

Innovativeness and success among vegetable farmers in Trinidad, West Indies

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This study investigated the innovativeness among vegetable farmers as it contributed to successful farming in Trinidad. Two hundred farmers from the main vegetable growing areas in Trinidad were surveyed. Personal, farm and farmer-related factors were assessed and used to examine relationship with innovativeness, operationalized in this study as the extent of sustainable technology use, the extent of adoption of modern marketing practices and the extent of use of modern information sources. Statistical techniques included descriptive and ANOVA. The main findings were that innovativeness is related to: farmers' education level, number of training courses attended, the type of crops produced, the number of parcels of land farmed, the amount of hired labour, the business orientation of farmers, records keeping behavior ($p < .01$ level); whether the operator is a full time or part time operator ($p < .01$ level); and age, the ownership status of land, and type of training pursued ($p < .05$ level). The study concluded that to ensure greater success in farming, and subsequent improved rural development, improved education/training of farmers as well as redesigned policies for Extension need to be put in place.

Keywords: Successful farming, innovativeness, Trinidad and Tobago, small farmers, vegetable producers

Success in farming can be very complicated because of the many diverse components involved including technological, physical and human. The interaction of these, as well as the many other components, results in a level of farming in any given situation. As such any intervention that seeks to improve farm success must identify the more important factors associated with these components and make the necessary interventions.

The farming population in Trinidad can be described as generally comprised of aged farmers with a low educational level and lack of knowledge in modern technologies, who rely on traditional practices in managing their farms. There is also low application of science and technology and this may be related to the fact that farmers rely more on non-government extension personnel, for example, input suppliers, for advice. Generally also, farming is characterized as small scale, with limited mechanization employed due to hilly terrain and poor infrastructure in rural areas. Farmers do not generally keep records of farm operations or profit and loss statements and they face institutional hurdles such as lack of money for farming; lack of access to

subsidies, limited credit from commercial banks for inputs and investments.

Several other issues may affect farmers' success. These include policy initiatives related to the Agricultural Incentive Programme (AIP) and the Farmer Registration Programme (FRP). Both programmes are geared towards providing support to the various agricultural sub-sectors, based on the requirements identified and the recommendations of the stakeholders, with the intention of boosting the overall efficiency and productivity of the agricultural sector. However, there continues to be frequently expressed concerns about the effectiveness of both programmes and their impact on the motivation of farmers to strive for higher successes in their enterprises.

Added to all this, farmers have to face issues related to infrastructure. These include: access roads, praedial larceny, land tenure issues, marketing concerns, lack of finance and perennial flooding as major concerns that prevent them from being as successful as they want to become. In more recent times, changing weather patterns usually upset farmers' planned production routines with

sometimes devastating consequences for their livelihoods.

One role of Extension is to motivate farmers. With a strong dedicated extension service, this can be done and farmers could be convinced to strive for success even in the face of challenging circumstances. Unfortunately, the level of extension service provided is also a source of contention among farmers. Farmers complain that they seldom see an Extension Officer. The reality is that because of the low number of extension officers to service the multitude of small farmers with an estimated Extension Officer to farmer ratio of 1:500, this situation will not change unless either more Extension Officers are employed or approaches based on group work are engaged. Whatever course is chosen, Extension has a duty to make an impact on farmers' incomes. This however will require an understanding of the issues that affect farmers' adoption of new technologies and then develop and deliver appropriate programmes.

Objective of Study

This study investigated the factors that are related to innovativeness among vegetable producers in Trinidad.

Overview of the Agricultural Sector of Trinidad and Tobago

The total number of agricultural land holders in Trinidad and Tobago in 2004 was 19,143 of which 18,169 or 94.9% were recorded in Trinidad (CSO 2005). According to the Trinidad and Tobago agricultural census report, in 2004, private holders accounted for 19,055 or approximately 99.5% of which 18,505 were classified as "Individual/Household/Sole Proprietor" and 550 as "Joint Partnership". The remaining 0.5% of holdings were primarily Private Companies and Government Institutions (CSO 2005). There were 13,874 or 72.4% holders engaged in crop production while the number of holders involved in mixed activities was 3,077 or 16.1%, and livestock activities recorded 2,046 holders or 10.7%. The majority

of holdings were small. Twenty two percent (22.0%) of all holdings were less than 0.5 hectares, 65.1% were between 0.5 and less than 5 hectares, 8.9% between 5 and less than 10 hectares while only 4.0% were greater than 10 hectares in size. The majority (71.6%) of private holders were between the ages of 35-64 years, 12.7% were under 35 years and 15.5% were over 65 years. The data showed that the average size of a private holder's household in Trinidad and Tobago was approximately 4.2 persons. Approximately 76.1% of the households ranged from 1 to 5 members, while 23.9% had over 6 members in the household.

With respect to the business orientation of farmers, studies have indicated that the majority of the farmers have a subsistence or traditional orientation. Ganpat, Seepersad and Bekele (2000, 38-44) reported that, "it is held that the majority of our farmers have a traditional or subsistence orientation. For them, farming is a "way of life" and not a "business", and the two perspectives are usually seen as incompatible". They continued that it is felt that traditional farmers use "primitive" technologies such as "slash and burn" and "shifting cultivation" which are "inimical to the environment and public welfare". They further stated that "the problem may lie in the fact that some people tend to see traditional or business orientation as a product of innate or inherent characteristics".

Conceptual Framework

Muhammad et al (2004) stated that successful farms used three major management methods; (i) production strategies that control costs, (ii) actively marketing their products, and (iii) adopting financial strategies. Firstly, "production strategies that control cost" can range from sustainable practices to alternative farming methods, both aimed at reducing cost. In this study, it is assumed that this concept encompasses sustainable production strategies, which in turn, will reduce cost in the long run. Next, "actively marketing their products" is accounted for in this study by farmers' penetration into modern markets. A modern market is characterized as export markets or niche markets (domestic or foreign). Lastly, "adopting financial strategies" is measured by

farmers' actual financial practices primarily methods of record keeping with respect of costs and profits. With respect to the business orientation of farmers, studies have indicated that the majority of the farmers have a subsistence or traditional orientation. Ganpat et al. (2001, 38-44) reported that, "It is held that the majority of our farmers have a traditional or subsistence orientation". For them, farming is a "way of life" and not a "business", and the two perspectives are usually seen as incompatible".

A study by McLean-Meyinsse, et al. (1994, 73-83) in the United States of America, showed that factors contributing to success of farming are good management practices, knowledge and early adoption of new technology, a strong work ethic, love of farming, size of operation, participation in government programs, and strong family support. Important areas for change include improved education, emphasis on high-return enterprises (fruits and vegetables), restructuring of USDA programs (including the guarantee of acceptable returns for fruits and vegetables producers), expansion of off-farm employment opportunities, and improved access to credit.

Jolly (1993) characterized successful small farmers as those maintaining economic viability through use of old equipment instead of new purchases; relying on contractors to carry out capital-intensive activities; producing specialty products; using diverse marketing outlets; seeking information to reduce production and marketing risks; and diversifying their income sources to include off-farm income. This USA study also concluded that access to credit appears to be a major difficulty for many of these small farm operations.

Nanhou and Duffy (2002, 17-20), measured success in terms of financial gains (profitability). The authors found a negative relationship between success and farmers' age and positive relationship for education, yield, machinery and labor efficiency, rented acres, and contribution to total revenue from livestock production. The study suggests that diversifying their operation between crop and livestock production will help to achieve success.

There has been very little research in this area in the Caribbean. However, Ganpat (2000) found that the following were important factors which influence the performance of small farmers using income derived as the performance measure. These were farmers' access to resources, value of the farm's capital base, farmers' technical ability and aspirations and the number of crops grown.

Based on the factors outlined by the literature, a general model was derived to understand the contributors to successful farming in Trinidad. These factors are detailed in the methodology, used as independent variables and hypothesized to have an effect on the innovativeness and success farmer. These dependent components were: (i) farmers' adoption of sustainable technology use, (ii) adoption of modern marketing practices and (iii) the extent of use of modern information sources.

Methodology

A survey was conducted in the main vegetable growing areas of the northern and central regions in Trinidad. As such, farmers located in counties Caroni, St George East and St George West were interviewed. The sample frame consisted of farmers recognized by the Government as having some sort of innovativeness and success and thus were active beneficiaries of Extension and other development support. These included National Agricultural Marketing Development Corporation (NAMDEVCO) registered farmers (n=178), short-listed farmers in competition for the national entrepreneurial award (n=90) and a list of farmers obtained from the selected county offices (n=531). From this frame, 200 farmers were selected proportionately from these three lists. The selection of the farmers from the agricultural counties was done using proportionate random sampling and consisted as follows: Caroni 38%; St George East 31.5% and St George West 30.5%.

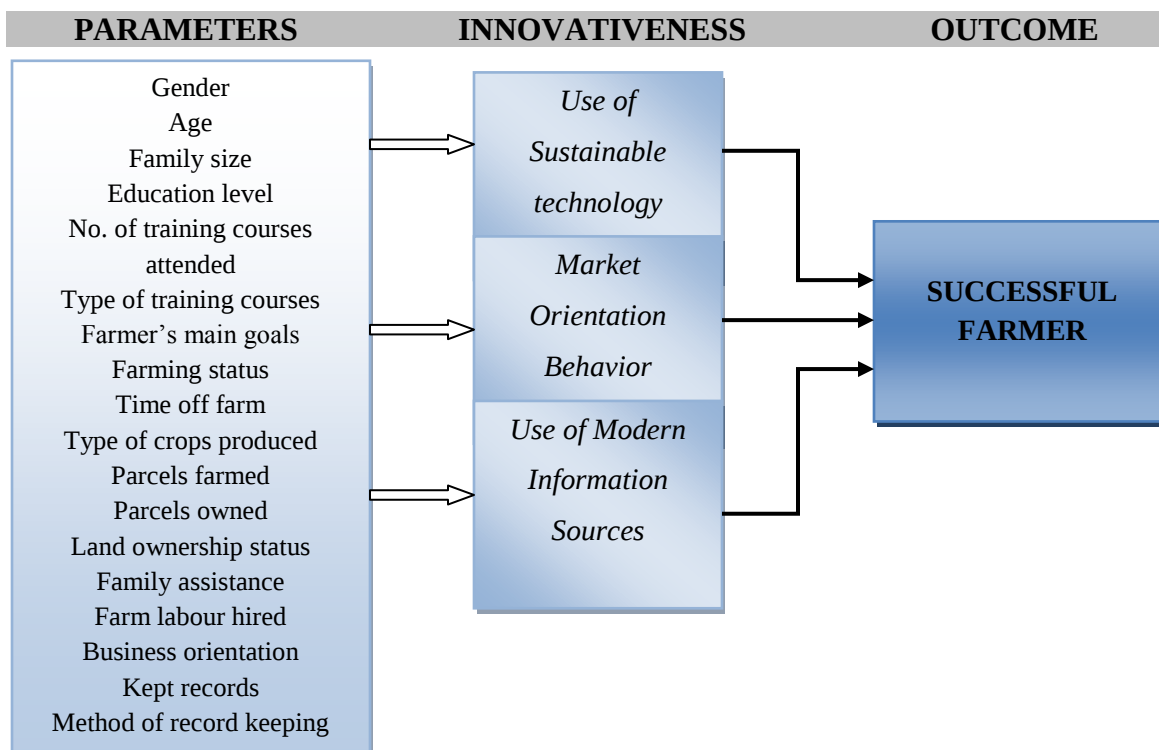


Figure 1: Framework of Study

The survey instrument consisted of five sections. In the first section, questions were related to “personal information” of the farmer. The second section dealt with “farm and farmer related” factors. The third, fourth and fifth sections consisted of questions that sought to capture farmers’ “sustainable technology use”, “market orientation” and “use of modern information sources”.

Sustainable technology use was assessed over 10 questions. Respondents were required to indicate (yes/no) to their use of 10 sustainable technologies available for use in vegetable production systems.

Market orientation was assessed over 10 questions. Respondents were required to indicate (yes/no) to their use of nine marketing practices available for sustainable use in vegetable production systems.

Use of modern information sources Respondents were required to indicate (yes/no) to their use of five modern information sources.

Pre-testing was carried out on five farmers in County Caroni from the general farmers’ list. Based on the feedback, the

questionnaire was edited to ensure clarity of questions. Data were collected using personal interviews. One experienced enumerator was hired to conduct the survey. This ensured consistency in the method used. Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS version 17). Various statistical procedures were used in the analysis of the data including descriptive statistics (means, range, percentages) and ANOVA.

Results

Personal and farm-related results

Table 1 describes the sample data of the 200 farmers surveyed: 90% were male and 10% were female; the majority of the farmers (53.5%) fell within the 41-60 age group. Some 26% were younger (20 -40 age group) and 20.5% were older (> 60 years of age); the majority had medium sized families (85.5% with up to 6 children); the majority of farmers (46.5%) indicated that they completed at least

primary level education, a fair portion had secondary level education (38.5%) and some 12% had tertiary level training. Some 87.5% reported being full-time farmers while 12.5 % reported that they were part-time farmers. Some 42% of farmers worked off farm for 1-3 hours daily, 30% worked off farm for 4-6 hours and 28% worked off farm for more than 6 hours daily.

The majority of farmers (84%) indicated that they did not attend training courses. 73% of the farmers indicated that they grew vegetables and other food crops, 27% indicated that they grew vegetables alone, while 24% indicated that they grew other food crops (root crops, banana, plantain, corn, peas. On the issue of land size, the majority of farmers (60%), farmed one acre or less of land. As regards tenure, 58.5% of the farmers either rented or had permission to use the land followed by 26.5% who owned the land. With respect to family assistance on the farm, 35.5% of respondents said that no family member assisted on the farm. The rest had 1-4 family members. For hired help, some 53.5% indicated that they hired up to four persons to assist in the last year.

46.5 % of the farmers indicated that they farmed mainly for “business and leisure”, while a similar percentage (45.5%) farmed “strictly as a business”. Seven percent indicated that they farm for “leisure only”. The majority (59%) of farmers said that they did not keep records, with some 32% reporting that they kept records in books and 9% that they used computers. With respect to farmer’s perception of farming, the majority of farmers (48.5%) reported that they “love farming very much”, 37.5% reported that they “Like farming”, while the minority of farmers (14%) stated that they “do not enjoy farming”. A majority (80.5%) of the respondents stated that they will continue in farming, 64% stated that they farm because there was very little else for them to do, 62.5% stated that they farm because that is all they know, while 21% stated that as soon as they can do better, they would leave farming.

With respect to the use of sustainable and other modern practices carried out on the farm, 72.5% stated that they use bio-

pesticides, 59.5% stated that they use natural pesticides and 33.5% had irrigation ponds. Equal amounts (27%) of respondents stated that they use micro-drip irrigation and overhead sprinklers. In addition, the majority of respondents (80.5%) stated that they cleaned their produce, while 67% graded their produce.

While a fair percentage of farmers participated in farmers’ group (46.5%), the majority of respondents (53.5%) did not participate in farmers’ groups and some 42.5% of the farmers invested personal funds on the farm.

With respect to modern marketing practices: 27.5% of the farmers stated that they sometimes secured markets before planting, while 12.5% always secured markets. 60% indicated that they did not secure markets before planting. On the issues of marketing, 83.5% of the farmers stated that they sold directly in the wholesale markets, 45.5% sold directly to consumers and 32% sold to middlemen. 55% of the farmers stated that they used machinery on their farms.

The methods by which farmers kept themselves abreast of modern agricultural practices were visiting local exhibitions (25.5%) and conducting internet searches (16%). When farmers had problems on the farms, 33% waited on an Extension Officer to visit, while 47.5% visited the relevant agricultural offices for assistance.

Innovativeness results

With respect to the dependent component “Sustainable technology use”, results indicated a mean score of 5.4 out of a maximum score of 10. Further, 39% of respondents scored 6-10, 25% scored 4-6, while 36% scored 0-3. With a maximum possible “Market orientation” score of 9, mean score for entire sample was 4.2. Results showed that 26.5% of farmers scored 5-9, 45% scored 3-5 and 28.5% scored 0-3. On the component “Modern information sources”, sample mean score was very low (0.6) out of a maximum attainable score of 5. Frequencies showed that most respondents (85.5%) scored 0-1, 5% scored 1-3, while 9.5% scored >3.

Reported success results

Farming appeared to be beneficial to most farmers as many (83.5%) reported profits. Notably, 30% reported profit margins of more than 50%, 30.5% reported profit margins between 25% to 50% and 23% indicated profit margins of 5% to 25%. Conversely, 16.5% reported no profit, implying limited success in their farming operations.

ANOVA Results

The ANOVA results of Personal and farm-related variables and the three operationalized forms of Innovativeness; “Sustainable technology use”, “Market orientation behavior” and “Use of modern information/communication sources” are summarised in Table 2.

The use of “Sustainable technology” was significantly related to farming status (full-time/part-time), the type of crops produced, the number of parcels of land farmed, the amount of labour hired and farmer’s business orientation, the type of training courses attended, time spent on off-farm activities and record keeping habit and the number of parcels of land owned (all at the $p \leq .05$ level of significance).

The mean values show that full-time farmers had significantly higher sustainable technology use scores than part-time farmers; farmers who produced vegetables only used more technology than those who also produced other non-vegetable food crops; farmers with larger sizes of land used more sustainable technology than those with smaller parcels of land; those who hired more labour used more technology than those who hired less farm labour; those farmers who were into farming with a higher business like orientation used more sustainable technology than those with less business like orientation. Farmers who attended training courses associated with crop production, used more sustainable technology than those who did

not. Farmers who spent more time off-farm had higher technology use scores than those who spent less time off-farm. Those who kept records also had higher technology use scores than those who did not keep records and those farmers who farmed more than one parcel of land also used more sustainable technology than those who farmed only one.

The “market orientation behaviour” dependent variable was significantly related to age of farmers, farmers’ education level, number of parcels of land farmed, their business orientation and record keeping habit at the $p < .01$ level of significance, type of crops produced, the ownership status of their lands, labour hired and method of record keeping (all at $\leq .05$ level).

Younger farmers were more market oriented than middle-aged and older farmers; farmers with higher levels of formal education were more market oriented than those with lower levels of education; those who farmed more parcels of land were also more market oriented than those who farmed less parcels and those farmers who held farming as strictly business were more market and finance oriented than those who viewed it as “business and leisure” and “leisure “only”; those who produced vegetable and other food crops were also more market oriented than those who produced vegetables alone; those farmers who rented or leased their farm lands were more oriented towards the market than those who owned and those who farmed illegally on other peoples’ land. Farmers who kept their records in books and on the computer were also more market oriented than those who kept less formal means of records.

The “Use of Modern information/communication sources” was significantly related to educational level, the number of training courses attended, record keeping habit and the type of crops produced (all at the $p \leq .01$ level of significance).

Table 1: Frequency distribution of personal, farm and farmer related factors

Variables		%
Gender:	Male	90.0
	Female	10.0
Age (years):	20-40	26.0
	41-60	53.5
	>60	20.5
Family size (members):	1-3	35.5
	4-6	50.0
	>6	14.5
Educational Level:	Primary	46.5
	Secondary	38.5
	Degree/ Technical	12.0
	No formal	12.0
Farmers' status:	Part time	12.5
	Full time	87.5
Courses attended in the last 2 years:	None	84.0
	One	10.5
	Two or more	5.5
Farm Size (acre):	Less than 1 ac	60.0
	≥ 1	40.0
No. of Parcels of land farmed:	1	6.5
	1- 2	47
	More than 2	24.5
Land Tenure status:	Owned	26.5
	Rented	17
	Permission to farm	41.5
	Illegal occupation	15
Type of crops grown:	Vegetables alone	27.0
	Vegetables and other food crops	73.0
	Other food crops alone	24.0
Hired labour:	None	23.0
	1 -4 persons	53.5
	>4 persons	17.5
Main Farming reason:	Leisure only	7.0
	Business and leisure	46.5
	Strictly business	45.5
Whether kept records:	Yes	41.0
	No	59.0
Time spent off farm	1-3 hrs	42
	4-6 hrs	30
	>6 hrs	28
Family assistance on farm	No family assistance	35.5
	Family assistance	64.5
Method of record keeping	No records	59
	Books (Hardcopy)	32
	Computers	9
Admiration for farming	Love farming very much	48.5
	Like farming	37.5
	Do not enjoy farming	14
Future of farming	Will continue farming	80.5
	Will not continue farming	19.5
Innovative measures		Mean Scores (SD)
– Sustainable Technology Use (Range: 0-10)		5.4 (2.7)
– Use of modern Marketing practices (Range: 0-9)		4.2 (1.9)
– Use of modern information sources (Range: 0-5)		0.6 (1.3)

Farmers with higher levels of formal education used more modern practices than those with lower levels; those who attended more training courses also engaged more modern practices than those who attended less

training; and those who kept records used more modern methods than those who did not. Farmers who farmed vegetables and other food crops also used more modern practices than those who farmed vegetables alone.

Table 2: Results of ANOVA of variables and (i) mean sustainable technology use score, (ii) market orientation score and (iii) modern communication practices score.

Independent Variables	Sustainable Technology Use (0-10)		Market Orientation (0-9)		Modern Communication Practices (0-5)	
	F	Means	F	Means	F	Means
Gender	NS		NS		NS	
Age	NS		3.88**		NS	
20-40				2.1		
41-60				2.0		
>60				1.7		
Family size	NS		NS		NS	
Education level	NS		4.07***		16.56***	
Primary				1.8		1.1
Technical training				3.0		1.0
Secondary				2.1		1.2
Degree				2.2		2.0
No. of training courses attended	NS		NS		7.99***	
None						1.2
1						1.5
2 or more						2.1
Type of training courses	4.12**		NS		NS	
Farm Mgmt		5.6				
Processing		5.6				
Crop and livestock		7.8				
Agricultural skills		6.8				
Farmer's main goals	NS		NS		NS	
Farming Status	12.12***		NS		NS	
Part Time		5.0				
Full Time		6.2				
Time off farm (hrs)	4.58**		NS		NS	
1-3		3.5				
4-6		5.0				
>6		4.1				
Type of crops produced	4.99***		2.81**		3.79**	
Vegetables		6.4		1.8		1.1
Vegetables and other		5.2		1.8		1.2
No. of parcels farmed	11.15***		8.62***		NS	
1		5.6		1.9		
2		6.4		2.0		
>2		7.0		2.4		
Size of farm (ac)	2.54*		NS		NS	
<1		5.0				
1-5		6.0				
5-10		5.8				
10-15		6.6				
>15		6.6				
Land ownership status	NS		3.64**		NS	
Owned				1.8		
Rented				2.0		
Leased				2.2		
Squatting				1.8		

Independent Variables	Sustainable Technology Use (0-10)		Market Orientation (0-9)		Modern Communication Practices (0-5)	
	F	Means	F	Means	F	Means
Gender	NS		NS		NS	
Farm labour hired	5.69***		3.53**		3.15**	
0 person		5.6		1.5		1.1
1 person		5.6		1.9		1.5
2 persons		6.0		2.2		1.2
3 persons		6.7		2.1		1.3
>4 persons		5.2				1.1
Business orientation	5.89***		8.69***		NS	
Leisure		4.8		1.2		
Business & Leisure		6.0		2.0		
Strictly business		6.4		2.1		
Kept records	6.82**		7.18***		25.63***	
Yes		6.4		2.1		1.5
No		5.8		1.9		1.1
Method of record keeping	NS		3.10*		NS	
Books				2.3		
Computer				2.0		
Paper				1.7		
Own Memory				1.5		

*** $P < 0.01$; ** $P < 0.05$; * $P < 0.10$; NS: Not Significant

Discussion

It is generally well recognized that for farmers to be successful, they should be innovative. Innovations can take many forms in a farming operation. In this study, three aspects of farmers innovations were examined among a subset of farmers recognized to have had some levels of success in their farming enterprise.

The overall results show that there is much room for improvement in their use of sustainable technologies on farm as well as their approach and practices related to marketing their products; farmers' scores were just about average for these behaviours. There is however considerable room for improvement in their use of modern information sources, farmers' scores was extremely low on this behaviour.

These three areas are important areas for intervention by government if national food security objectives are to be achieved. Actions are needed at policy level that should specify the scope of the extension work that is needed to support farmers' innovativeness and ultimately national food security.

This study, which was done among farmers who have been beneficiaries of extension services by both the state and state assisted organizations, and have been recognized as farmers who can move the sector forward, showed that a lot more work needs to be done.

Sustainable technology practices must be the focus of extension for farmers' adoption as increasingly the fragile environment is being threatened by agriculture and agriculture related activities such as the use of inorganic fertilizers and pesticides. Moreover, as Caribbean nations are affected by climate change, water resources will become more valuable and as such appropriate sustainable water management practices will be needed. Similarly with increasing incidents of high intensity rainfall, valuable soil may be lost due to inappropriate land preparation and cultivation practices. Extension staff needs to be updated on all these technical matters as well as the appropriate extension teaching and training methods to be used to bring about increased adoption of sustainable practices.

In a similar manner, in some countries that have modern extension systems, marketing extension has been developed as a specialized form of extension for farmers. This change came as a result of the historical focus of extension on production practices, neglecting to assist farmers to identify and focus on market and marketing practices.

Vegetable production in Trinidad has come a long way and farmers use a variety of technologies, not all very appropriate and sustainable, to produce their crops. Indeed, Trinidad is self-sufficient in most vegetables

and even supplies the wider Caribbean region. There is unfortunately a lot of losses in this highly perishable sector and a lot of this may be related to improper or inadequate marketing arrangements which result in production beyond what the market can absorb, both in quantity and quality. The underdeveloped value addition sector for vegetables also contributes to high losses. Farmers' knowledge of markets and marketing practices can be enhanced by a dedicated effort of the extension service. This can be done by two ways; either marketing extension should be specific programming areas in all extension programmes or the national extension service should dedicate a set of staff as specialists in marketing to work with farmers involved, not only in vegetable production but in all other areas of food production.

A key ingredient of success is knowledge. For farmers to be successful, they should be up-to-date with modern farming practices. They can access such knowledge in two ways; either rely on the extension service which may or may not have current information or, in these times of modern communication, they can access such information themselves from a variety of sources. The vegetable farmers in this study did not, to a very large extent, use any of the modern communication sources assessed. Farmers have to be made aware of these sources and be encouraged to access them. Trinidad has fairly well developed Information and Communication Technology (ICT) infrastructure and services which farmers could make more use of.

This low use of modern communication sources may be simple a reflection of the low use by extension staff. This low use by extension staff may be further related to their employers' lack of ability to assist them both in training and provision of modern ICT tools to help them in their work.

Innovations demand the availability of cutting edge information. Present technologies will restrict farmers from achieving their true production potential, they must have access to a wider set of

innovations and extension must empower them in this regard.

Conclusion

A key ingredient of success in farming is innovation. Farmers in the vegetable sector in Trinidad have some measure of success based on their reported incomes. However, there is room for improvement in their adoption of sustainable technologies and their marketing behavior. There is considerable room for improvement in their access of information to be even more successful.

This study identified clear roles for the Government through its Ministry of Agriculture to assist these farmers, a re-focus of the scope of extension programmes to include sustainable technologies and marketing extension; a reorganized extension service to facilitate a specialized extension service; and the equipping of extension staff and officers with modern communication tools to enable them to provide modern, if not real time assistance to farmers to access new information.

In an era of changing climatic events which often leave devastating consequences for small farmers and their livelihoods, a re-focus on building a culture of innovativeness is needed. This study has brought a few key areas to the fore for attention.

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