THE IMPACT OF FARMERS' ACCESS TO RESOURCES ON INCOMES AND IMPLICATIONS FOR DEVELOPMENT

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ABSTRACT

Beyond the traditional factors of production, several other issues are increasingly being recognized as important determinants for the sustainable development of small farm systems. Farmers' level of access to essential resources such as water, electricity, roads, market, transport, credit, extension, research and labor was assessed and used to categorize farmers into high, medium and low levels of access to resources. Descriptive statistics profiled these three sub-groups, in particular the mean incomes generated by each group. Multiple Regression Analysis explored the effects of several farm, and farmer-related variables on farmers' incomes among the three access categories.

A review of the main results indicated that i) income generated was positively influenced by level of access to resources ii) factors associated with incomes generated for subgroups classified as low, medium and high access varied among the subgroups and iii) the farm systems with medium level of access to resources presented the most opportunities for development workers to bring about meaningful change in small farmers' incomes in the short term. These findings highlight the urgent need for Research and Extension to develop approaches and strategies that deliberately target groups of farmers whose incomes can be optimized in the short term, even within present resource constraints, while awaiting other long-term policy actions to improve their level of access to resources and ultimately improve incomes.

Key words: Small Farmers, Access to Resources, Incomes, Sustainable development.

Introduction

Since the livelihood of significant portions of rural people is largely agriculture-based, the agricultural sub-sector must be considered as an essential component of all development efforts and accorded the necessary importance. One major area for intervention involves shifting farmers' practices away from the traditional methods of production to modern science-based methods. As agricultural extensionists and other development-oriented workers seek to facilitate farmer and farm readiness to take advantage of new technologies and thus improve incomes, farmers' level of access to essential resources must become a priority focal area for action.

Although participatory methods of development are becoming increasingly popular, many extension systems still employ methods which are based on the Transfer of Technology paradigm. Technologies developed at research stations or sourced elsewhere are offered for adoption by farmers. Often recommendations are given for possible adoption over diverse typologies, ignoring differences that may exist among farmers and in farming situations and circumstances. "One size fits all' broad-based programs cannot be expected to bring about the desired transformation since they will not effectively promote the decisions that are required for changes in farming methods, adoption of technology, improved production and incomes.

Farming in developing countries, particularly small countries is complex in nature, characterized by wide variations in farming systems. While it is

acknowledged that a variety of factors, and farm circumstances, both in the natural and socio-economic environment impact on outcomes (Byerlee and Collinson, 1988), one major variable for categorization of farm systems, level of access to resources, not explored to any great extent, now demands closer scrutiny. (Roling, 1988) identified this variable as being most important as farmers make decisions to expand operations, use or not use a given recommendation, purchase a new piece of equipment or other inputs. Pinstrup-Andersen and Pandya-Lorch (1998) indicated that there are several challenges to ensure food security and natural resource management, which include inadequacies in the availability of and access to agricultural inputs such as water, fertilizers, pesticides, energy, research and technology.

Several other factors have been suggested (Dolly and Young, 1991) to impact small farmers' incomes in the Caribbean region. These are access to good roads, adequate water, electricity, reliable transport, markets, credit, research and extension. Small farmers have variable access to these resources and the role that these play in determining incomes and its implications for sustainable development needs to be understood in some greater detail.

Indeed the situation is even more complex. In developing countries several different combinations of these resource limitations are possible, resulting in highly diversified farming situations. Behavioral responses, farm production levels and consequently incomes can be expected to vary widely in such situations.

Farming with limited access to essential resources is complex, and farmers respond with a variety of decisions and behaviors. Therefore the degree, to which farmers have some measure of access to those key resources in his environment that influence strategic farming decisions, will determine farms' income. A case study in Guatemala (Van Braun *et al*., 1989) showed that with appropriate access to resources and markets and effective assistance in institution building at the community level, the poor can substantially improve income and welfare.

The central thesis of this study is that any development strategy which takes into consideration differences in the circumstances of rural people and their environment holds more potential for speedier transformation. Indeed, technology, information and support services can be targeted to meet the specific needs of identified categories of farmers. This special focus on categories of clients in the design and delivery of extension services was long noted (Roling, 1988) and is particularly relevant for farm systems with varying access to resources.

This issue is urgent simply because in developing countries, it is often the agricultural sector that is the least recipient of state resources required for development. There may be conditions however that could be improved in spite of this neglect. One purpose of this study was to search for such windows of opportunities for development intervention.

In this study, farms were stratified on the basis of their level of access to resources and a search for factors that play important roles in determining farmers' incomes within each access level was conducted. We believe that it is possible to improve incomes among the different sub-groups through an understanding of the factors that influence outcomes within each grouping and manipulating them. This, we posit, is a much more useful approach than the practised broad-based approach which assumes that all farms have the same level of access to resources. Development agencies can implement more directed policies, programs, and other initiatives to optimize incomes possible, in spite of prevailing constraints.

Objectives

The objectives of this study were i) to assess and describe small farmers' resource situations and ii) to elaborate factors that impact the incomes of farm systems categorized on the basis of their levels of access to resources.

Method

One hundred and eighty crop-based farmers in Trinidad, WI with land area of ≤ 1ha. (2.5 Ac.) in size were selected by a simple random sampling procedure done in two stages. In the first stage, nine crop-growing areas, where farmers were farming in close proximity, were randomly selected from 75 such areas across the country. Twenty farms were then chosen randomly from each selected area and surveyed.

A structured interview schedule was used to collect data on a number of farmer and farm-related variables including their access to nine key resources, and

incomes. Based on a summated score, farmers were assigned statistically into high, medium and low levels of access to resources for further analysis. Multiple Regression Analysis was done to identify the important factors that influence farm incomes, both for the entire sample and for each of the three subgroups.

The Dependent variable, Net Cash Income of farms was used as an indicator of farmers well being. This measure has been used among small farm systems in Latin America successfully (Dillon and Hardaker, 1993) and was measured as follows:

Net Cash Flow = Farm Receipts - Farm Payments

Farm Cash Surplus = Net Cash Flow + Loans Received - 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, sale of cottage products and earnings from off-farm employment. Net cash income was transformed to natural logarithmic scale to stabilize variability.

Farmer related Independent Variables included1111:

Age: Actual years.

Experience: Number of years 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: Assess using a summated self-rating scale of six questions about respondents' perception of his entrepreneurial abilities. Range 6 – 24.

Goals: Five economic goals were assessed, scored using the method of paired comparisons (Bradley, 1976). Farmers were place on a continuum to reflect their economic orientation. Scores ranged between 1 (high economic orientation) and 0 (low economic orientation).

Farm Related Independent variables included:

Farm Size: Acreage farmed.

Tenure: Status of holding scored to reflect degree of ownership as Owned (4); Family farm (3); Rented or leased (2) and Illegal occupation (1).

Technology Used: Summated scored of respondents' use of 12 practices offered for adoption (Yes = 1; No = 0).

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

Labour Base: Amount of additional labour available for farm work, and recorded as man/days.

Resource Base: Summated score based on size of farm, labour 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; ¾ = 3; ½ = 2; ¼ = 1; none = 0.

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

The major test variable, access to resources was assessed using a summated score of respondents' perception of access to nine resources needed for successful farming. These were roads, water, market, extension, transport, credit, land, research and labor. Access to each was rated: Very Good (4), Good (3), Fair (2), and Poor (1). Total scores ranged from 9-36. Farms were grouped into three access levels (low, medium and high) based on aggregate scores as follows; scores <19:low access; 19-26:medium access; and scores >26:high access.

Results

Description of groups based on levels of access

Summary statistics presented in Table 1 showed that farmers' incomes were significantly different ($p<0.001$) among the identified groups, with the high access group having the highest income followed by medium access group. Farmers falling in the low access group reported lowest cash income.

Several other differences on farmer and farm-related variables were evident. The high access group had significantly greater mean scores than the other groups on managerial ability ($p<0.04$) and aspirations ($p<0.04$). The low access group had significantly higher mean scores than the others in experience ($p<0.03$) and risk bearing ability ($p<0.002$). The low access group also had significantly lower mean scores in tenure ($p<0.004$), technical ability ($p<0.001$) entrepreneurial ability ($p<0.001$) managerial ability ($p<.04$) and land use intensity ($p<0.002$) than other groups. The low access group has lowest mean training score with the high access group having the highest mean training score. The medium access group had the highest mean score on goal orientation only.

Effect of variables on income

Regression analysis of variables on income for the combined group i.e. ignoring differences in access to resources, and the three sub groups (low, medium and high access) was used to assess the impact access to resources has on farmers' incomes.

Regression results are summarized in Table 2. The regression of cash income on the variables in the combined sample yielded nine variables with statistical association ($p< 0.05$). The adjusted R^2 of the fitted model is 32.5% with overall regression being significant at 0.001%. All variables except risk bearing ability had positive coefficients. Farm income increased as experience, training, aspiration, capital base, resource base, technical ability, technology use and security of land tenure increased.

Analysis of the sub groups resulted in the identification of incongruent sets of variables as possible predictors of income for the various access groups. In the high access group, income was influenced by training and capital base. These are common to the variables selected for the combined set. In the medium access group, net cash income was influenced negatively by land use intensity and capital base, but positively by experience, tenure, resource base and technology used. The adjusted R^2 for this model was 48.1%. In the low access group, net cash income was negatively affected by education and positively by goal and tenure (Adj.$R^{2=}$ 29.7 %.)

Discussion

Access to resources plays an important role in determining farmers' incomes. This investigation found that net cash incomes were significantly different among farm systems based on their level of access to resources. Farm systems with greater access to roads, water, markets, transport, credit, research and extension generate higher incomes than those that do not enjoy a comparable measure of resource-access. The lower, significantly different incomes in the medium and low access categories compared to the high access group signal that different factors might be responsible for farmers' incomes in the various sub-groups. These should be understood as a first step toward development of sub-group intervention programs to meet the specific development objectives of farmers and their farms. These should be based on farms' circumstances and resources available or resources that could be made available or improved by development workers or farmers themselves.

Detailed examination of the high access group shows that only two factors, capital base and training determine income. Where systems have high levels of access to the critical success factors, investments in additional training and capital would improve income generating capacity. These farmers however, are most likely information seekers, without much dependence on extension and also able to raise further capital without much assistance from external sources. It suggests some measure of independence among these farmers. In a resource constrained environment, this group of farmers should perhaps command the least attention from development workers. There is a tendency however for extension to gravitate to this category of farmers, because of the highly visible on-farm improvement seen and their need to report successes to their supervisors and therefore be seen as productive workers. This needs to be lessened so that extension could focus more time on other categories of farmers.

For systems with medium access to resources, more experience, secure land tenure, a higher resource base and higher level of technology used will result in higher incomes for farmers. Again this is expected. The negative association of land use intensity is probably related to the types of crops grown. Farmers with moderate access to resources are likely to cultivate crops that can be harvested over several growing seasons, rather than short term cash crops because of their higher security of tenure. Such crops are planted at lower cropping intensities, but command higher prices. The negative relationship of capital base suggests that increased investment in machinery and other inputs may mean loans have to be

repaid from income earned and may be a burden on farmers. Also, with limited access to other resources, capital investment is likely to depress income.

For systems with lowest access to resources, where farmers' goals are oriented toward economic ends and they have greater security of tenure, higher incomes are generated. Formal education however is negatively associated with incomes, suggesting that farmers with higher education levels may have accepted their low access situation as very difficult to change and engage in commercial farming to the minimum, subsidizing their income with salaried earnings. Part-time farming is a feature of Caribbean small farming. The key to the improvement of this system lies in motivational changes to move farmers away from the lower end of the commercial continuum to a higher position, and policies to facilitate farmers gaining greater access to resources. Extension agents are however bearers of technology and are often inadequately trained to meet the socio-psychological needs of their clients. Curriculum needs to be reviewed to provide staff with the required abilities to motivate farmers and change any counter productive attitudes.

Comparing the determinants of farm income across differing levels of access shows that farmers in the medium access group are manifestly different from the low and high access groups. The medium access group, to which most farmers belong, needs to be carefully analyzed and programs and strategies developed to improve their access levels and consequently incomes. It is in this category that much speedier and more sustainable development of a community could take place and the lives of a greater number of persons improved.

There is some similarity however in the factors that influence income in the medium access group and the combined sample. This suggests that policies and programs planned on the basis of aggregated/combined information will unintentionally be beneficial to farm systems with medium access to resources and of lesser value to other systems, particularly the low access group.

Interestingly, data also show that low access systems are uncomplicated and successful interventions can be designed on the basis of information about the interrelationships within this group. High access farmers most likely can maintain their own development through their own initiative of capital development and proactive information acquisition.

Improvement in resources will increase the incomes of the low and medium access groups. This is now clear. However, this can be costly. An alternative cost effective approach to achieve higher incomes is to deliberately target those factors that improve incomes within each access group. This may be implemented with relatively lower cost. The resulting higher incomes generated may empower farmers to take their own actions to further improve their access status. Empowerment of farmers, rather than technology deliverers, must therefore be seen as the primary goal of development workers.

Conclusions

This paper sought to draw attention to the shortcomings of the broad-based, generalized approaches to promote farmer development. Instead of hoping that such efforts will be successful and facilitate the transformation of the lives of farmers, evidence suggests the urgent need to look beyond the mass of small farmers and actively identify sub-groups with different levels of access to resources and the relevant conditions that affect incomes. This information can then be used as a basis for action. Only then can meaningful intervention be made and we can have more confidence that our efforts will bring about the development of our small farmers.

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Table 1: Combined and Group mean scores, and p-values for group comparison

Variables	All n=180	Low Access n=54	Medium Access n=97	High Access n=29	p-value
Income ($TT)*	13752	9494	14100	20483	p<0.001
Farmer related					
Age	42.6	43.9	40.9	46	p>0.14
Experience	22.1	24.9	21.9	17.3	p<0.03
Education	8.4	7.4	9.1	7.9	p<0.10
Training	8.6	5.6	8.5	14.7	p<0.001
Aspirations	15.6	15.0	15.5	17.0	p<0.04
Goal Orientation	0.56	0.57	0.59	0.44	p<0.005
Managerial Ability	18.7	18.3	18.5	20	p<0.04
Technical Ability	24.5	22.3	25.3	26.1	p<0.001
Entrepreneurial Ability	10.2	8.9	10.4	10.7	p<0.001
Farm related					
Farm Size	1.48	1.47	1.47	1.51	p>0.90
Tenure	2.8	2.4	2.9	2.9	p<0.004
Technology Used	8.9	8.2	9.1	9.6	p<0.10
Capital Base ($TT)*	49152	57817	44895	47255	p>0.10
Labor Base	1.8	1.4	1.9	2.3	p>0.24
Labor Intensity	7.01	7.3	6.59	7.86	p<0.005
Resources	24.5	24.3	24.5	25.2	p>0.50
Land Use Intensity	1.4	1.1	1.5	1.7	p<0.002
Risk Bearing Ability	2.5	2.8	2.4	2.3	p<0.002

* $1.00 US= $6.30 TT (Year 2008)

Table 2: Summary Results of Regression of the Net Cash Income on Farm and Farmer Related Variables

Independent Variables	**Combined Sample**	**Low Access Group**	**Medium Access Group**	**High Access Group**
	*Beta	*Beta	*Beta	*Beta
Experience	0.17	-	0.29	-
Education		-0.25	-	-
Training	0.07	-	-	0.39
Aspiration	0.08			
Goal Orientation		0.31	-	-
Technical Ability	0.21			
Tenure	0.34	0.46	0.35	-
Technology Used	0.15	-	0.25	-
Capital Base	0.05	-	-0.15	0.37
Resource Base	0.32	-	0.56	-
Land Use Intensity		-	-0.097	-
Risk Bearing Ability	-0.02			
R^2 (adj.) %	32.5	29.7	48.1	31
DF (Error)	170	50	90	26
F (Overall)	10.59	8.45	15.84	7.28
Significance	P<.001	P<.003	P<.001	P<.004

* Beta represents the fitted regression coefficients based on standardized variables