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Factors Related to Successful Farming Across Different Topography in Trinidad and Implications for Extension

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ABSTRACT

Farming in the Caribbean region is characterized by a multitude of small farm holdings on marginal lands producing food for home use and sale. While some of these farms are on flat lands, it is estimated that in Trinidad some 50% are situated on steep and undulating terrain. Extension programs for improvement in these systems can benefit from an understanding of the factors that influence success, not only for the entire small farm system but also for the flat land and hilly land operations as separate subsystems. This study investigated factors associated with incomes using data obtained from a random sample of 180 commercial-oriented farmers. Regression analysis was done. Results indicated that commercial-oriented hill type farms can be as successful as flat land farms, and that the factors that influence success on flat and hilly terrain are quite dissimilar. For the entire farming systems, experience, aspirations, technical ability, tenure, labor and capital bases, and access to resources are all positively related to success. However, training is negatively related. On hilly lands, farmers' experience, capital base, labor base, technical ability and access to resources were positively related to success. Age is negatively related. On flat lands, training, aspirations, land tenure, resource base, technical ability, access to resources and technology use are positively related with land use intensity and entrepreneurial ability negatively related to income. The unexpected relationships of training and age on farm's success are discussed in some detail highlight the critical, necessary intervention and adjustments extension educators must make to improve these small farm systems.

INTRODUCTION

A typical farm in the Caribbean is generally small in land-size (<2 ha.), and operators are loosely categorized as "small farmers".

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They may be either subsistence or commercial-oriented and constitute the majority of farms in the region (Rajack, 1990). They produce the bulk of food and cash crops. In Trinidad, for example, it has been established (NADP, 1992) that total available arable land is a small, 26% of total land area. Further, the state is the largest single owner of arable land, and together with other large land- owners, control 70% of this available arable land. These lands are usually flat or gently sloping, and fertile. The state and descendants of the colonizers had first choice on available land. The multitude of small farms in Trinidad, estimated at 40,000 (CSO, 1982), farm on what is left of the remaining fertile, flat lands. Most farm marginal lands support their families. It is estimated that about 50% of these systems are on lands that are either hilly or undulating in nature.

This situation is similar to other countries in the region. Several of the Caribbean countries that are largely dependent on agriculture for foreign exchange earnings are characterized by wide variation in topography. Some countries are very mountainous e.g. Dominica and St. Vincent, with other having a fair amount of both flat and hilly land e.g. Trinidad, Jamaica, and yet others being mostly flat, e.g. Barbados. While a wide variety of farm systems is possible in the region, it is estimated that 50-70% of the farming operations are located on lands that are either sloping or hilly in nature.

The Inter American Institute for Cooperation on Agriculture (IICA), noted that geological constraints continue to be a major hindrance to the development of the resource base of farmers and is reflected in the slow rate of technological progress in the region (IICA, 1998). The geological constraints would include topography as well as soil type. Traditionally, more emphasis has been placed on the effects of varying soil type and fertility on production and income than on topographical variations. However, the shear number of farms on marginal land demands that some attention should be paid to this major differentiating characteristics if increased output of these farm systems is to be achieved.

Several contrasting features must be noted. Flat, fertile lands support a longer growing season and may be associated with easier access to resources including extension and education. There would be easier access to garden shops, facilitating increased use of improved seeds, fertilizers and pesticides. Soil quality would tend to be good for farming. Hillside farms on the other hand can only be operated in the wet season, lack of water being the constraining factor in the dry season. Access to the key resources to sustain optimum production will also be restrictive. In Trinidad, existing policies and consequently extension programs do not cater for differences in topography and tend to have a built in flat-fertile land bias.

The objectives of this study were to determine what variables were associated with farm incomes among small commercial-oriented farmers, to compare and contrast the effect of variables on the income of farms on flat and hilly lands, and to assess the impact of these variables on the planning and delivery of extension education programs.

METHOD

One hundred and eighty crop-based, commercial-oriented farmers with farm sizes of <1ha were selected using a simple random sampling procedure done in two stages. In the first stage, nine crop-growing communities characterized by farms in close proximity were selected randomly from 75 such areas across the country. Twenty farms were then chosen randomly from each selected area and surveyed. Data were collected using a structured interview schedule. Multiple Regression Analysis was done to assess the effect of variables on farm income for the entire sample and for flat land and hilly land sub samples.

Dependent Variable

The Net Cash Income of farms was used as an indicator of successful farming. This measure has been used among small farm

systems in Latin America successfully (Dillon and Hardaker, 1993). It was determined as follows:

Net Cash Flow	=	Farm Receipts- Farm Payments
Farm Cash Surplus	=	Net Cash Flow+ Loans Received minus Interest and Principal Repayments
Net Cash Income	=	Farm Cash Surplus+ Gifts+ off-Farm wages + Sale of Products

This measure captures to some extent the complexities and peculiarities of small farm systems in the Caribbean by taking into account several key facets often ignored, such as monetary gifts from abroad, sale of cottage products and earnings from off-farm employment. Net cash was transformed to natural logarithm for the Regression Analysis.

Independent Variables

Farmer-Related

Age : Actual years.

Experience : Number of years in farming.

Education : Years of formal education.

Training : Total number of educational activities attended in last year.

Aspirations: Assessed using a summated Likert-type scale consisting of six questions about future developments of the farm. Range; 6-24.

Managerial Ability: Assessed over a summated self rating scale of six questions concerning respondents' perception of his management abilities. Range; 6-24.

Technical Ability : Assessed over a summated self rating scale of six

questions about respondents' perception of his technical abilities. Range; 6-24.

Entrepreneurial Ability: Assessed over a summated self rating scale of six questions about respondents' perception of his entrepreneurial abilities. Range; 6-24.

Farm Related:

Farm size : Acreage farmed

Tenure : Status of holding scored as Owned (4), Family owned (3), Rented or leased (2), illegal occupation (1).

Technology Used: Summated score of respondents use of 12 practices (Yes=1; No=0)

Capital base : Total dollar value of money spent on last crop, value of farm lands, equipment etc.

Labor base : Amount of additional labor available for farm work, and recorded as man/days.

Resource base: A summated score based on size of farm, labor base and capital base.

Labour Intensity: Average hours spent on farm per day.

Land use intensity: Proportion of acreage under crops in rows or close spacing. Responses were scored: All (=) 4, 3/4=3, 1/2= 2, 1/4=1, none=0.

Risk bearing ability: Operators' perception of the ability of the farm to recover from some disaster e.g. pests diseases, flooding. Very Good=4, Good =3, Fair=2, Poor=1.

Access to Resources: Summated score of respondents' perception of assess to nine resources needed for successful

farming. These were roads, water, market, extension, transport, credit, land, research and labor. Access to each scored: Verity Good (4), Good (3), Fair (2), Poor (1).

The major test variable, topography, was categorized as Flat and Hilly.

RESULTS

Summary descriptive statistics of variables under study are given in Table 1. The statistics are computed for hilly and flat lands separately and combined. The separated groups of farmers are not statistically distinguishable ($p>0.80$) in terms of mean net cash income. Farmers on flat lands attended significantly more training sessions ($p<0.05$) had higher mean scores for managerial ability ($p<0.02$), spent more hours on farm (labor intensity) per day ($p<0.005$) and farms had a higher risk bearing ability ($p<0.002$). On the other hand, farmers on hilly lands have less secure land tenure ($p<0.01$) and higher land use intensity scores ($p<0.001$) and attended fewer training sessions than the other groups. Farm systems were not statistically different on the other variables tested.

Regression Analysis on the combined sample of farmers (n=180) generated a nine-variable multiple linear regression model. These relationships are summarized in Table 2. The results indicate that farmers with more experience, higher aspirations, better technical abilities, more secure land tenure, higher technology use scores, larger capital bases and resource bases, better access to resources, and who attended fewer farmer training sessions had higher net cash incomes. Statistical details provided in Appendix 1 show the adjusted R^2 value 36.2% and the overall regression significant at 0.1%.

The search for variables affecting net farm income for both hilly and flat lands separately using the original set of explanatory variables led to the determination of incongruent sets of explanatory variables

for the two groups (Table 2). On the flat lands, the variables positively associated with net farm income are training, aspirations, technical ability, tenure, technology use, resource base and access to resources. Land use intensity and entrepreneurial ability are negatively related to income (Table 2). Adjusted R^2 was 39.2%.

On hilly lands, variables that are positively associated with net cash income are experience, technical ability, capital base, labour base, and access to resources. Age however is negatively related. The associated R^2 was fairly high (52.3%). These relationships are summarized in Table 2 and detailed in Appendix 1. Several of the variables influencing net cash income in the two topographical zones are different from each other and from the combined data set.

DISCUSSION

While several of the variables examined are related to farm income in the manner that is consistent with other published findings, the variables that contradict expectations are discussed because of the implications for extension education. There is a very weak, negative relationship between training and farm income for the entire sample. The more training experiences, in which farmers participated, are associated with lower farm incomes. This is an unexpected relationship, as usually, training results in improved technical competencies that enable farmers to farm more scientifically and usually results in greater success.

Several explanations are possible. Farmers may have attended a lot of sessions but did not put the training into practice; either lacking the necessary resources to implement recommendations or the training may not have been relevant or appropriate to their specific needs and farm circumstances. The results suggest that time spent in training may well be time spent away from productive activity. This is a serious finding and calls into account the fundamentals of the training experiences provided by extensionists, the recommendations offered, as well as the time and methods of delivery.

Table 1: Combined and group mean scores of study variables and p-values for group comparison

Variables	Combined n=180	Flat n=113	Hilly n=67	Significance
* Net Cash Income $TT	13752	13870	13552	p>0.80
Farmer-Related				
Age	42.6	42.4	43.0	p>0.75
Experience	22.1	22.9	20.6	p>0.20
Education	8.4	8.1	9.1	p>0.13
Training	8.6	9.5	7.2	p<0.05
Aspiration	15.6	16.0	15.0	p<0.10
Managerial Ability	18.7	19	18	p<0.05
Technical Ability	24.5	24.1	25.2	p>0.10
Entrepren. Ability	10.2	10.04	10	p>0.90
Farm Related				
Farm Size	1.5	1.45	1.51	p>0.50
Tenure	3.8	3.6	2	p<0.01
Technology Use	8.9	8.9	8.9	p>0.85
*Capital Base ($TT)	49152	49980	47756	p>0.65
Labor Base	1.8	2.0	1.4	p>0.10
Labor Intensity	7.01	7.33	6.46	p<0.005
Resources	24.5	24.6	24.5	p>0.90
Land Use Intensity	1.4	1.14	1.81	p<0.001
Risk bearing Ability	2.5	2.64	2.3	p<0.002
Access to Resources	21.2	20.9	21.6	p>0.30

***1$US=6.30 $TT (2001)**

Table 2: Comparative results of relationships between variables and income based on regression analysis

Variables	Combined Sample	Flat Subsample	Hilly subsample
Age	0	0	-
Experience	+	0	+
Training	-	+	0
Aspiration	+	+	0
Technical ability	+	+	+
Entrepreneurial ability	0	-	0
Tenure	+	+	0
Technology used	+	+	0
Capital base	+	0	+
Labor base	0	0	+
Resource base	+	+	0
Land use intensity	0	-	0
Access to resources	+	+	+

\+ Indicates positive relationship
\- Indicatives negative relationship
0 Indicates no relationship

Extension educators should reexamine their needs assessment protocols. Were they done properly? Were assessments targeted at commercial-oriented farmers are assessed over all farmers? Were hillside farmers and flat land farmers assessed separately? And, were needs assessments and solutions identification exercises done on an ongoing basis? If not, then training experiences provided are going to be inappropriate and ineffective, as training needs of farmers vary with their commercial orientation, season, crop type and topography to name a few variables, Extension could well be wasting farmers' precious time if sufficient, careful planning is not done! Although the relationship is weak, it should save as an alarm bell to practitioners, as current training experiences could have a disastrous effect on incomes if the situation is left unchecked.

For farmers on flatlands, there is also a weak positive relationship between training and income suggesting a mild beneficial effect of the training experiences. This subset of farmers has the highest mean score for participation in activities. Extension education is often targeted at these farmers. The opportunity exists to further strengthen this relationship by rethinking and reworking our education efforts. For hillside farmers, training is not related to income. These farmers participated to the lowest amount of training and this low level did not impact positively on their incomes. Extension has an excellent opportunity to make training more accessible by seeking out these farmers and designing strategies that will encourage participation. Such sessions must be relevant to their needs as they farm on steep or undulating topography.

Extension providers are clearly quite comfortable when dealing with farmers whom they could easily access. Most extension agents are trained with a flat-land bias and are given resources to work with these farmers. Farmers less accessible, such as hilly land farmers are inadvertently omitted and for them training is not an important predictor of income as evidenced by the data. Improvements in these factors will only serve to improve incomes and issues of targetting and proper needs assessment must be given greater priority to reverse this situation.

The data also show that younger farmers perform better on hillside systems than older farmers. Younger farmers tend to be more enterprising, and have the capacity to work longer hours and harder under severe conditions. To encourage farming, national governments often seek to make land available to young entrepreneurs on some sort of lease arrangement. Often, flat lands seem to be the only option available, but these are limited in quantity in most Caribbean countries. If more hillside lands are made available, a larger amount of farms could be brought into the production system.

The impact of extension education efforts is also greatly

enhanced with a younger farming clientele. However, they are the ones more likely to engage in illegal, temporary occupation of land, practice shifting agriculture and slash and burn techniques. The implications for sustainable use of sloping lands ensuring potential future productivity become critical. These young people constitute a special category for program action. Policies and programs to lessen the negative effect of this type of farming while at the same time encouraging them to stay on the land is going to be a major challenge.

A comparison of the varying topographical systems highlights the marked similarities between the entire sample and flat land system and the dissimilarity between the entire sample and the hill land systems. The flat land and hilly systems are very dissimilar. All this simply suggests that systems simply cannot be treated similarly and thus extension education interventions made on the basis of our understanding and analysis of a combined farm system will not have the anticipated positive effects on all farmers. Each system needs careful analysis and appropriate interventions. Policies and programs designed to cater to their unique characteristics must be done if extension wants to generate success stories. There is urgent need to understand the farmers, the farming environment and the resources associated with farming in different environments.

Commercial-oriented farms on hillsides can be as successful as farms on flat lands. That farmers region-wide continue to farm on hillsides should have alerted extensionists to the fact that it is equally profitable as farming on the flat lands. For the highly visible subsistence-oriented farms it may different, but these were not the focus of the study. Notwithstanding the similar financial outcome of farming, the yearly incomes generated are relatively low requiring remedial actions. It is in this context that the close examination of the different variables that influence success for the combined group and separately for each topographical zone is useful as extension providers develop programs and strategies for improvement.

That commercial-oriented farmers on hilly land can do as well as flat land farmers is encouraging news for the aspiring mass of small farmers operating on hillsides in the region. There is a general tendency of extension to concentrate development efforts to farmers on flat lands. The large number of farmers on hillsides could benefit much more from educational efforts, infrastructural improvements etc. if plans are developed with their circumstances in mind. This needs to be reconsidered. If the vast array of farm systems on hillside is included purposely into development efforts then increased national production and incomes for these farmers could be achieved creating an opportunity to improve the standard of living for many.

CONCLUSION

Firstly, extension educators simply cannot allow themselves to be lulled into the belief that the provision of training will be beneficial to clients without proper preparations and some measure of clientele specification. The fundamentals of good training experiences must be adhered to; proper client segmentation needs assessments and strategy development must be done. In most countries, frontline extension staff is generally equipped with only basic training in agriculture. This is clearly insufficient. Extension education is an important discipline and those entrusted with this responsibility need to be sufficiently trained in the principles of adult education and the selection of appropriate methods, techniques and delivery styles and times. Extension directors and policy makers must address this omission. Training and retraining of extension staff in extension methods must also be done periodically.

Secondly, topographic variations and extension education practices play important roles in determing farmers' success. Consequently, commercial-oriented farmers on hillsides as a select group must be catered for as plans and programs are developed by extension. The concentration of efforts for farmers on flat lands needs to be reexamined and there must be much more emphasis on hillside

farms if national production is to be improved. Careful analysis of farming systems, their constraints and opportunities must be done to inform programs and policies. The provision of proactive programs directed to suit the needs of varying clientele must form an integral part of the extension program development process if we are to reach further into the farming community. Many other variations may exist and extension must plan to cater to these variations.

Finally, policy shifts to make hillside lands more available to young farmers would improve national agricultural output and at the same time decrease unemployment, a serious concern among developing countries. Such a cadre of younger farmers, more amenable to training in modern methods of farming can be of immense value to countries seeking to improve the human capacity of their farming population as they seek to sustain their agriculture into the future.

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APPENDIX 1: Summary results of Regression of Natural logarithm of Net Cash Income on selected farmer and farm related variables

Independent Variables	Combined		Hilly lands		Flat lands	
	Coefficients (SE)	Beta	Coefficients (SE)	Beta	Coefficients (SE)	Beta
Age			-0.0104 (0.0068)	-0.187	-	-
Experience	0.0107 (0.0042)	0.189	0.0253 (0.0085)	0.379	-	-
Training	-0.002 (0.0066)	-0.021		-	0.0028 (0.0097)	0.029
Aspiration	0.0153 (0.0146)	0.071		-	0.0146 (0.0185)	0.073
Technical Ability	0.0272 (0.0105)	0.182	0.0278 (0.0153)	0.163	0.0448 (0.0161)	0.319
Entrepren Ability			-	-	-0.0749 (0.0342)	-0.255
Tenure	0.2201 (0.0451)	0.326	-	-	0.2795 (0.0551)	0.428
Technology Use	0.0309 (0.0169)	0.182	-	-	0.0516 (0.0233)	0.193
Capital Base	(0.000002) (0.000002)	0.125	0.000007 (0.000002)	0.344	-	-
Labor Base			0.1140 (0.0466)	0.225	-	-
Resource base	0.052 (0.0192)	0.275		-	-0.0591 (0.0172)	0.294
L/Use Intensity			-	-	-0.0596 (0.1057)	-0.047
Access to Resources	0.0337 (0.0107)	0.230	0.0557 (0.0198)	0.253	0.0178 (0.0147)	0.141
R^2 (adj.) %	36.2		52.3		39.2	
DF (Error)	170		59		103	
F (Overall)	12.3		11.34		9.04	
Significance	p<0.001		p<0.001		p<0.001	