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Assessing farmer field school as a sustainable agricultural methodology for farmers in Trinidad and Tobago

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Abstract

Pest management is one of the most limiting factors to crop production in Trinidad and Tobago. Surveys conducted in 1995 revealed that pest control is the single largest expense, accounting for 30 - 40 % of total crop production costs (Lopez et al. 1995). One of the problems identified was the transfer of both existing and new technologies to farmers to ensure development of their knowledge base, leading to sustainable agricultural production. A pilot Farmer Field School (FFS) project in 2003, introduced the use of Farmer Participatory Approaches (FPA) for Ecological Crop Management (ECM) in Trinidad and Tobago. During the period 2004/2008, thirty eight FFS have been conducted with over 400 farmers participating.

In order to assess the FFS as a sustainable agricultural methodology, a survey of 106 farmers, who had participated in FFS over the period 2003-2008, was conducted in May 2009. The factors studied were demographic, institutional, environmental, social and economic. The farmers were interviewed in groups in the field and their responses captured using the meta card system of voting.

Basic frequency analyses were carried out which indicated that more than 90% of the farmers were very satisfied with the institutional arrangements, became more knowledgeable of the factors related to the environment and agreed that the knowledge gained from the FFS empowered them to make more sustainable agricultural crop management decisions. More than 79% of the farmers had adopted the integrated pest management (IPM) technology transferred using the FFS methodology and are currently using these IPM practices. This paper outlines and underscores the need for continued assessments of Farmer Field Schools and related Farmer Participatory Approaches to determine whether they could be used as sustainable agricultural methodologies for farmers in Trinidad and Tobago.

Keywords: Ecological Crop Management, Farmer Field Schools, Sustainable Agricultural Methodology, Integrated Pest Management

Introduction/ Background

The Farmer Field School (FFS) was introduced in 1989 by the Food and Agriculture Organization of the United Nations (FAO) to reduce Indonesian rice farmers' reliance on insecticides. Due to its success the concept was soon extended to other Asian countries, Africa, Latin America, the Middle East and Eastern Europe. The FFS methodology was introduced into the Caribbean in 2002 and added new commodities and was encouraged to adapt to local conditions (Lopez et. al. 2004).

Farmer field schools are based on an innovative, participation, learning by discovery approach and enables farmers to acquire an understanding of the principles of IPM in any situation. It is an informal farmer driven "bottom-up" education approach, which emphasizes farmer empowerment through participatory technology development and transfer as well as the acknowledgement of the indigenous knowledge of farmers and their experience (Nyambo and Kimani, 1998). This approach offers opportunities through which key stakeholders (farmers, extension workers, and researchers) interact as partners to develop IPM options.

It was shown that FFS can improve farmer knowledge in pest identification and improve their ecosystems understanding (Godtland et al, 2004, van den Berg, 2004, Tripp et al, 2005). In China, where bollworm-resistant transgenic cotton varieties have been widely introduced, FFS was found to be effective in helping to realize the potential of pesticide reduction that Bt varieties offer (Yang et al, 2005).

In Trinidad and Tobago pest management is one of the most limiting factors to vegetable production. Surveys conducted in 1995 revealed that pest control is also the single largest expense, accounting for 30 - 40 % of total crop production costs (Lopez et al. 1995). Surveys on management practices revealed a tendency among farmers to apply pesticide cocktails in vegetables or use pesticides according to a planned calendar without the understanding of the agro-ecological requirements of the crop (Ramroop et al., 2000).

Pest management continues to rely heavily on chemical control methods alone, with negative implications to the consumer, the environment and the farmer's health (Lopez et al., 2004). Characteristics of conventional agricultural methods as practiced by farmers included, the use of chemical pesticide 'cocktails', the extensive use of broad spectrum insecticides which killed both target and non-target organisms and an increase in the recommended amount of chemicals, sometimes over ten times the recommended rates, (Ramroop et al.2000).

Concerns based on conventional practices included: the negative effects of misuse and abuse of pesticides, development of pesticide resistance in pest species, elimination of natural enemies, unsafe residue levels in foods, environmental contamination (particularly waterways), risks to human health (pesticide handlers, users and consumers) and the spiralling costs of production.

Parallel to the conventional practices some trends in pest management included: Integrated Pest Management (IPM) programmes aimed at reducing pesticide usage; increased use of other options for pest management (for example, cultural methods, monitoring, resistant varieties, and conservation of natural enemies) and the use of "soft" chemicals with low toxicity to humans and natural enemies were being encouraged. Additionally, the use of chemicals that cause less environmental contamination (for example, botanical insecticides) and the use of different biological control strategies (for example, the introduction of natural enemies to control exotic pests) were being explored.

There was evidently the need for safer approaches to crop production. The recent successes in the management of the hibiscus mealybug, *Maconellicoccus hirsutus* using the natural enemies (*Cryptolaemus montrouzieri, Scymnus coccivora* and *Anagyrus kamali)* and the citrus blackfly, *Aleurocanthus woglumi* using biological control (*Amitus hesperidum, Encarsia* spp.), have proven that alternatives to pesticide use exist and need to be explored and exploited. Additionally, use of entomopathogenic fungus, locally extracted and formulated *Metarhizium anisopliae* was used to control sugar cane frog hopper, local isolate of a fungus *Paecilomyces tenuipes* was used to control the diamond back moth (DBM) *Plutella xylostella* on cabbage and the use of the lace wing (*Chrysopa* spp) was used to control the red palm mite in coconuts, (Lopez et. al 2004).

The problem therefore was on the transfer of both existing and new technologies to farmers to ensure development of their knowledge base, leading to sustainable agricultural development.

The Ministry of Agriculture, Land and Marine Resources (MALMR) together with the European Union - CARIFORUM Caribbean Agriculture and Fisheries Programme's project on Integrated Pest Management (IPM) and CAB International in 2002 initiated a training programme, Farmer Participatory Approach (FPA)/ Farmer Field School (FFS). This training was aimed at developing the human resources needed to help farmers learn about Integrated Pest Management (IPM) and implement it in their production fields. The trained persons (FFS Facilitators) then led similar programmes in the various counties in Trinidad. During the period 2002 – 2008, thirty eight (38) Farmer field Schools in various crops, including cassava, cabbage, sweet potato, tomato, hot peppers and water melons were conducted with over 400 farmers being trained.

This programme therefore came at an appropriate time when the focus was on IPM strategies and reduced pesticide usage. This farmer participatory approach (FPA) is an alternative strategy to inform farmers on plant health issues with a view to reducing their current almost exclusive dependence on chemical pesticides in the management of pests. The key to the success of this FPA is the empowerment of farmers with an understanding of the agro-ecology of their own fields and thereby enabling them to make informed decisions where interventions of plant health management are needed.

The Farmer Field School (FFS) is a form of adult education, which evolved from the concept that farmers learn optimally from field observations and experimentation. It was developed to help farmers tailor their Integrated Pest Management (IPM) practices to diverse and dynamic ecological conditions.

In regular sessions from planting until harvest, groups of neighboring farmers observe and discuss dynamics of the crop's ecosystem. Simple experimentation helps farmers further improve their understanding of functional relationships (e.g. pests-natural enemy population dynamics and crop damage-yield relationships). In this cyclical learning process, farmers develop the expertise that enables them to make their own crop management decisions. Special group activities encourage learning from peers, and strengthen communicative skills and group building (Lopez et al., 2004).

This study was conducted to assess Farmer Field School as a sustainable agricultural methodology in Trinidad and Tobago.

Methodology

A structured questionnaire was designed to obtain information on the demographics of farmers as well as to assess the institutional, environmental, social, and economic factors that had an impact on the farmers, after FFS was introduced to them. One hundred and six (106) farmers who participated in the FFS (2003-2008) were interviewed in groups in the field and their responses captured using the meta card system (voting). These responses were then collated and analysed and group discussions were used to obtain responses for some open ended questions.

Analysis

Basic frequency analysis was carried out and the results were depicted using bar charts and tables. The characteristics (age, gender, educational level) of the farmers are shown in Table 1.

Twenty three percent (23%) of the farmers were under 25 years, 22% of the farmers between 41-55 years and 55 % of the farmers between 26-40 years. The majority of the farmers who participated were males (90%) with 10 % female participants. The educational level of the farmers varied with 1% being at the tertiary level, 56% at primary level and 43% at secondary level.

Institutional Support

Farmers indicated if they were dissatisfied, satisfied or very satisfied with the following: venue for FFS; day and time of FFS; accommodation; frequency; duration of sessions; knowledge and skill of facilitator; input into field activities and classroom activities. More than 90% of the farmers were generally very satisfied with the institutional support provided (Figure 1). Farmers guided the activities from the start of the programme.

Knowledge and Skills

Farmers indicated if their knowledge was poor, fair or very good (before the FFS and after the FFS). Parameters included knowledge and skills in the following: insect pests, diseases and weeds; insect and disease zoos; natural enemies; soil and plant nutrient management; pesticides and post harvest.

Before the FFS, more than 70 % farmers indicated that they had poor or fair knowledge /skills in the named areas. After the FFS, more than 80% farmers indicated that they had very good or fair knowledge in the areas. No farmer indicated poor knowledge after the FFS. Generally, after the FFS more than 79% of the farmers improved their knowledge and skills in Crop and Plant Health Management (Figure 2).

Environmental Related Factors

Farmers indicated if their knowledge was poor, fair or very good before and after the FFS. The parameters included: knowledge of the field environment; pesticide toxicity and safety; use of safer chemicals and reduction in water, air and land pollution. More than 90% of the farmers were more knowledgeable on the factors related to the environment after the FFS (Figure 3).

Social / Empowerment

Farmers indicated if they agreed or disagreed to the following after the FFS: increased confidence levels, increased interaction among farmers; improved relationship between Ministry/farmers and confident decision making. More than 90% of the farmers agreed that after the FFS, the experience had a favorable impact on them leading to greater confidence levels and improved relationships (Figure 4).

Economic Factors

After the FFS, more than 95% of the farmers disagreed that their income or standard of living had increased and indicated that there was no reduction in pesticide costs and other inputs (Figure 5). They further indicated that while they had reduced the number and quantity of pesticides used, the costs of the other inputs have spiraled. Additionally, the costs of the pesticides recommended for use in IPM programmes, for example, those with low toxicity and environmentally friends are more expensive than the toxic pesticides.

Impact / Adoption

Results indicated that after the FFS more than 90% of farmers had adopted practices taught during the FFS (Figure 6). These farmers carried out and continued to carry out these practices in their fields. The FPA and FFS therefore have the potential for being a sustainable agricultural methodology.

Farmers suggested improvements can be made to the FFS throughout the island by providing greater incentives, increasing the sensitisation sessions for farmers, repeating the FFS in other crops, including market planning and organic farming and maintaining follow up visits after FFS in the field.

Farmers indicated that they would invite other farmers to participate and attend FFS sessions for the following reasons:

(1) FFS facilitated learning and farmers improved their crop knowledge and skills
(2) Farmers learnt by doing and from the experiences of other farmers
(3) Participants were motivated by other farmers and it made learning interesting
(4) It was enjoyable and easy.

Additionally, it was possible to obtain better crop yield and quality of produce; participants learnt how to use safe pesticides and handled pesticides properly and were better able to observe their fields. Farmers indicated that the FFS could be improved in several ways as shown in Figure 7.

Results and Conclusions

Farmers have discovered many aspects of crop management in a range of crops through regular field observation, logical inference, sharing and learning from their collective experiences. They found that their time was not wasted since they learnt things that enabled them to save them money or helped them to obtain greater yields. They learnt that applying pesticides based on observation and identification of the problem was beneficial. Using IPM techniques also resulted in better quality and safer product that in turn could command a higher price.

The strengths of a FP programme are many. Participatory and other social group building activities and discovery skills are applicable to a range of areas in the daily lives of farmers. It empowers them and leads to an increased awareness of their community, the environment, health issues etc. Farmer Participatory methods also present opportunities to test alternative approaches to pest management. The preliminary impact assessments studies revealed substantial reductions in pesticide use, equal or higher yields and significant increases in farmer's profits.

Farmer Participatory Approaches and Farmer Field Schools have the potential for being sustainable agricultural methodologies. Further studies and statistical analyses to determine whether FFS is a sustainable agricultural methodology in Trinidad and Tobago should be continued. Impact assessment studies in the various communities should be explored and the FFS approach should be incorporated in the work programme of the Ministry of Agriculture, Land and Marine Resources (MALMR).

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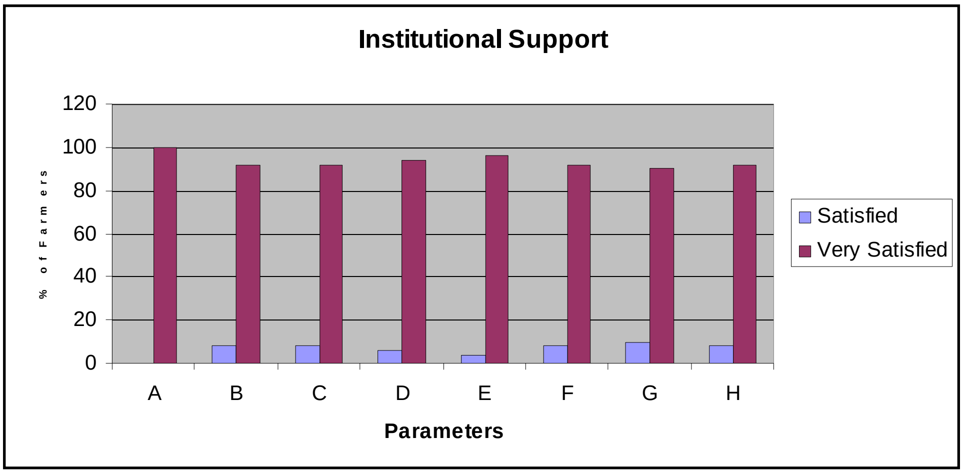
Table 1: Characteristics of Farmers

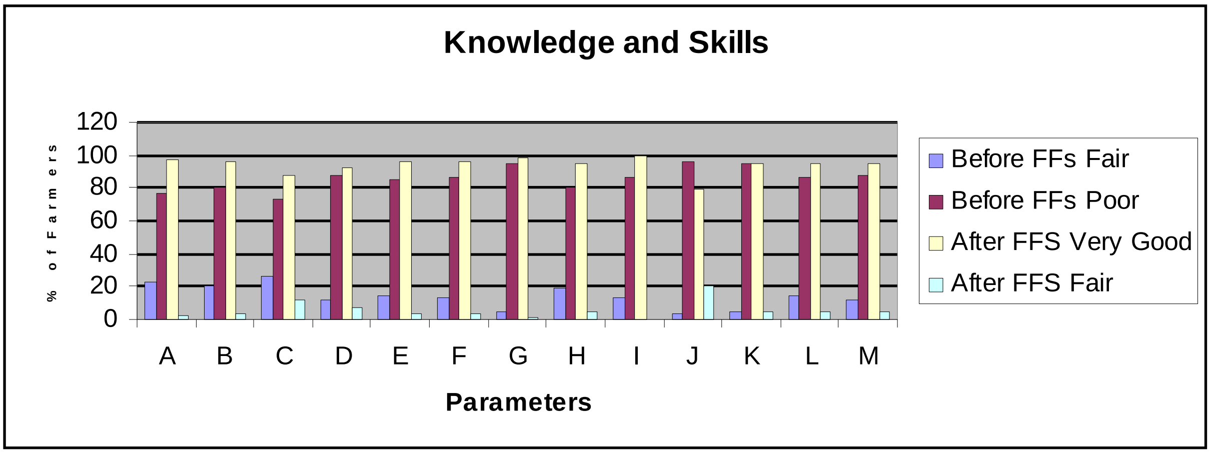
	Age of farmers (yrs)			**Gender**		**Educational Level**		
	<25	*26-40*	*41-55*	*Male*	*Female*	*Primary*	*Secondary*	*Tertiary*
%	*23*	*55*	*22*	*90*	*10*	*56*	*43*	*1*

Twenty three percent (23%) of the farmers were under 25 years, 22% of the farmers between 41-55 years and 55 % of the farmers between 26-40 years. The majority of the farmers who participated were males (90%) with 10 % female participants. The educational level of the farmers varied with 1% being at the tertiary level, 56% at primary level and 43% at secondary level.



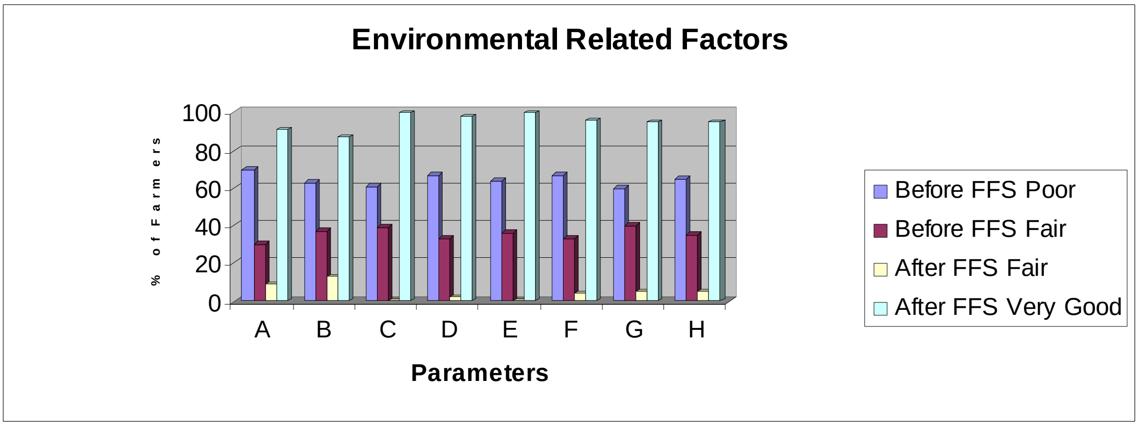
A - Venue
B - Day and Time of FFS
C - Accommodation
D - Frequency
E - Duration of Sessions
F - Knowledge and Skill of Facilitator
G - Input into field activities
H - Classroom Activities

Figure 1: Institutional Support



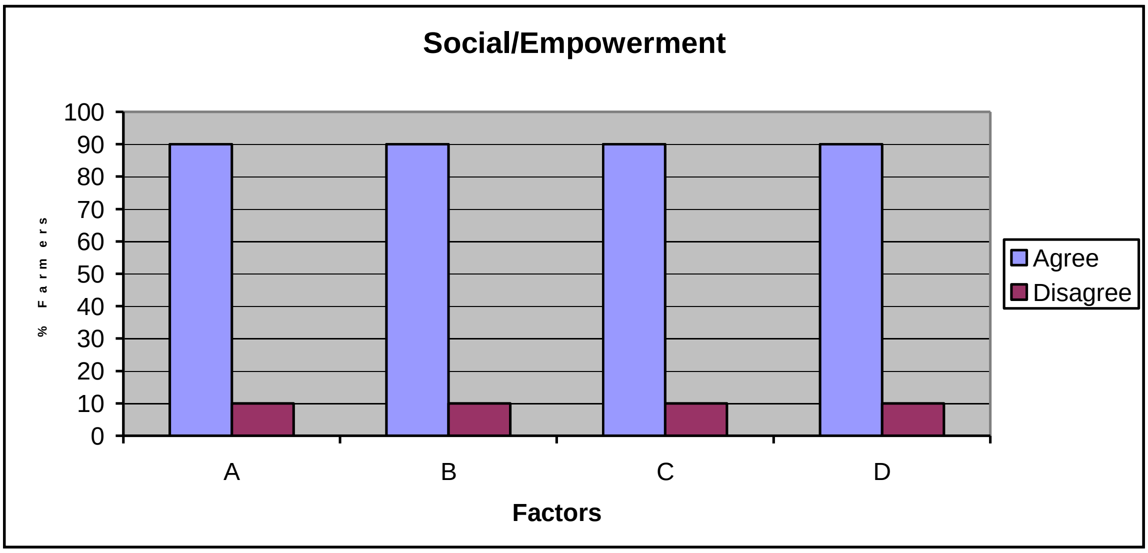
A - How pathogens spread in and to your fields
B - Interaction between crop, pests, diseases and the environment
C - Relationship between soil testing and fertilizer use
D - Stages of crop development and nutrient requirement
E - Methods and fertilizer rates
F - Identification of diseases
G - Identification of Natural Enemies
H - Lifecycles of pathogens and Natural Enemies
I - Set up insect/disease zoos
J - Conduct field experiments
K - Classification of pesticides
L - Mode of action of pathogens
M- Adherence to pre harvest intervals

Figure 2: Knowledge and Skills



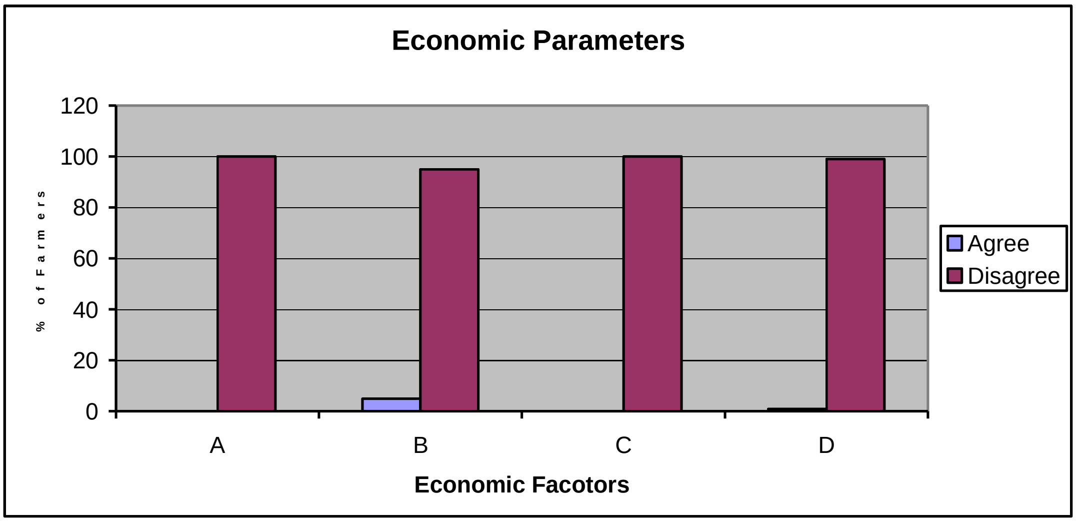
A- Knowledge of field environment
B- Knowledge of pesticide toxicity
C - Use of safer chemicals
D- Use of toxic chemicals
E - Pesticide Safety
F - Reduction in water pollution
G - Reduction in air pollution
H - Reduction in land pollution

Figure 3: Environmental Related Factors



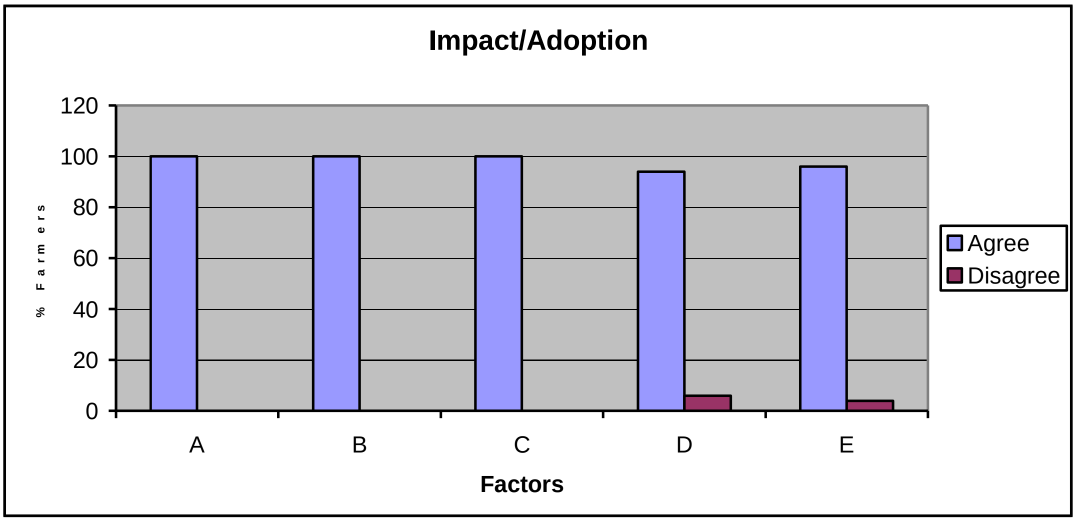
A - Increased confidence levels
B - Increased interaction among farmers in the area and outside
C - Improved relationship between farmers and Ministry staff
D - Confident decision making

Figure 4: Social/ Empowerment



A - Increase income
B - Increased standard of Living
C - Reduced pesticide costs
D - Reduction in costs of other inputs

Figure 5: Economic Parameters



A - Observe fields more frequently
B - Follow pre harvest intervals
C - Use safer chemicals
D - Conduct experiments on the farm
E - Improvement on the overall yield and quality of crops

Figure 6: Impact/Adoption after FFS

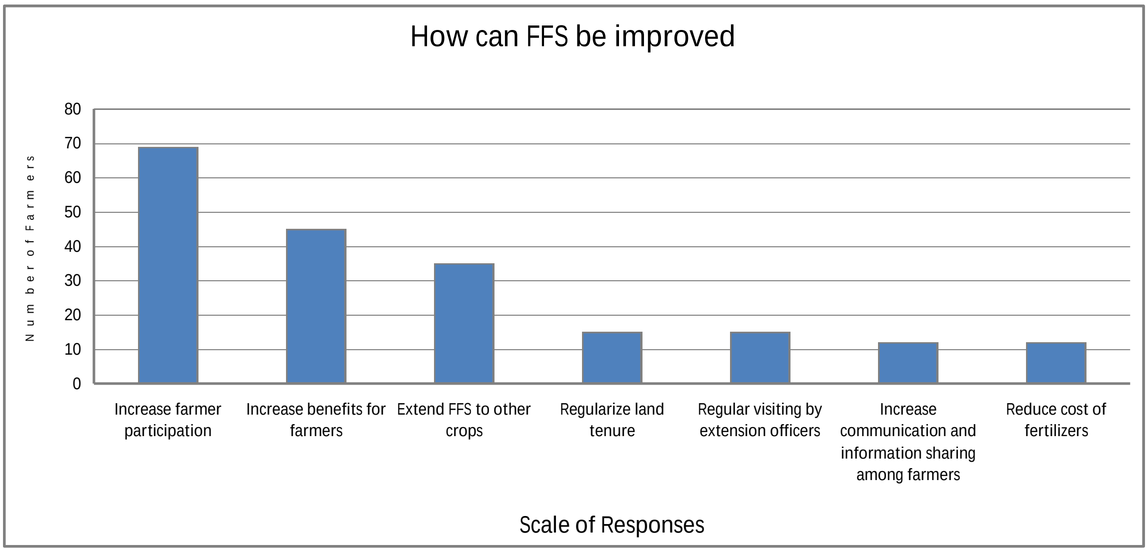


Figure 7: How FFS can be improved