such as land tenure and subsidy information to farmers. Results of this study suggest better communication may be needed of the research and development initiatives being undertaken to meet food security objectives. This is in keeping with Lindner and Dolly (2012) who suggested that for an Extension System to be effective, it must be seen as a credible, unbiased source of information and present solutions based on research.

The similar finding that food producers indicated partnerships between public sector agencies, research institutions, and private sector business are of great importance is related to the previous finding; enhancing the link between extension and research agencies has to be given greater attention by government. Moreover, this finding might be extended to other players in agricultural extension environment. In Trinidad, there exists a pluralistic extension system with state-assisted organizations and private providers involved alongside the public extension system. Partnerships and linkages among government agencies, NGOs, researchers, and educators have been postulated to be key factors in building and an effective extension system (Lindner & Dolly, 2012). Wynn et al. (2013) also noted that a coordinated effort is key for adoption of new practices.

Also of great importance for additional information was the need to develop postharvest technologies that can create employment, reduce postharvest losses, improve produce quality at farm gate,

and ensure greater food safety. Presently, there are few training programs on postharvest technologies and practices provided to farmers. Most technologies offered to farmers are focused on pre-production and production- related activities. As a result, postharvest losses may be significant and result in reduced incomes to farmers.

The National Agricultural Marketing and Development Corporation (NAMDEVCO) operates a postharvest storage facility but this service is limited for use by their exporters. The public extension service is yet to introduce postharvest training to farmers. Wastages at farm gate are easily observed as farmers and farmers often cite difficulty in postharvest management due to lack of training. However, there has been recent information provided which could help address postharvest losses and proper postharvest practices in Trinidad (see Maharaj, Mohammed, Maharaj, & Sankat, 2012). The high importance attached to technology packages to help farmers improve yield, quality and availability indicated more attention must be given to research and publication for farmers. While some level of information exists it is heavily focused on yield improvement, producers are saying there is a gap to be filled with information on quality and availability of products in the marketplace. This is an area for extension intervention, particularly through the communication unit of the Extension Training and Information Services Division (ETISD) communication unit.

Results of the ANOVA test confirmed the existence of great variability in agricultural producers' perceptions of food security issues based on several important factors, confirming earlier research by Ganpat and Bekele (2001) and Ganpat and Bholasingh (1999). It was shown farmers in south Trinidad and commercial farmers believe research and development in agriculture is important to addressing food security. Also, farmers of north Trinidad, who operated commercially, were full-time farmers, and had tertiary level education indicated partnerships between public sector agencies, research institutions, and the private sector are necessary to provide suitable capacity to deliver all food production programs.

Farmers of north Trinidad, commercial farmers, and persons with tertiary level education, had significantly higher needs for training in the area of postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety. The farmers of these specific demographic backgrounds can be viewed as large-scale farmers; they are key stakeholders who make an important contribution to food security. Evidently, these are the sub-populations of the agricultural sector that extension programming should target. This supports the findings of Ganpat and Bholasingh (1999) who determined that sufficient diversity exists among farmers to warrant targeted extension programming. Results suggest that the Trinidad extension service should seek to establish and maintain a strong relationship with the commercial farmers on larger-sized holdings and provide programs designed primarily to increase their production and profits. Motivations in production and profits will ensure continued agricultural sustainability and industry expansion.

While many problems exist in the Trinidad and Tobago food production, adequate training in the areas of incentives, research and development production and post production practices has the potential to greatly assist Trinidad food producers play their part in meeting the country's food security goals. This has implications for

policy makers; they must actively conduct an empirical analysis of the present incentive program with a view to its modification, address the management of research and development in a pluralistic environment and empower the extension and communication departments of the extension services to deliver more information to producers on a timely basis. These measures should result in sustainable agricultural growth, which will ultimate lead to food security.

Further complicating these issues, agricultural production in the Caribbean is subject to uncertainties both locally and internationally. Small scale Caribbean farmers are usually severely hampered in their production efforts by unpredictable weather, market fluctuations, demand shifts due to imported and substitutable goods, supply-impeding factors such as changes in input costs and the supply of labor (FAO, 2011). Moreover, Caribbean farmers are not insured against such changes and are therefore, significantly affected by market forces. The impact on production caused by endogenous and exogenous factors are reflected in domestic agricultural production levels which have shown great variability and decline over the last few years (FAOSTAT, 2014).

Given these important factors affecting agricultural production in the region, the road to achieving food security is complex and economically challenging. Food security requires sustainable growth in agricultural production in the long run. While many factors challenge the achievement of national food security goals, this study focused on understanding the role that extension could play in this context. Extension services in Trinidad could use these results to develop programming that will facilitate increased production and sustainability in agricultural growth.

References

Borich, G. D. (1980). A needs assessment model for conducting follow-up studies. *Journal of Teacher Education, 31*(3), 39-42.

Central Intelligence Agency. (2007). Trinidad and Tobago. *The World Factbook.* Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/td.html

Central Intelligence Agency. (2012). Trinidad and Tobago. *The World Factbook.* Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/td.html

Food and Agriculture Organization. (2008). An introduction to the basic concepts of food security. *Food security information for action: Practical guides.* Retrieved from http://www.fao.org/docrep/013/al936e/al936e00.pdf

Food and Agriculture Organization. (2011). *Safeguarding food security in volatile global markets.* Rome, Italy: Author.

Food and Agriculture Organization, IFAD, & WFP. (2013). *The state of food insecurity in the world 2013: The multiple dimensions of food security*. Rome, Italy: Author.

Food and Agriculture Organization of the United Nations: Statistics (FAOSTAT). (2012). *Agriculture statistics*. Retrieved from http://faostat.fao.org/faostat/collections?subset=agriculture

Ganpat, W., & Bekele, I. (2001). Looking for the trees in the forest: Farm typology as a useful tool in defining targets for extension. *Proceedings of the 2001 AIAEE Conference*. Retrieved from https://www.aiaee.org/attachments/article/1385/pa20.pdf

Ganpat, W. G., & Bholasingh, D. (1999). Attitudes of farmers toward farming in Trinidad. *Journal of International Agricultural and Extension Education, 6*(3), 33-38. doi: 10.5191/jiaee.1999.06305

GFRAS. (2013). *Worldwide extension study: Trinidad and Tobago*. Lindau, Switzerland: Author. Retrieved from http://www.g-fras.org/en/world-wide-extension-study/central-america-and-the-caribbean/caribbean/trinidad-and-tobago.html

Lindner, J. R., & Dolly, D. (2012). Extension and outreach: Not a question of if, but how. *Journal of International Agricultural and Extension Education, 19*(3), 6-14. doi: 10.5191/jiaee.2012.19301

Maharaj, R., Mohammed, A., Maharaj, V., & Sankat, C. (2012). Appropriate post harvest practices for perishable crops in the Caribbean Region. In W. Ganpat & W. Isaac (Eds.), *Sustainable food production practices for the Caribbean* (pp.314-347). Jamaica: Randle.

Ministry of Food Production, Land, and Marine Affairs. (2012). *The national food production plan 2012-2015.* Port of Spain, Trinidad: Author.

Renwick, S. (2010, August). *Current trends in agricultural information services for farmers in Trinidad and Tobago/Caribbean.* Paper presented at the World Library and Information Congress: 76th IFLA General Conference and Assembly, Gothenburg, Sweden. Retrieved from http://conference.ifla.org/past-wlic/2010/85-renwick-en.pdf

Rosen, S. (2008). Rising food prices intensify food insecurity in developing countries. *Amber waves: The economics of food, farming, natural resources, & rural America, 6*(1), 16-21.

World Health Organization. (2012). *Food security*. Retrieved from http://www.who.int/trade/glossary/story028/en/

Wynn, J. T., Coppedge, R. H., & Strong, R. (2013). Future IPM trends in Trinidad and Tobago: A qualitative study of farmers' perspectives. *Journal of International Agricultural and Extension Education, 20*(2), 65-76. doi: 10:5191/jiaee.2013.20205