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WILL SMALL YAM FARMERS IN JAMAICA ADOPT THE MINI-SETT TECHNOLOGY?

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ABSTRACT. To alter the production and productivity structure at the farm level entails technological innovations for achieving a more efficient use of natural, human, and economic resources. Beyond the complexity of devising technology in itself, it impels recasting the farming systems to emphasize a more commercially-oriented system than subsistence traditional production. This transformation demands that agricultural technology adoption and sustainability among small farmers be examined within the context of their perception. It must surpass the generation and exposure processes of technological alterations to farmers if it is to be cost-effective and provide elements of sustainability. If agricultural research and technology transfer is to promote suitable agricultural technology, generate sustainable farming techniques and methods, foster technology flows, and generally strengthen income levels, it merits to incorporate the social and economic milieu and often overlooked; farmers' attitudes.

INTRODUCTION

This research paper is a renewal attempt to clarify the importance of farmers' social context and opinions related to embracing a technological production package. It overviews and incorporates attitudinal questions centered on farmers discernment of The Mini-Sett Technology for yam production. The objective is to conceptualize and ascertain the social and attitudinal traits of those farmers who are more likely to espouse said technology.

There is no single set of socio-economic variables that will ensure the adoption and sustainability of a given technological package. However, the existence of a profile of a Jamaican farmer who are disposed to adopt The Mini-Sett Technology in the production of yams goes a far way towards facilitating the implementation of technology transfer, which is likely to become more cost-effective as it is target-oriented and focused on those yam farmers who seem most likely to become adopters.

An interview of 100 farmers selected randomly from the seven (7) major producing Parishes of Jamaica revealed that the knowledge of the Mini-Sett Technology related to yam production is fairly widespread. Most farmers have currently undertaken in their yam production systems some of technology components and practices. However, many are unaware of, and unable to highlight, formally, the specific practice or component they have incorporated to address their individual constraints to a more productive yam enterprise. It seems that the small farmers intuitively derived their technical rationale that validates the adoption of a partial element or complete technological package.

Based on the study's results, there is a positive attitudinal pre-disposition among small yam farmers towards adopting technological change even if it involves risks. The transformation of traditional yam production is up-and-coming. Any attempt to identify those farmers who are more likely to accept and adopt The Mini-Sett Technology requires a clean understanding of the technology, its objectives and the problem-solving capability of applying the techniques-partially or totally. Indeed, there is evidence to support the thesis that yam production and productivity can be enhanced due to the application of this technology. A sense of optimism prevails that it might well constitute a major break-through in the transformation of the traditional system of yam production among the small farmers of Jamaica.

Small farmers' participation in the generation and transfer of technology was not always considered essential for incorporating technological innovations in their production processes. Technology was considered overall neutral. The situation is different today. Technology is rapidly changing the way we live and produce. Production units are compelled to increase production and productivity at a relatively faster rate than before to be able to remain competitive. This requires more knowledge and skills to be procured, devised and delivered to the farming community expeditiously to accelerate adoption. To hasten this process, the technology generation and transfer processes must take into consideration small farmers' participation and perception as well as knowledge of their environment.

Increases in agricultural productivity entail either a design of a technological innovation to alter a prior production system, or a modification of the production process. While this is feasible, as it encourages efficiency in maximizing production, it does not ensure increases in production by itself, for it requires to be adopted by producers. Thus, the transfer and adoption of agricultural technology is crucial for enhancing production especially among small farmers. Indeed, this process recognizes the need to assess farmers' opinions, preferences, criticisms and suggestions as they refer to a specific technology. Once this perception is known and evaluated it can be communicated more readily to technology designers who need to understand the farmers' point of view about the usefulness of a new technology to enhance its adoption (Crowder *et al.*, 1993).

The Mini-Sett Technology was developed to improve the efficiency of yam production especially for export and was tested on farmers' fields through the IICA/MINAG Cropping Systems Project in 1987 (Chin, 1993). This technological package was introduced to increase yam production by changing the traditional system thereby reducing labour costs, achieving more efficient use of stakes, and of the amount of planting material required per production unit. Additionally the mini-sett method simplifies packaging and grading for export, diminishes harmful effects due to post-harvest chemical treatments, and contributes to the control of soil erosion (Chin Sue, 1991). Its dissemination was through the National Yam Export Development Project.

OBJECTIVE:

The core of this paper is to discern the profile of those farmers likely to adopt The Mini-Sett Technology. The objective of this study is to feature the underlying rationale for the adoption or non-adoption of this technology by giving an insight concerning small farmers priorities and decision making processes. Thus, a Jamaica's farmers' profile that seems more prone to adopt this technology can be suggested, identified, from which in turn a clientele can be portrayed and targeted. Indeed one could muse that the viability of this technology to be transferred, adopted and be more cost effective is high once ensemble to farmer's needs.

JUSTIFICATION:

Traditionally the process of agricultural technology generation and transfer in Jamaica has been "Top-to-Bottom" as limited consideration has been given to the views of farmers who are the "end-users". Efforts developed and disseminated following this approach are often frustrated, mirrored on the adoption levels. The cost-effectiveness of this methodological procedure to increase production and productivity remains a subject of debate. A weakness lies within the research procedures used to develop new technological packages, as they lack evaluations or assessments of farmers' perspectives and perceptions of the problems to be addressed, and more importantly, how the innovations will affect them. An alternative is the On-Farm Research and Extension Systems Approach.

Like many other technological packages, the Mini-Sett Technology for yam production was introduced among the farming community in Jamaica without enough consideration as to its acceptability in satisfying the farmer's needs. Ashby, (1990) refers to some of the objectives that circumscribe farmers' evaluation of the technological innovations, where include; inter alia.

(I) Supporting farmers' needs for year-round timely food supply; and

(ii) Compatibility with their farm plans, which incorporate an insurance strategy reflected in their high crop mix to buffer price variability, crop failures, etc.

Indeed, their production function seems to reflect an income flow stabilization rather than a profit maximizing objective. The complexity of small farming systems in Jamaica is a function of multiple objectives. These systems are compelled to be self sufficient, and this is reflected in their need to produce a continuous and reliable supply of food based on a constant and balanced cash flow to cover farm or household expenditures. These considerations set apart the importance for designers of new technologies to measure and evaluate farmers' perceptions and motives for their specific problems and solutions if one is to expect increased and sustained levels of adoption. This is especially the case when dealing with small farmers having very low resource endowments, a fragile natural resource base from which they operate and limited and unreliable supply of institutional services and infrastructure.

METHODOLOGY

Study Design and Sample:

A survey was conducted in the seven (7) major yam growing parishes in Jamaica (St. Andrew, St. Catherine, Clarendon, Manchester, St. Ann, Trelawny, and Hanover). Data was collected from one hundred (100) farmers randomly selected throughout the parishes. The questionnaire was designed to gather information on farmers' background, their criteria for choosing a new technology and their reaction to novel technological practices.

Method of data analysis: Apart from the descriptive statistics used to summarize the responses of the questions (frequencies and cumulative frequencies), factor analysis was used to identify the factors behind the interrelationship among the various attitudinal and opinionated questions. The purpose of using factor analysis is to represent a variable Zj in terms of several underlying factors.

The specification of the factor analysis model used is as follows:

$$Z_j = a_{j1}F_1 + a_{j2}F_2 + \ldots\ldots\ldots a_{jm}F_m + d_j u_j \quad (j = 1,2,\ldots,n)$$

where each n observed variables are described linearly in terms of m common factors and a unique factor. The common factors account for the correlations among the variables, while each unique factor accounts for the remaining variance of that variable. The coefficients of the factors are frequently called "loadings".

The model may be further written explicitly for the value of variable j for individual I as follows:

$$Z_{ji} = \sum_{p=1}^{m} a_{jp}.F_{pi}...+d_j\, u_{ji}\ (I = 1,2,....,n_{ji} = 1,2,...,n)$$

In this expression F_{pi} is the value of a common factor P for an individual I, and each m terms $a_{jp}.F_{pi}$ represents composite, while $d_j u_{ji}$ is the "residual error" in the theoretical representation of the observed measurement Z_{ji}.

The commonality of a variable Z_j is given by the sum of squares of the common-factor coefficients, i.e.,

$$h^2_j = a^2_{j1} + a^2_{j2} + ... a^2_{jm}\ (j=1,2,....,n)$$

The factor analysis model may be expanded and expressed as follows:

$$Z = a_{11}F_1 + a^2_{j1} + a^2_{j2} + ...a^2_{jm}\ (j = 1,2,....n)$$

$$Z = a_{21}F_1 + a_{22}F_2 + ... + a_{2m}F_m ......d_2u_2$$

$$Z = a_{n1}F_1 + a_{n2}F_2 + ... a_{nm}F_m............ + d_nu_n$$

This set of equations is called the factor pattern.

Explanation of model:

The basic factor analysis model used is described as the Analysis of Variance (ANOVA), which seeks to explain the following:

(i) Overall significance of the regression.
(ii) Significance of the improvement of fit obtained by the introduction of additional explanatory variables in the model.
(iii) Quality of coefficients obtained from the different samples.
(iv) Extra sample performance of the regression, and the stability of the coefficients.
(v) Restriction imposed on the coefficient of the function. In other words, to examine the correlation between and among the explanatory variables ($F1...F_m$) to determine how they influence the model (if all other variables are held constant, i.e., if specific explanatory variables are removed from the model).

ANOVA was used to identify the extent, and the impact of the error term variations (between and among the explanatory variables) on the model, thus the relative impact on the coefficients of the variable used. Hence, the explanation of loadings can be done by testing the quality of coefficients, and the restriction imposed on the coefficients of the function.

For the model $Z_j = a_{ji}F_1 + a_jF_2 + ...a_{jm}F_m + d_ju_j (j=1,2..n)$ is explaining Z_j=Total of sum of squares of the model $a_{ji}F_1 + a_jF_2......a_{jm}F_m$ = total sum of squares variations among and between the explanatory variables; $d_j\ u_j$ = the residual error (or the unexplained error) which is equivalent to the correction factor a_j = the coefficient of correlation of the explanatory variables of the model.

The individual observation, Z_{ji} is a subset of the composite model Z_j, with its components a_{ji}, F_{pi} - a subset of $a_j\ F_j$ and a_{pi}, being the coefficient of and among the m explanatory variables $F_1...F_m$. The model built from the individual observations upwards using jm common factors namely:

(i) The correlation among the explanatory variables,
(ii) The summation of the regression lines of system of equations expressed in a matrix form, and
(iii) Along with the residual error $d_j\ u_j$, seeks to explain the impact of each individual variable on the model. It also seeks to determine the level of correlation between the other explanatory variables $(F_1...F_m)$ and how it relates to the variation (the spread of the data among the points on the regression line) which is due to the unexplained (residual error). Hence, the model $Z_j = a_{ji}F_1 + a_jF_2......a_{jm}F_m + d_j\ u_j$ (j=1, 2..n) is applied.

RESULTS

Social Aspects of Farmers:

This section focuses on the farmers' socio-economic aspects and related information solicited in the survey. The parameters relate to: sex, age, income, educational level, farm size, land tenure, experience in and exposure to farming, and also the farm family's contribution to farm labour requirements. The rationale is that if generation and transfer of technology is to be effective and sustained, an understanding of the socio-economic setting on which small farmers' operate is essential.

Comparative analysis of results to the social aspects of the respondents in the "Minisett Adoption Technology Survey, 1995" carried out by IICA, and the "Modified Baseline, 1992" carried out by the Ministry of Agriculture, shows similar characteristics. Table 1 of the Annex shows that the gender of farmers is predominantly male with about 50% of them being over 50 years of age. Sixty-seven percent (67%) of the respondents had less than or equivalent of primary education, 73% being full time farmers with 56% having more than twenty five (25) years of farming experience. In short, farmers have been engaged in agriculture for very long period and are dedicated to farming activities, but have achieved only limited formal educational levels. This provides an information base for on-farm technology generation and transfer systems.

Tables 2 and 3 display the acreage of land use and tenure of the respondents. Most (56%) farmers used land within the range of 1-5 acres, and 18% with less than 1 acre, with 55% on slightly more than half of them being titled owners. The structural implications regarding size of these farming units bias the technological feasibility of these innovations. Similarly, the land tenure situation conveys a high correlation about the type of crops (annual vis-à-vis perennial) to be introduced on those farming systems as a function of the land tenure status.

While approximately 73% of the farmers derived their income from farming it is important to note that 62% of them were utilizing labour from the farm family. Tables 4 and 5 correspondingly underline the high level of economic dependence on the management, production and productivity of their farms, within their low level of endowment.

General Information:

If the primary objective of a given technological practice or package, (i.e., The Mini-Sett Technology), for small farmers is to increase productivity, in order to be effective and meaningful, it must be envisioned in a way that incorporates and reflects the farmer's needs and their absorptive and adoption capacities more effectively. The absence of a researcher-farmer relationship is a major limitation to the traditional existing research procedures, that must be changed to one in which farmers' participation is basal.

In order to facilitate the analyses of yam-farmers production practices and appraise their systems and perspectives will be necessary to provide additional information to avoid blindly prescribing blanket recommendations, unrelated to causal factors that will limit their application, adoption and ultimate success. For instance (66%) of farmers appeared dissatisfied with the income generated from present yam production, low prices being the frequently uttered opinion. Tables 6 and 7 advances the various problems that are likely to be encountered in the production of yam. As expected, the high cost of labour accounted for 50% of the problems, followed by erosion, 26%. While only 1% had difficulty acquiring stakes, responses to the other problems were almost equally distributed. This serves as a preamble to try new production packages or technological innovations that specifically save on labour costs.

When questioned on the awareness of The Mini-Sett Technology, 93% responded positively. Similarly a high percentage reported that they had either practiced the technique or seen it done (Table 8). Thus the coverage of this technology among the farming community is not only well-known but practiced, at least with some of the technological components as presented in Table 9. Indeed, 24% are currently planting on mounds, with almost equal amounts (23%) using mulch. Close planting is practiced by 18% and while 23% are planting smaller setts, 4% are using smaller stakes. Eight percent (8%) of the respondents are not currently using any of the practices. This confirms previous findings that some components of The Mini-Sett Technology are being adopted by small yam farmers (Chin-Sue *et al.*, 1995).

Given that Extension by far was the most reliable source of agricultural information (Table 10), it supports the high levels of awareness and adoption. Also it is a reflection of the effectiveness of the means used to transfer technological information. Farmers seem to prefer the on-spot extension system to uphold one-to-one discussions and demonstrations. Small farmers consider very highly and reliable the inter-personal relationship with the extension officer, on this case, through the implementation of the National Yam Development Project by The Rural Agricultural Development Authority (RADA) in disseminating this technology.

Attitudinal Variables:

For a technology generation and transfer system to be demand-driven, it is critical to understand and analyze measurements pertaining to the farmer's view on technological changes, specifically to The Mini-Sett Technology. Several attitudinal questions, Table 11 of the Annex displays the results of the responses measured on a "yes, "no", "don't know" questions.

While common belief prevails that farmers are reluctant to change, it does not reflect how "easy and/or comfortable" they feel about accepting changes. Sixty five percent (65%) of the farmers indicated that they did not feel uncomfortable accepting technological changes. Similarly the general perception about small farmers not being risk-prone, does not account for their attitude towards their readiness to make changes even if they involve risks as 81% agreed to this. It seems that for small farmers, risk is a matter of degree (a calculated risk). Approximately 88% strongly agreed that farmers should participate in research experiments. It calls for small farmers' participatory approach to a sense of belonging or involvement in innovations.

Responses to the statements "new technologies are expensive, new technologies are labor intensive" show contrasting agreements. Most (55%) of those interviewed reported that new technologies were expensive while 53% felt that new technologies were not labour intensive. Interestingly, equal responses

(47%) were given for agreeing and disagreeing with the availability of inputs for new technologies.

As displayed, approximately 53% of the farmers admit experiencing erosion problems, compared with the 54% that indicated a preference for using mounds instead of hills. An overwhelming 91% agreed that it was good to treat planting material. This was confirmed as the question "I grow yams without chemicals" reported a 65 % disagreement with the statement.

An overwhelming 90% of those interviewed indicated that they have interest in growing yams using production systems other than the traditional, which validates the small farmers' attitudes towards change and risk. Approximately, 86% of the farmers denoted that they had some preference for using mulch. Forty-two percent (42%) indicated preference for plastic mulch while (44%) would prefer to use grass. Getting adequate water for growing yams did not seem much of a problem as the majority (55%) of the farmers indicated good water supply. Unexpectedly, responses show that more than half, approximately 58%, did not like to produce big yams. Most of the farmers, 71% reported that market outlet, for yams were available, but approximately 60% felt that the present price was unreasonable.

Factor Analysis of Attitudinal Variables:

Factor analysis was used to estimate the attitudes of one hundred (100) yam farmers in the seven (7) major yam growing parishes of Jamaica. Thus, one has to identify the factors'--underlying dimensions, behind the inter-relationships among the various attitudinal questions (Q12-Q27 as in Table 11).

A correlation matrix was used to show inter-correlation among the attitudinal variables. There is substantial correlation between questions #'s 16 & 22 (r=.83) and between questions #'s 17 & 22 (r=.69). Yet, there are also very low and negative correlations between some of these variables. Questions #'s 13 & 20 have a very low positive correlation (r=.19) whereas, questions #'s 12 and 13 have a very low negative correlation (r=-0.082). Several factors can be extracted from the matrix by inspection, but as the matrix' size increases it becomes difficult to ascertain factor patterns using this technique. Instead a mathematical technique was used for making factor analysis easier than visual inspection.

The factor analysis procedure encompasses two steps. The first is to extract the "unrotated' factors, otherwise called factor "loadings". A factor loading is essentially the same as a correlation. It expresses the relationship between a variable and a factor (allowing to interpret the meaning of the factor with respect to the particular variable's meaning). Table 12 presents the factor loadings for the unrotated matrix. Only those loadings with absolute values of

0.4 and above are included in the matrix, since factors with those values sensibly delimit their attributes.

The second step in the analysis is the rotation of the factor loadings to obtain a better interpretation of the correlation, Table 13. The loadings from the unrotated matrix are different from those of the rotated matrix. For instance in the unrotated matrix, the variables load heavily on factors 1 & 3. This presents a clustered picture that makes interpretation difficult. In the rotated matrix, however, the variables are more dispersed, allowing better interpretation. The equamax method of rotation was used. The number of factors chosen to be rotated was determined by the Eigenvalue. The Eigenvalue measures the portion of total variation accredited to the common factor, which is the sum of the squares of the factor loadings. Eigenvalues less than 1.0 are usually not interpreted since they account for no more than the variance of a single variable. As a result, only seven (7) factors were chosen in the rotation matrix.

Table 14 in the Annex presents the final commonality estimates of the variables and eigenvalues. A commonality symbolizes the sum of squares of the loadings for each variable. The range in value is from 0 to 1.0. The higher the value, the higher the contribution to the total variation. For instance, question # 14 has a communality of 0.64, implying a high correlation between other variables comprising the factor, thus this variable contributes 64% of the total variation.

Discussion of key factors:

Factor 1 Three variables were significant in forming the factor --Q's # 12, 17 & 26. The farmers expressed that they were comfortable accepting changes. They implied that there was not much difficulty getting inputs for new technologies nor finding market for yams.

Factor 2 The two variables significance in this factor suggest that farmers felt new technologies were expensive with plastic mulch (which is more expensive) being preferred to grass mulch which is also labour intensive --Q's # 16 & 19.

Factor 3 Only one variable was found significant in this factor --Q # 13. It suggests that farmers are willing to undertake new technologies even if involves certain degrees of risks.

Factor 4 The single variable found significant in this factor implies that most farmers were experiencing erosion -- Q # 18.

Factor 5 The variables making important contribution to this factor denote that most farmers believe that they should be involved in research experiments, with interest of growing yams of medium to small sizes in other ways than traditional –Q's # 14, 25 & 21.

Factor 6 The two variables forming this factor centered around the use of chemical in yam production. Farmers imply that it was good to treat planting materials i.e., growing yams with the use of chemicals –Q's # 20 & 24.

Factor 7 The two variables forming this factor suggest that farmers had interest growing yams on mounds than hills and other than the traditional way– Q's # 22 & 21.

DISCUSSION

There are curbed arguments to the proposition that the technology generation and extension process for small farmers ought to be an integrated and phased approach. Phased concerning the need to focus on technology generation, before heavily investing in extension services as a vehicle for delivering information. Indeed, extension services are unlikely to be cost-effective without a strong inflow of technology that is valuable to farmers. And it should be integrated in that the research and extension processes must be demand-driven by an active and participatory role of the farmers themselves. This is an approach to make a research/extension agenda more effective and accountable to clients' needs.

Through a phased system –established on linkages of research, extension, and farmers, the delayed and uncoordinated technology generation and extension process can be accelerated. From the survey results it is evident that there is a potential for tremendous increases in yam production by means of The Mini-Sett Technology. But for this to be achieved there is a need to identify and disburden farmers' priority problems. Indeed, this facilitates building and expanding on achievements derived from pilot efforts, –the National Yam Export Development Project, to decide the best models for strengthening the research and extension work at the farm levels on a phased approach.

A look at the social variables shows that the majority (73%) of the respondent farmers, were full-time farmers, 67% with primary or no education and more than half (56%) having more than twenty-five (25) years experience in farming, whose main source of income is from farming. This identifies a social group of farmers highly dependent on their farming systems for their livelihood, but whose capacity to comprehend adequately the application stages and benefits to stem from new ideas of farming is hampered. Parallel to their land structure and tenure characteristics –74 % with less than five (5) acres, it limits the technology generation and challenges its relevance to their limited resource base. If one is to concur farmers' years of experience --over twenty-five (25) years, they require sufficient time and constant feedback to be convinced that the practices they have used can be improved to their benefit. This suggests that the technology generation and extension system has to be constant and monitored over long periods before successful long-term use and benefits to be derived from a new technology can be realized.

This calls for technology generation and transfer to be tuned to farmers' socio-economic characteristics to enhance its effectiveness and adoption. Farmers' participation in technology generation itself is important, but also the transfer of information, where a personal relationship seems vital. Farmers rendered their appreciation for this type of relationship as 87.5% endorsed that farmers should participate in research experimentation, and 67% choose the extension officer as the most reliable means of obtaining agricultural information.

The two most severe problems reportedly encountered in the present yam production system are the high cost of labour, and the low income generated due to low market prices. If given enough technical supervision, farmers can realize that both constraints (high labour costs and low yields, since higher yields generate higher incomes) can be addressed by The Mini-Sett Technology. This realization is promising when results show that 93% of the farmers interviewed were aware of The Mini-Sett Technology with the majority, 88%, practicing some techniques involved. This implies that farmers are willing and somewhat capable of applying practices of this technology beyond the initial stages of introduction, but many are unable to identify which practices are most suitable for addressing their specific constraints, maximizing profits and minimizing the cost of producing yams.

From the attitudinal questions, the attitudes extracted from factor analysis query general perceptions, beliefs and arguments surrounding small farmers behavior towards technological innovations. The findings highlight the fact that farmers were willing to modify old practices or adjust to new methods even if they involve risks. This presents a positive environment for the adoption of The Mini-Set Technology in yam production. It denotes their willingness to use chemical treatments and a preference for plastic mulch, although farmers expressed the view that the high cost of plastic helps to contribute to their assessment that new technologies are more expensive.

This analysis feature some reactions that yam farmers display towards the viability of The Mini-Sett Technology. It accents some attitudes that seem favorable or critical constraints towards the sustainable adoption of any of the components of this technological package, recently introduced to the farming community in Jamaica. From the factor analysis it seems that the prospects for the sustainability of at least some of the components are promising. Granted it comprises a long term support for yam development programmes. This will allow small farmers, exporters and other economic sectors to realize the economic prospects of increasing yam production and productivity on a sustainable basis through the application of The Mini-Sett Technology.

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Table 1. Social Aspects.

Social Aspects	Current Survey	Adopt. of Mini-Sett Tech. in Jamaica[1]	Ministry of Agriculture[2]
		Percent of Farmers	
Female	15	7	10
With primary or no education	67	65	67
With tertiary education	5	10	8
Over 50 years old	52	51	52
Over 25 years farming experience	56	60	46
Full time farmers	73	43	74

[1] Adoption of Minisett Technology in Jamaica, Chin-Sue, *et al.*, IICA,1995
[2] Modified Baseline Survey NYEDP Data Bank, Ministry of Agriculture, 1992

Table 2. Acreage of Land Utilisation

Acreage	Percentage of farmers
0-1	18
1-5	56
5-10	11
10-20	9
>20	6
TOTAL	100

Table 3. Land Tenure

Tenure	Percentage of farmers
Owned	55
Rental	17
Leased	18
Other	10
TOTAL	100

Table 4. Farming as a Major Source of Income

Farming	% of farmers
Yes	73
No	27
TOTAL	100

Table 5. Land Tenure

Labour	% of farmers
Yes	62
No	38
TOTAL	100

Table 6. Income from Yam in Production.

Satisfaction	% of farmers
Yes	34
No	66
TOTAL	100

Table 7. Problems encountered in Yam Production.

Problems	% of farmers
High cost of labour	50
Lack of water	9
Shortage of sticks	1
Low yield	8
Erosion	26
Other	6
TOTAL	100

Table 8. Awareness of the Mini-Sett the Mini-Sett Technology.

Awareness	% of farmers
Yes	93
No	7
TOTAL	100

Table 9. Current Practices of the Mini-Sett Technology.

Practices	% of farmers
Mounds	24
Mulch	23
Closer planting	18
Smaller setts	23
Shorter stakes	4
No practice	8
TOTAL	100

Table 10. Most Reliable Means of Agricultural Information

Means of Information	% of farmers
Extension	67.0
Radio	9.3
Television	3.0
Newspaper	5.2
Other	15.5
TOTAL	100

Table 11. Percentage Rankings for Attitudinal Questions

	Attitudinal Questions	Yes	No	Don't Know
Q12	I feel uncomfortable accepting changes	33	65	2
Q13	I am prepared to make changes which may involve risk	80.8	18.2	1
Q14	Farmers should participate in research experiments	87.5	12.5	-
Q15	New technologies are expensive	55.1	40.8	4.1
Q16	New technologies are labour intensive	43.7	53.1	3.1
Q17	Inputs are always readily available for new technologies	43.7	43.7	12.5
Q 18	I experience erosion problems from time to time	52.6	43.3	4.1
Q 19	Plastic mulch is preferred to grass mulch	41.8	43.9	14.3
Q 20	It is good to treat planting material	90.7	9.3	-
Q 21	I am interested in growing yams in other ways than traditional	89.8	8.2	2
Q 22	I prefer hills to continuous mounds	38.8	54.1	7.1
Q 23	There is problem of getting enough water for growing yams	43.9	55.1	1
Q 24	I grow yams without the use of chemicals	29.9	64.9	5.2
Q 25	I like to grow big yams	42.3	57.57	-
Q 26	There is a problem finding market for yams	25.5	71.4	3.1
Q 27	The present price for yam is reasonable	39.6	59.5	1

Table 12. Unrotated Factor Pattern: Principal Component

Variable notation		Factor						
Q		1	2	3	4	5	6	10
12	Feel uncomfortable accepting changes			.4943				
13	Prepared to make changes involving risk			.4105				
14	Farmers should participate in research experiments	.4354						
15	New technologies are expensive							.4901
16	New technologies are labour intensive	.4099						
17	Inputs are readily available			.4879				
18	I experience erosion problem						.4611	
19	Plastic is preferred to grass mulch	.4588						
20	It is good to treat planting materials	.4298						
21	I have interest in growing yams other than traditional	.4343						
22	Prefer hills to continuos mounds			.4431				

23	Inadequate water supply for yams							
24	Grow yams without chemicals					.4877		
25	Like to grow big yams				.4740			
26	Problem finding yam market	.4747		.4993				
27	The present yam price is reasonable	.4562						

Note: Factors 7,8, and 9 were not present in the above table since there were no values represented.

Table 13. Rotated Factor Pattern: Equamax Rotation.

Variable notation		Factor						
Q		1	2	3	4	5	6	7
12	Feel uncomfortable accepting changes	.6373						
13	Prepared to make changes involving risk			.7215				
14	Farmers should participate in research experiments	.4354						
16	New technologies are labour intensive		.6794					
17	Inputs are readily available	.6466						
18	I experience erosion problem				.7677			
	Plastic is		.7133					

19	preferred to grass mulch							
20	It is good to treat planting materials						.6725	
21	I have interest in growing yams other than traditional					.5115		.6399
22	Prefer hills to continuos mounds							.7316
24	Grow yams without chemicals						.4522	
25	Like to grow big yams					.6906		
26	Problem finding yam market	.5979						

Table 14: Final Estimate of Communalities For The First Seven Variables and Eigenvalues: Unrotated Matrix.

Variable	Factor	Estimated Communality	Eigenvalue	Percent of Variation	Cumulated Percentage
Q 12	1	.4791	3.2292	0.20	0.20
Q 13	2	.4908	2.0091	0.14	0.34
Q 14	3	.6356	1.8819	0.13	0.47
Q 15	4	.4216	1.4807	0.12	0.59
Q 16	5	.4727	1.2683	010	0.69
Q 17	6	.3800	1.2070	0.09	0.78
Q 18	7	.5120	1.1051	0.07	0.85