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Why targeting matters

Examining the relationship between selection, participation and outcomes in farmer field school programmes

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Systematic Review 11

Agriculture

International Initiative for Impact Evaluation

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Why targeting matters: a systematic review of farmer field schools targeting

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Abstract

Farmer field schools (FFS) are an adult education and agricultural extension approach designed to empower farmers, increase productivity and improve livelihoods. Targeting an FFS programme affects participation and participant characteristics are likely to influence programme outcomes. We systematically reviewed the literature and then carried out content analysis, meta-analysis and meta-regression analysis to explore how FFS programmes are targeted and how this affects participation and performance. We find that some FFS programmes include equity criteria, targeting the poorest and most disadvantaged farmers in a society on the grounds that they are most in need of the benefits FFS participation provides. However, many FFS programmes include effectiveness targeting criteria designed to promote the inclusion of farmers with more resources, more education and greater social agency, with the aim of maximising programme effectiveness.

While programmes typically achieved effectiveness-related inclusion objectives, some programmes failed to fulfil equity-related inclusion goals. This was either because conflicting targeting criteria and participant selection mechanisms favoured elite capture, or because the need for access to a minimum level of social and economic capital precluded the participation of some participants. There is also evidence that the characteristics of FFS programme participants can have a significant impact on programme outcomes. FFS programmes with participants with relatively higher levels of education may be more effective in improving the adoption of practices such as integrated pest management (IPM) and increasing yields. Programmes with relatively more educated participants may also be more successful in passing on FFS learning to neighbour farmers living in the same communities. However, poorer farmers are more likely to benefit when they participate directly in FFS programmes than when they receive knowledge indirectly.

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Abbreviations and acronyms

BLDS	British Library for Development Studies
CIP-CARE	International Potato Center (CIP) Cooperative for Assistance and Relief Everywhere (CARE)
EU	European Union
FAO	Food and Agriculture Organization
FFS	Farmer Field Schools
GUMAP/SARDI	Ganta United Methodist Agriculture Programme/Sustainable Agriculture and Rural Development Initiative
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
JOLIS	IMF-World Bank joint library network
LMIC	Low- and Middle-Income Country
PROMIPAC	Programa de Manejo Integrado de Plagas en América Central (Central America Integrated Pest Management Program)
SSCI	Social Science Citation Index

1. Introduction

Farmer field schools (FFS) have been used as a way of tackling rural poverty since they were first implemented as a means of introducing Integrated Pest Management (IPM) to Indonesia in 1989. Field schools involve groups of farmers collectively managing trial plots and learning by doing through observation of innovative agricultural practices. They aim to develop skills in problem solving through participatory learning, with group activities designed to empower farmers as well as promote social cohesion through increased cooperation. Typically, field schools are intended to empower farmers and to tackle inequality by achieving community and social objectives. However, many programmes also promote the introduction of sustainable farming techniques and the reduction of pesticide usage, with the intention of protecting the environment, improving the health of communities, and increasing production levels and food security.

Farmer field schools are currently one of the most common approaches to rural adult education and agricultural extension, and have reached an estimated 10–20 million people in over 90 countries (Braun and Duveskog 2010; Waddington *et al.* 2014).[1] They have been widely adopted by international organisations that place poverty reduction at the heart of their mission, such as the International Fund for Agricultural Development (IFAD) and the Food and Agriculture Organization of the United Nations (FAO) (Braun and Duveskog 2008; Pontius, Dilts and Bartlett 2002). However, early adopters of innovative agricultural techniques are often better-off farmers who are more able and more likely to accept the risk that any new method implies as they have access to the necessary assets, the ability to absorb the costs of additional labour time, and are comparatively better able to withstand a negative shock should it occur. Diffusion of knowledge from early adopters (who take part in the field school) to later adopters (who do not) is often an explicit component of an FFS programme, in particular those involving IPM curricula, where diffusion from better-off to poorer farmers may be vital for sustained adoption and impacts (Feder and Savastano 2006).

Any development programme faces a potential trade-off between impact and equity, and farmer field schools are no exception. The question many FFS programmes face is whether they should target the better-off farmers who are most able to innovate—for example, by selecting experienced and educated farmers with considerable productive assets, as in the CIP-CARE programme in Peru (Godtland *et al.* 2003). Alternatively, should they promote poverty reduction objectives and target the poor and priority groups such as women, as with the Sustainable Tree Crops Programme in Cameroon (David 2007), or young people or ethnic minorities, as with Danida's Agricultural Support Programme in Bangladesh (Danida 2011)?

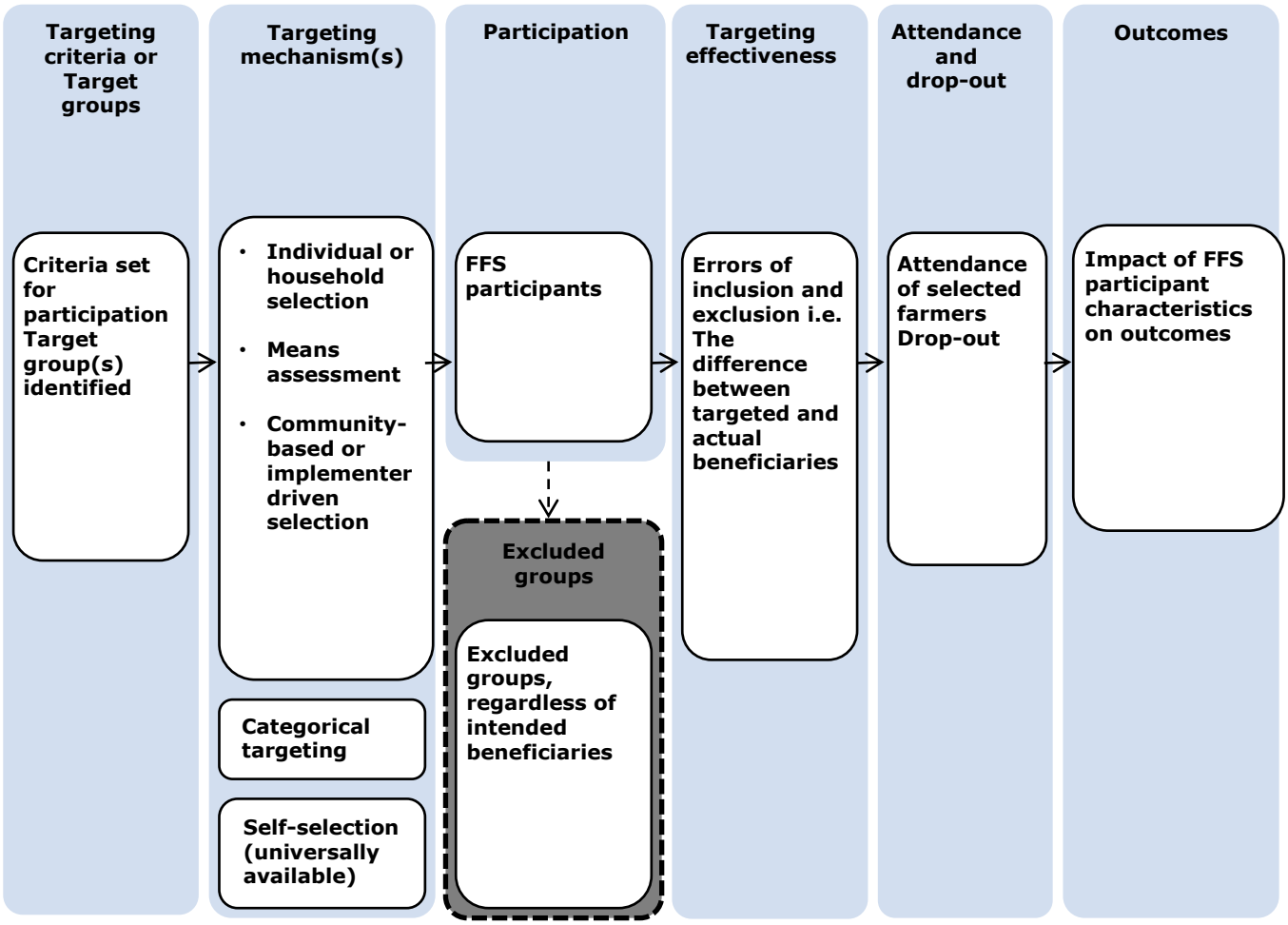
This paper assesses the targeting choices and performance of FFS programmes from around the world. Figure 1 provides a framework for the analysis, organised around the targeting process.

[1]There is a debate among research and practitioner communities as to whether FFS should be considered an intensive form of agricultural extension (Feder and Savastano 2006; Ricker-Gilbert *et al.* 2008) or an adult education intervention (Van den Berg and Jiggins 2007).

Specifically, the research tackles six questions:

1. Who do FFS programmes target? That is, what criteria, if any, are set for the selection of participants?
2. What targeting mechanisms are used by FFS programmes? That is, how do FFS programmes go about reaching their intended beneficiaries?
3. Who participates in FFS programmes and which groups are excluded?
4. Is FFS targeting effective? That is, do programmes reach their intended beneficiaries?
5. What factors determine levels of participant attendance and drop out?
6. Does the choice of FFS participants have an impact on programme outcomes such as knowledge, adoption and yield? Do participant characteristics influence the extent to which neighbour farmers who do not participate are able to benefit through learning from field school graduates?

Figure 1: The FFS targeting process



The following sections of this paper set out the research methodology and then address each of the research questions in turn. Two final sections synthesise findings from the review questions to explore the targeting process as a whole, and barriers and facilitators to female participation before offering some conclusions.

2. Methodology

The analysis adopts a systematic review approach for the identification of included studies and the coding of targeting mechanisms and outcomes.

2.1 Search strategy

This research was based on the materials retrieved by 3ie's systematic review of FFS programmes (Waddington *et al.* 2014). The original search for this review examined a range of different databases, including general social science databases and agriculture subject-specific databases such as AgEcon, CAB Abstracts, Social Science Citation Index (SSCI), International Bibliography of Social Science, EconLit, US National Agricultural Library, JOLIS, BLDS, IDEAS and the 3ie impact evaluation database. To ensure maximal coverage of unpublished literature, the search also included Google and Google Scholar, the Networked Digital Library of Theses and Dissertations Index to Theses, and the ProQuest dissertation database, adapting the search strategy for each database.

The search strategy was based on the guidance provided in Hammerstrøm *et al.* (2010) and using 'pearl harvesting' methods (Sandieson 2006). The following basic search strategy was used, adapted for each database to include thesaurus terms where these were available:

'farmer* field* school*' OR (['integrated' AND 'management'] AND ['field* school*' or 'farmer* field*'])

Bibliographies of included studies and existing reviews were scanned for eligible studies. Development journals were also hand-searched and key researchers and organisations working in the field of agricultural extension were identified.

2.2 Inclusion criteria

The 460 full texts identified by Waddington *et al.* (2014) were assessed for inclusion in the targeting analysis according to the following inclusion criteria:

1. Projects involving FFS programmes implemented in low- and middle-income countries were included in the analysis. Owing to the limited nature of reporting on intervention design and implementation, we included all studies that indicated that the FFS approach had been followed, whether or not they employed recommended FAO guidelines. Projects that solely involved other adult education or agricultural extension activities, or which were undertaken in high-income contexts, were excluded.

2. Only studies that contained relevant data relating to targeting were included. We used text-mining to search systematically for relevant data using a set of relevant keywords (Target*, Beneficiar*, Participa*, Select*, Drop*, Absen*, Attend*, Poverty, Poor, Land-holding, Landholding, Educat*, Women, Female, Gender, Male). These keywords were selected using a pearl harvesting approach which drew on the terminologies used in key texts relating to targeting and/or FFS.

3. Targeting methods: We regarded any data on targeting criteria and targeting mechanisms as factual reports of an FFS programme's design and implementation, and therefore such information was includable regardless of study design.

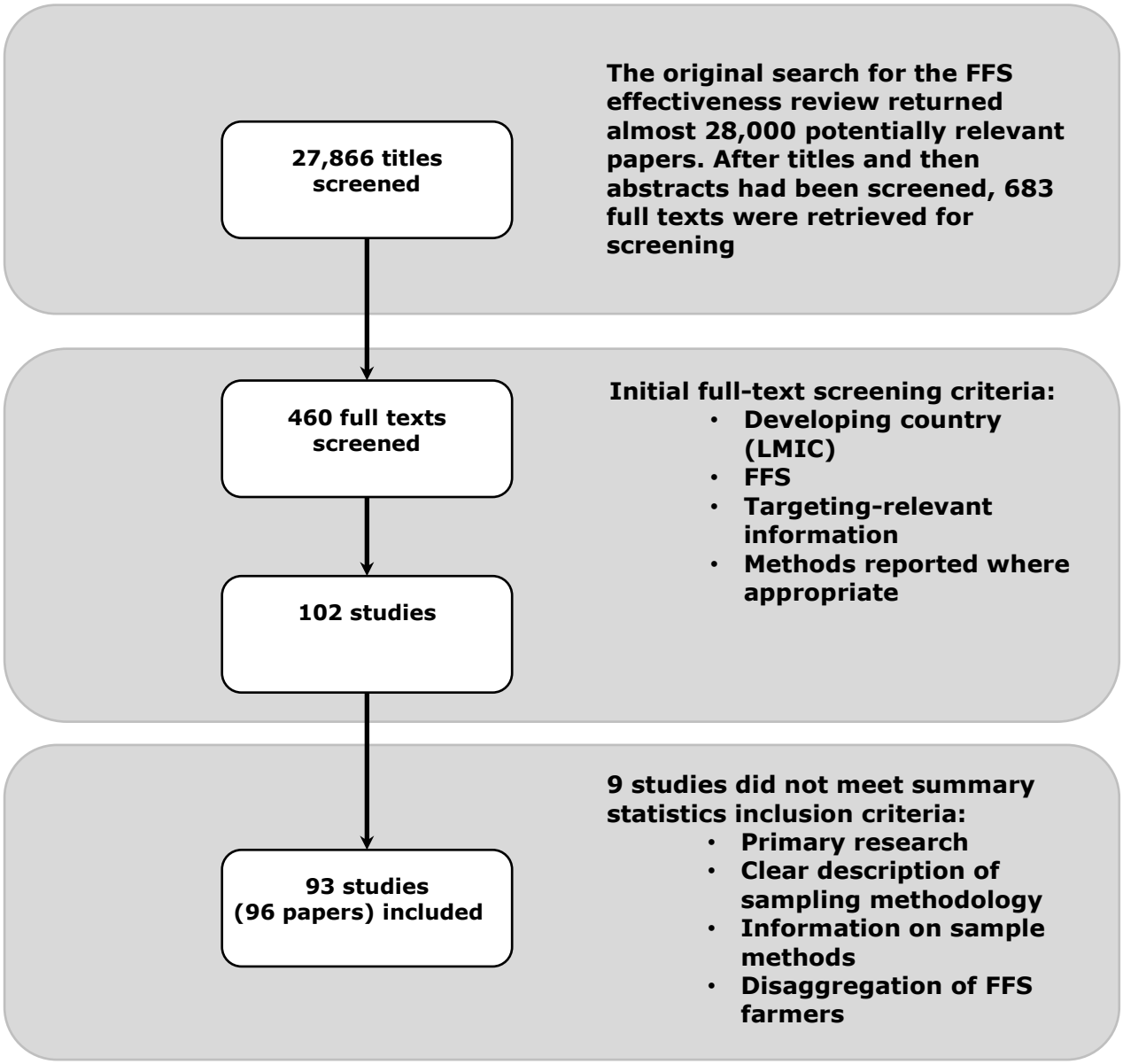
4. Participation: Statistics based on primary research and relating to participation were included if the following criteria were met:
    i. At least some information was provided on sample size, sample characteristics and a clear description of sampling methodology. This was to ensure that the data collected were to some extent representative of the population of FFS participants (and FFS non-participants for those studies that provided a comparison group).
    ii. Studies were only included if they reported summary statistics which disaggregated FFS participants or their households from non-participants. Studies which reported statistics for a town or village without disaggregating data for FFS farmers from non-participants were excluded.

5. All other data relating to targeting effectiveness, excluded groups, attendance or drop out were included only if based on primary research, and research methods and data source were clearly reported.

2.3 Search results

An initial analysis of the 683 full texts retrieved from the search identified 95 papers with relevant information on targeting, reporting on a total of 97 studies. Some papers provided data on multiple different studies of FFS programmes or multiple studies of the same programme in different countries, while some studies were reported on by multiple papers. Five papers were subsequently excluded as they did not meet the inclusion criteria for summary statistics and did not contain any other relevant evidence. As a result, a final total of 92 studies from 90 papers were included in the analysis and these papers are summarised in the included studies list at the end of this paper. Figure 2 provides an overview of the search results and stages of the screening process.

Figure 2: Search results and screening overview



The data available for each of the included studies were varied both in terms of detail and breadth. Many papers provided data for only one or a few stages of the targeting process, although around a third of them provided data on four steps or more. Table 1 provides an overview of the data available for each stage in the targeting process. Appendix A provides an overview of the data provided by each study by research question.

Table 1: Data extracted from source studies

	Targeting criteria	Targeting mechanism	Participation descriptive statistics	Excluded groups	Targeting effectiveness	Attendance & drop out	Programme effectiveness
Total Studies =93	52	58	55	12	48	11	43

2.4 Data extraction and analytical approach

As some full texts contained data relating to multiple FFS programmes, throughout the review all analysis was carried out at the study level. Data relating to all included studies were extracted onto a series of bespoke forms built around the different stages of the FFS targeting process as outlined in Figure 1.

Qualitative data were analysed using a content-analytical approach organised around the targeting process outlined. Content analysis involves drawing up categories with reference to theory and then systematically coding data (Mays, Pope and Popay 2005). The categories developed should be clearly defined and mutually exclusive (Dixon-Woods *et al.* 2005). Separate coding forms, each with its own set of categories, were constructed for data relating to each of the stages in the targeting process. The coded data then provided a basis for tabulations, frequency counts and narrative syntheses designed to draw out the patterns contained in the data.

Summary statistics relating to participation were also extracted into a set of customised forms. As studies provided these statistics in a variety of formats, a number of heuristics were developed to facilitate data synthesis and analysis (see Appendix B). Simple averages were calculated across a range of variables for all studies that provided summary statistics for FFS participants. For those studies that compared FFS participants with non-participants (neighbours or comparison group farmers), we assessed whether these differences were statistically significant on average by pooling t-statistics using meta-analysis. The following formula was adapted from Charmarbagwala *et al.* (2005) and drew on the method of Stouffer *et al.* (1949) to synthesise z-transformed p values where ti are the t-statistics to be combined and M represents the number of t-statistics included:

$$t_c = \frac{\sum t_i}{\sqrt{M}} \sim N(0,1)$$

The summary statistics presented results in a variety of formats and, therefore, formulae based on those provided by the Cochrane Handbook were used to convert between p values, t-statistics, standard errors and standard deviations (Higgins and Green 2011, Ch.7). Where standard deviations were unavailable and there was not enough information to compute them using standard formulae, they were imputed using the median standard deviation for the relevant variable across studies in the sample. Where standard deviations were unavailable but results were reported as being statistically insignificant, a p value of 0.5 was assumed.

For the majority of the data for which meta-analysis was carried out, we report mean values of variables for all FFS participants, then for any neighbouring farmers living in the same location as FFS participants, and then for comparison group farmers from different locations. Pooled t-statistics together with statistical significance tests are reported for assessment of FFS participants and neighbours, and FFS participants and comparison farmers. In all cases we report the overall variable mean for FFS farmers, noting that each pooled t-statistic is based on a sub-sample of those studies which also reported means for neighbours or comparison farmers. However, for the variables *distance to the nearest road* and *distance to nearest extension office,* we show variable

means for FFS participants separately for those studies reporting means for neighbours, and for those studies reporting means for comparison groups, in order to account for the different scales of distances being measured.

To examine the question of how the characteristics of participants influence the effectiveness of FFS programmes, outcomes data relating to farmer knowledge, adoption of practices and agricultural outcomes (from Waddington *et al.* 2014) were merged with data on participation relating to land owned, years of education and female inclusion. Meta-analysis and meta-regression models were then estimated.

2.5 External validity

There are 43 studies that provide both evidence relating to the effectiveness of FFS programmes and descriptive information about FFS participation.[2] This information allows us to say something about external validity, both in relation to FFS farmers from programmes examined in this analysis, as well as to farmers in low- and middle-income countries more generally. Appendix C provides an overview of the sampling approach used by the 38 studies that provided descriptive statistics, with most sampling either the entire population of FFS farmers or selecting a random sample. In total, six studies collected data on the entire population of FFS farmers, while a further 23 employed random selection either of field schools or villages, or participants, or both. Of those remaining, five reported that they had selected the FFS programmes purposively, but were unclear how FFS farmers were sampled or whether the entire population of FFS farmers was included. Three reported that FFS farmers had been selected purposively with the goal of including either a balanced sample of male and female farmers (Endalew 2009), or to ensure that full-time farmers who attended FFS sessions regularly were included (Khalid 2003), or with the aim of being representative over a small sample size (Douthwaite *et al.* 2007). A final study drew on random sample household survey data in Indonesia, although it is not clear to what extent the sampling frame was representative of the population of field school farmers (Feder and Savastano 2006).

3. Who do farmer field schools target?

The different targeting criteria reported by the studies are set out in Figure 3 (see Appendix D for definitions of each theme depicted).[3] Many programmes employed effectiveness criteria designed to target farmers thought to be better placed to adopt the lessons contained in the training and to disseminate them more widely within their communities. The most important effectiveness criterion, found in 25 per cent of programmes, was being a member of an organised farmer group or cooperative. One fifth of programmes target educated farmers with at least a basic level of literacy and numeracy; for example, Indonesia's National IPM Programme targeted literate farmers on the basis that they would be most able to learn and diffuse the FFS message (Van de Fliert 1993). Around 7 per cent of programmes respectively targeted more prosperous

[2] Thirty-eight of these provided descriptive statistics along with information on sampling methodology, while a further five provided qualitative data.

[3] Targeting themes are not necessarily mutually exclusive, so percentages do not sum to 100 per cent as programmes typically include multiple criteria. It is also likely that studies only reported some of the targeting criteria that were actually applied to programmes, with the result that these figures underestimate the frequency with which they were applied.

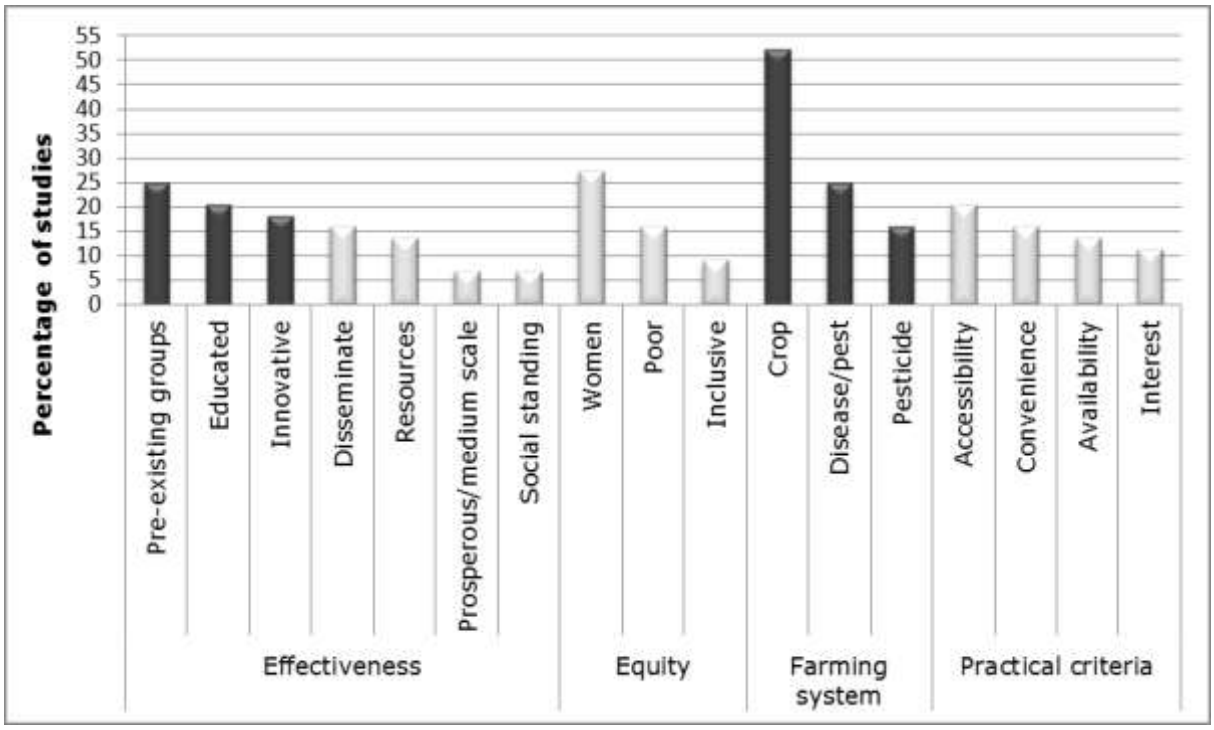
farmers (as in the case of some FFS programmes included in the Indonesian National IPM programme; Mariyono 2007; 2009), or those with high social standing, as in the case of some FFS programmes included in the Cambodian National IPM programme (Simpson 1997). Fourteen per cent made access to resources such as land and irrigation a precondition for participation; for example, Gottret and Córdoba (2004) report that the PROMIPAC programme in Nicaragua and Honduras targeted 'producers with potential'—those with land, water and a good credit record. Sixteen per cent of programmes targeted those willing and able to disseminate the FFS message, as with field schools in Ethiopia (Endalew 2009), while 19 per cent targeted innovative farmers, as in the case of a UNDP programme in Kenya that encouraged the inclusion of farmers who had already introduced innovations in their fields (Duveskog, Mburu and Critchley 2003).

In contrast, there were also programmes that employed equity criteria. Over one quarter of programmes explicitly targeted women, with examples including Nepal's (Esser *et al.* 2012) and Ghana's National IPM Programmes (Carlberg, Kostandini and Dankyi 2012), while 15 per cent directly targeted the poor, as in the case of the Zimbabwe Afforest FFS (Hofisi 2003).[4] A further 10 per cent of programmes were designed to be inclusive of all farmers or sizes of farm. For example, the Lipton Tea–Kenya Tea Development Agency FFS programmes were designed to include a mix of different farm sizes (Mitei 2011). However, programmes were not clearly divided between those that used effectiveness or equity targeting criteria; some programmes contain criteria reflecting both a desire to be more inclusive (for example, by including women and/or poorer farmers) and the intention to choose participants likely to make use of training (for example, by targeting pre-existing community groups or farmers with a basic level of literacy and numeracy).

Other farming system criteria reflect the desire to target farmers of particular crops, those with pest and/or crop disease problems such as the Striga Control Programme in Nigeria (Douthwaite *et al.* 2007), or those seen to be over-reliant on chemical pesticides such as the FAO-EU IPM Programme for Cotton in Asia which targeted high pesticide usage areas (Wu 2010). The single most common targeting criterion was that farmers should be growing a particular crop, most commonly rice, but also often other staples; for example, the IPM Collaborative Research Support project in Ecuador targeted only farmers for whom potatoes were a principal crop (Mauceri *et al.* 2005). Many programmes also include 'practical criteria' based on the motivation (11 per cent) and availability (14 per cent) of farmers, and the convenience (16 per cent) and accessibility (21 per cent) of their locations. For example, one programme in Bangladesh was implemented in locations where the NGO, Care International, already had ongoing operations (Banu and Bode 2003), while the FFS for IPM in the Sri Lanka programme was targeted at locations that were accessible to trainers (Tripp, Wijeratne and Piyadasa 2005).

[4] This was variably defined, but typically a programme was classified as having targeted the poor if it explicitly referred to the targeting of poor, marginal or smallholder farmers.

Figure 3: Targeting criteria (percentage of programmes, n = 48)



4. What targeting mechanisms do farmer field schools programmes employ?

Targeting mechanisms can be divided into three broad types (Coady, Grosh and Hoddinott 2003). Individual or household assessment involves either a means test or the selection of participants according to explicit criteria by a third party, such as community leaders or programme implementers. Categorical targeting identifies target groups using easily identifiable criteria at either the individual or household level (for example, gender, age, ownership of land, membership of farmer group), or the community level (for example, specific locations, areas with pest or pesticide problems). Self-selection occurs where a programme is universally available.

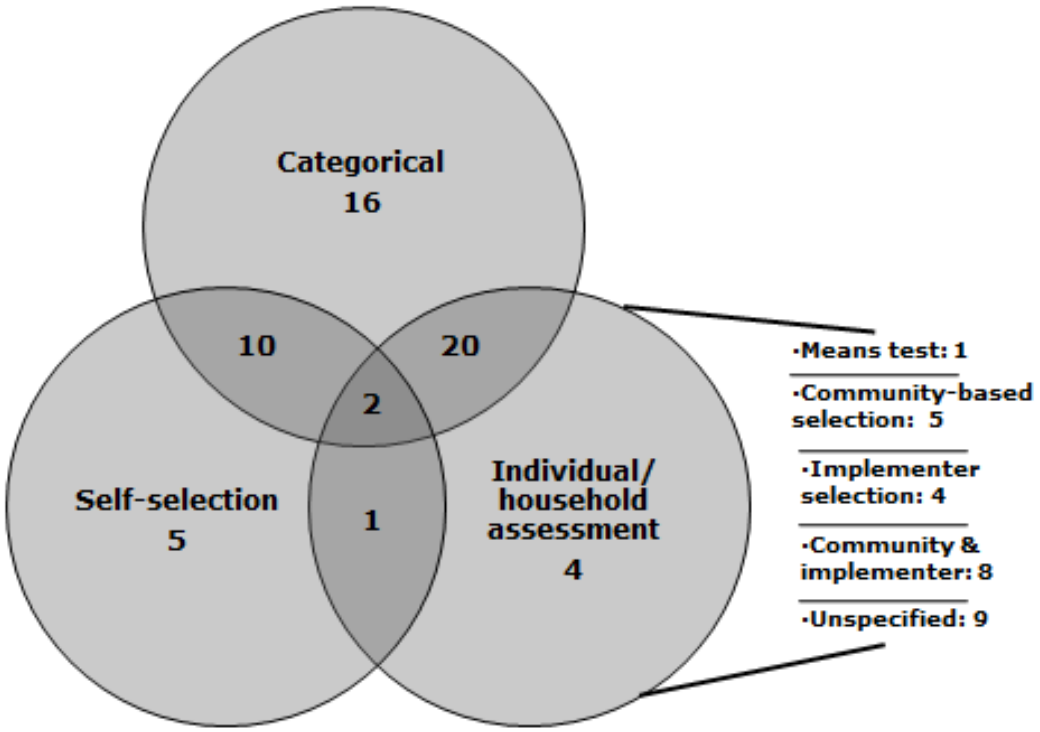
Data on 93 targeting mechanisms from 58 programmes showed that most programmes adopted more than one mechanism. Typically, targeting was undertaken in the form of a two-step procedure whereby the pool of potential participants was delimited using predetermined inclusion criteria and/or categorical targeting, with individual or household assessment or self-selection determining who ultimately participated in the FFS programmes. Figure 4 depicts how these mechanisms were combined in the FFS programmes.

Over 80 per cent of the programmes for which we have data used categorical targeting, just under half used individual or household assessment, and just under one third, self-selection. Where an assessment was carried out, it was almost always in the form of community- or implementer-based selection of participants rather than a means test. For example, selection criteria for the National IPM Programme in Cambodia were

designed by a national team, and then the host NGO chose FFS participants in collaboration with the village leader (Simpson 1997). One exception to this was that of a Peru-based FFS programme (Godtland *et al.* 2003) where target villages were chosen from those in which the implementing NGO was already active, and the FFS was made available to all those identified by a survey as belonging to middle-income groups.

Just under one third report self-selection as a targeting mechanism. Of course, in the literal sense all participants self-select as participation is voluntary, but it is usually self-selection of those satisfying the eligibility criteria: just 9 per cent of programmes were open to all potential participants, as with a study of FFS programmes from the Bangladesh National IPM Programme (Ricker-Gilbert *et al.* 2008). A further 22 per cent of programmes were made available to all those who met predefined selection criteria such as membership of a pre-existing community group or cultivation of a specified crop. This was the case with the Philippines Collaborative Research Support Program, which was made available to all onion farmers located close to agricultural support offices (Yorobe, Rejesus and Hammig 2011).

Figure 4: Targeting mechanisms (n = 58)



There are also a few cases in which the targeting mechanism implemented differed from that intended at the design stage. In Ecuador, the Ecosalud FFS programme was nominally open to all those with access to some land, although in practice locations and participants were identified by programme implementers in collaboration with local government (Tracy 2007). Similarly, a programme in Uganda was intended to be universally available, but in practice community leaders and implementers chose participants (Isubikalu *et al.* 2007). The discrepancy between intended and implemented mechanisms employed in these latter cases may stem from the practical difficulties inherent in selecting a limited number of participants from a potentially larger pool of interested parties. They may also be indicative of a tension present in some programmes between the intention to fulfil goals relating to both equity and effectiveness, or be a result of the potential for elite capture when local leaders are involved in selection.

4.1 Who participates in farmer field schools?

Table 2 presents summary statistics for participants in the FFS programmes. The first part of the table shows means based on all studies that reported summary statistics for FFS participants. It shows that typically, FFS participants tend to be middle-aged (mean = 41.3 years), experienced and educated farmers with access to a modest amount of land. They are also more likely to be male than female, supporting a household of around five to six people.

The second part of the table provides a meta-analysis of pooled t-statistics for all studies that compared FFS participants with non-participant farmers. Means are reported separately for all FFS participants, then for any neighbours in the same locations, then for comparison groups in comparable non-FFS locations. Statistical significance is reported first for the comparison between FFS farmers and neighbours in the same community, and then for the comparison between FFS farmers and comparison groups.

The meta-analysis indicates that FFS farmers were on average more likely to be better educated than their neighbours. As we have seen above, many programmes target more educated farmers on the assumption that these farmers will be most likely to develop skills, learn new knowledge, implement new practices, and help their neighbours through formally facilitating field schools or informally through diffusion. The education gap is even larger with comparison communities (the non-FSS farmers in FFS communities have more education than the mean in the comparison communities), suggesting selection of communities of relatively higher socioeconomic status.

On average, FFS farmers also had a statistically significantly smaller amount of land than comparison groups based in other locations, but no significant differences were found between FFS farmers and neighbours for land size. This could indicate some effort to target areas with comparably fewer resources, but that it was not necessarily the poorer farmers within a given community who ended up as FFS participants. However, the differences are not large in magnitude, suggesting that FFS farmers did not have substantively different sized landholdings than others.

On average, women are under-represented in FFS programmes. The proportion of women taking part in field schools is significantly lower than for non-participants within a community, although the absolute difference is not that great. However, the proportion of female FFS participants is significantly higher than the proportion of female farmers in

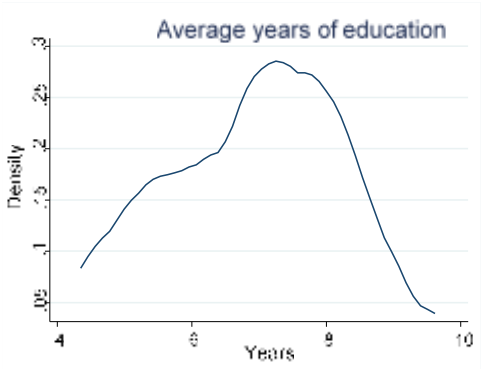
non-FFS communities. This may show that women are better represented in FFS programmes than in farming communities. However, it might also be because FFS programmes have targeted communities with greater numbers of female farmers (or crops traditionally grown by women), with men still making up the majority of the FFS groups formed.

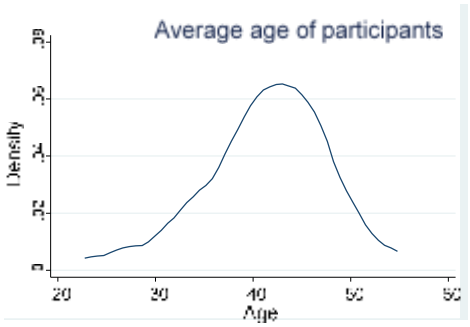
Finally, FFS farmers were more likely to be younger than comparison and neighbour farmers, although all group means are in the low 40s. This suggests that programmes are either explicitly targeting younger farmers, or that some other targeting criterion or contextual factor means that relatively younger farmers are more likely to participate. Although there are only a handful of studies to draw on, participants were also likely to be based in more accessible locations than comparison and neighbour farmers, suggesting that access criteria may be important in determining which locations are chosen for FFS programmes.

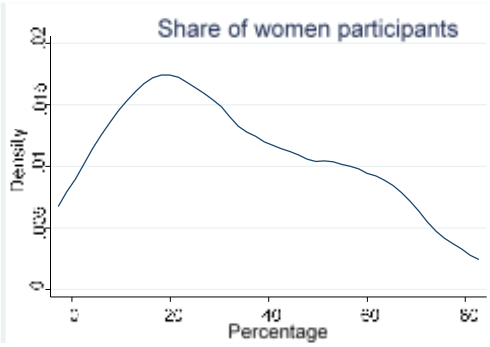
Some of the differences between FFS farmers and neighbours may be explained by a greater emphasis on effectiveness targeting than on equity, although it is also likely that contextual factors such as the economic and social capital of potential participants or the mechanisms used to select participants were important determinants of participation.

Due to the variation in targeting criteria implemented, there is also variation in farmer characteristics across FFS programmes. Looking beyond averages, analysis across the different programmes indicates that there are FFS interventions that involve a high degree of participation of poorer and less educated farmers, as well as those that include large numbers of educated and better-off farmers (Figure 5). Indeed, it is due to this variation that analysis of the relationship between characteristics of FFS participants and programme effectiveness can be undertaken in Section 7 of this paper.

Figure 5: Kernel density histograms showing farmer characteristics







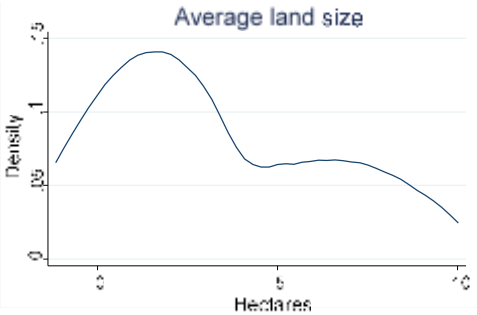


Table 2: FFS participation summary statistics and meta-analysis (n = 55)

FFS participants: summary statistics[1]

	Mean	*n*
Age (years)	41.3	35
Household size (people)	5.6	21
Farm size (hectares)	2.8	28
Sex (% female)	39.5	36
Education (years)	6.8	25
Literacy (%)	72.2	6
Farming experience (years)	18.3	15
Household head = male (%)	85.8	3
HH head = FFS farmer (%)	71.5	2
Married (%)	83.4	2
Landowner	48.2	2

- *[1]Based on all summary statistics for FFS farmers*
- *n equals the total number of studies on which the mean is based*

Meta-analysis of FFS farmers and comparison groups in (i) the same location and (ii) different locations

	Mean	*n*
Age (years) FFS	41.9	25
Age (years) neighbours	43.4***	13
Age (years) comparisons	44.3**	15
Household size (people) FFS	5.7	17
HH size (years) neighbours	5.4***	11
HH size (years) comparisons	5.9	12
Farm size (hectares) FFS	2.8	25
Farm size (ha) neighbours	2.6	16
Farm size (ha) comparisons	3.3***	14
Sex (% female) FFS	33.9	14
Sex (% female) neighbours	37.0***	10
Sex (% female) comparisons	28.6***	7
Education (years) FFS	6.8	24
Education (years) neighbours	6.4***	14
Education (years) comparisons	5.7***	17
In agricultural assoc. FFS (%)	41	1
In agric. assoc. neighbours (%)	13**	1

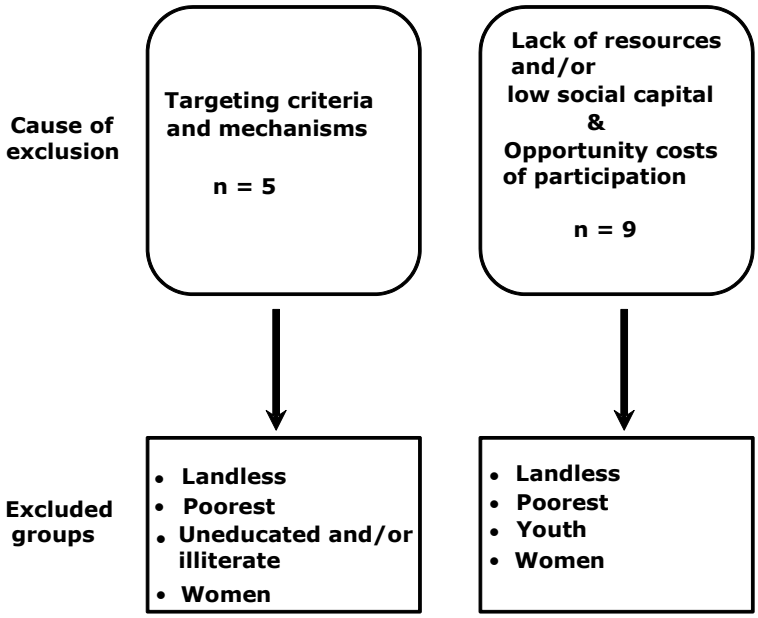
	Mean	*n*
Farming experience (years) FFS	17.9	11
Farming experience (years) neighbours	19.3	7
Farming experience (years) comparisons	20	5
Household head = male (%) FFS	85.9	3
HH head = male (%) neighbours	87.6	3
HH head = male (%) comparisons	94	3
Married (%) FFS	83.4	2
Married (%) neighbours	86.5***	1
Married (%) comparisons	73.8	2
Distance from road (km) FFS	0.3	1
Distance from road (km) neighbours	0.5***	1
Distance from road (km) FFS	2	2
Distance from road (km) comparisons	4.1***	2
Distance to extension office (km) FFS	6.8	2
Distance to ext. office (km) neighbours	7.6**	2
Distance to ext. office (km) FFS	4.3	1
Distance to ext. office (km) comparisons	5.3**	1

- *Tests of significance are pooled t tests, based on Stouffer et al.'s method.*
- *Statistical significance is given at the 0.001 (***), 0.05 (**) and 0.1 (*) levels*
- *All tests of significance compare a variable for an FFS group (FFS) with non-FFS participants, either based in the same location (same loc.), or in a different location (diff. loc.).*

4.2 Who is excluded from farmer field schools and why?

Although some pro-poor programmes successfully targeted resource-poor or socially marginalised groups, these groups were also the most likely to be excluded. In particular, women (half the studies reported exclusion), people with no access to land (just under half) and the poorest farmers (two thirds) were often left out. Illiterate and uneducated farmers (two studies), young people (one study) and those in poor health (one study) were also reported to have been excluded in some cases. Figure 6 matches the groups most commonly excluded with the causes of exclusion.[5]

Figure 6: Causes of exclusion for different excluded groups (n = 12)



In around half the cases, either targeting criteria precluded some groups from taking part or targeting mechanisms meant that groups were less likely to be selected or not even considered. Some were excluded because programmes' inclusion criteria explicitly called for farmers to have access to land (Danida 2011; Tracy 2007; Van de Fliert 1993), irrigation (Van de Fliert 1993), or be numerate and literate and have good social standing in order to participate (Simpson 1997; Van de Fliert 1993). In the National IPM Programme in Cambodia (Simpson 1997), the targeting criteria designed to encourage the participation of literate farmers with good social standing combined with the targeting mechanism of community-implementer selection, with the result that elites were favoured and poorer farmers overlooked. In four cases in Bangladesh, Kenya, Cambodia and Indonesia, a combination of inclusion criteria intended to recruit pre-existing groups or literate farmers combined with community implementer-based participant selection, with the result that women were excluded (Danida 2011; Najjar 2009; Simpson 1997; Van de Fliert 1993). In the case of the Promoting Farmer Innovation FFS in Kenya, female-headed households were simply not represented at the village meeting at which programme participants were selected (Najjar 2009).

[5] Sometimes multiple causes combined to reduce the participation of certain groups, and as a result the total n sums to over the 12 included studies.

In two thirds of cases, a lack of economic capital (such as land or tools) or social capital (such as social connections or agency), or the need to give up time and money to participate in FFS programmes and the likely impact on earnings and production meant that potential participants felt unable to participate. Even where programmes did not include restrictive inclusion criteria, the necessity of having some form of access to tools (Van der Wiele 2004) or access to land (Hofisi 2003; Van Der Wiele 2004) still prevented participation. This was particularly the case for youth, women or day-labourers without land of their own. Some simply did not have time to take part (Danida 2011; Davis *et al.* 2009, 2012; Van Der Wiele 2004) or felt unable to due to the opportunity costs of participation, such as the potential loss of productive output or the cost of travelling to an FFS site (Bwalya 2005; Davis *et al.* 2009, 2012).

A study of the PROMIPAC programme in Nicaragua and Honduras emphasised the need for some form of compensatory payment to offset the opportunity cost of attendance (Gottret and Córdoba 2004). In one Kenyan case, payment of a small capital investment was a requirement for participation, something which was beyond the means of poorer farmers (Najjar 2009). The GUMAP/SARDI FFS programme in Liberia demonstrates some of the additional challenges facing women, with household work and the demands of childcare making it impossible for them to participate without some form of support (Van Der Wiele 2004). There were also cases in Zimbabwe and Liberia of women being unable to obtain permission from their husbands to take part (Hofisi 2003; Van Der Wiele 2004).

5. Is targeting effective in farmer field school programmes?

Effective or successful targeting means minimising errors of exclusion and inclusion so that programmes reach their intended beneficiaries (Cornia and Stewart 1993; Smolensky, Reilly and Evenhouse 1995). Errors of inclusion result in a programme including participants who are not in the core target group. Errors of exclusion result in incomplete coverage of target group(s). We compared each programme's targeting criteria with data on participation. The analysis shows that there are instances in which each of the different FFS targeting criteria were met. There are also examples of targeting failures for criteria relating to inclusivity and female participation. Table 3 provides a summary of which targeting criteria were shown to have been successfully met and which were shown not to have been met (with the number of studies or n for each criterion in parentheses).[6] The majority of source studies reported only limited information on target groups and actual participants, if they reported on them at all. Even fewer provided data for target groups that corresponded to those available on participants (for example, reporting both that a programme explicitly targeted the inclusion of women and providing data on female participation).

The targeting criteria and mechanisms used sometimes resulted in errors of inclusion, favouring elites to the detriment of farmers with fewer assets or less social power. In Uganda (Isubikalu *et al.* 2007), although selection was intended to be open to all, in practice community leaders' involvement in the recruitment process meant that most participants had social connections to recruiters or already belonged to pre-existing community groups. Conversely, the Afforest FFS programme was designed to reach resource-poor farmers in Zimbabwe, but was able to reach its target group by changing the targeting mechanism used. Originally the programme was designed so that

[6] No data indicates that there were no cases in which there were data showing targeting failures, which cannot be taken either to indicate success or failure.

community members would choose participants, but implementers observed that selection by peers was leading to nepotism and took over the selection process, with the result that a majority of FFS farmers were from the resource-poor target group (Hofisi 2003). Even where community members played no part in participant selection, social elites or organised community groups sometimes still monopolised FFS places. In Peru, existing social networks (Ortiz, Nelson and Orrego 2002) and pre-existing farmer groups (Godtland *et al.* 2003) dominated the selection process to the detriment of poorer or middle-income farmers. A study of the PROMIPAC programme in Nicaragua and Honduras attributed the successful targeting of farmers to the comparatively higher levels of social influence that these farmers typically possessed (Gottret and Córdoba 2004). Errors of inclusion favouring those with greater economic or social capital are a recurring problem for development interventions. For example, elite capture has been reported to have affected poverty-targeted interventions designed to deliver social safety nets (Conning and Kevane 2002) and agricultural assistance (Arcand and Wagner 2012).

Table 3: Targeting effectiveness (n = 48)

Targeting criteria	Targeting criterion met (n)	Targeting criterion not met (n)
Pre-existing groups	4	No data
Educated	3	No data
Resources	3	No data
Prosperous or medium scale	2	No data
Inclusive or open to all	1	2
Women	5	2
Poor	3	No data
Crop	15	No data
Disease and/or pest	8	No data
Pesticide	5	No data

Errors of exclusion prevented women from participating where practical barriers, including time availability, access to tools, land, social power and so on prevented women from joining and attending on a regular basis, as was the case with the GUMAP/SARDI programme in Liberia (Van Der Wiele 2004). Two cases of successful targeting of female farmers in India (Mancini and Jiggins 2008) and Cambodia (Simpson 1997) were ascribed in part to the proactive role the implementers played in encouraging female participation (Mancini and Jiggins 2008; Simpson 1997).

In summary, effectiveness targeting of more educated and better-off farmers appears to have been successful. On the other hand, equity targeting (programmes designed to be inclusive or aimed solely at the poor) has not always succeeded in reaching target groups, typically either because targeting mechanisms favoured elites or because the characteristics of the target groups made it difficult for them to participate. Notably, programmes have had mixed success in reaching women.

6. What factors determine levels of participant attendance and drop out?

Some FFS programmes experienced significant problems with attendance and drop out. For example, a study of an FFS in Iloilo in the Philippines found that around 25 per cent of initial participants dropped out before the FFS was completed (Rola and Baril 1997), while a study of the Ecosalud Programme in Ecuador reported that around half of the original FFS group members dropped out (Tracy 2007). The latter study also reported that, on average, only a little over half of participants showed up for FFS sessions. Table 4 provides an analysis of 11 studies that explored the different reasons for FFS non-attendance or drop out.[7] In general, poor attendance and drop out resulted from a number of different factors. Some of these were related to the accessibility and relevance of FFS sessions, poor programme implementation, or economic constraints and the perceived returns and opportunity cost of attendance.

Table 4: Attendance and drop out (n = 11)

Reason	Example(s)
Unfulfilled expectations (of payment)	participant hopes of receiving loans, cash or payment in kind for attendance not met (7)
Trainer or Training	Trainer quit (3) Poor trainer attendance (2) Training format too 'academic' (1)
Time	Attendance too time consuming or other time commitments (4)
Distance	Too far for participants or trainer to travel (3)
Crop choice	Low market demand for FFS taught crop (1) FFS crop not produced by some farmers (1)
Language	Training not delivered in local languages (2)
Other implementation problem	Promised seeds not delivered (1) Funding ceased (1) No land for FFS sessions (1)
Poor health	Health prevented attendance (2)

Note: Frequencies in parentheses.

Around two thirds of studies reported that participants dropped out because they did not receive anticipated loans, cash or payment in kind for their attendance (Friis-Hansen 2005; Hofisi 2003; Isubikalu *et al.* 2007; Machacha 2008; Najjar 2009; Rwegasira *et al.* 2004; Yajima 2010). This expectation was often partly due to past experiences of development programmes that offered incentives or rewards to participants. Although not explicitly stated, it is possible that in some cases the absence of payments was instrumental in participants leaving because it made the opportunity cost of participation prohibitive. In around a third of cases, participants felt that the amount of time required

[7] The studies are not always clear whether the factors they described resulted in non-attendance or drop out, and therefore the analysis here combines the two.

by the FFS sessions was too much, or stated that other commitments made attendance of all sessions difficult (Machacha 2008; Tracy 2007; Van Der Wiele 2004; Yajima 2010). The distance to the FFS site and associated costs or difficulties also led to non-attendance or drop out in two cases (Gottret and Córdoba 2004; Tracy 2007), while the difficulties associated with FFS trainers travelling to school sites and visiting dispersed farmers was also reported to have negatively affected some groups (Hofisi 2003).

Three programmes had problems in retaining trainers or filling empty positions in a timely manner (Hofisi 2003; Tshiebue 2010; Yajima 2010). Irregular trainer attendance was also reported to have put participants off (Machacha 2008; Tracy 2007). In one case in Uganda, farmers found the training approach poorly suited to their needs, reporting that the delivery style was 'too academic' (Isubikalu *et al.* 2007). Two studies of FFS programmes in Kenya and Ecuador reported that the training was not delivered in local languages (Najjar 2009; Tracy 2007), one also reporting that promised tools and seeds were not delivered (Tracy 2007), and another that funding was not forthcoming (Machacha 2008). Najjar's (2009) study of a programme in Kenya reported that FFS groups were unable to find a new site for field schools when the landowner of the original site dropped out, or where the group could not keep up with rental payments. The decision by community leaders to select a crop not farmed by some FFS members also negatively impacted participation in the case of the PROMIPAC intervention in Nicaragua and Honduras (Gottret and Córdoba 2004), as did the perceived lack of a market for the curriculum crop chosen for an FFS in Tanzania (Rwegasira *et al.* 2004). In two cases, poor health was also cited as a reason for non-attendance or drop out (Najjar 2009; Van Der Wiele 2004).

7. Targeting and effectiveness

7.1 Does the choice of FFS participants affect programme outcomes such as knowledge, adoption and yield?

Given that FFS programmes target (and reach) contrasting types of farmers, with very different levels of economic and social capital, the targeting process may have important consequences for outcomes such as skills development and empowerment, as well as knowledge of curricula, adoption of innovative farming practices and agricultural output. The logic behind programmes that employ effectiveness targeting is that participants with better education, more assets and better social networks will be more likely to learn, adopt FFS teaching, improve yields and foster learning among neighbouring farmers, either through formal methods of training or informally through diffusion.

The same logic suggests that FFS programmes that successfully target on equity-based criteria will produce a higher degree of participation from farmers with less education and lower access to resources or social networks, with the possible consequence that improvements in knowledge, adoption and agricultural outcomes will be harder to achieve due, for example, to the complexity of the message, or the inability of these farmers to attend training sessions or adopt beneficial practices. However, it may not necessarily be this simple. There may actually be more potential for training to impact on outcomes for poorer farmers and female farmers who start from a lower baseline. Poorer farmers may also already be unable to afford large amounts of chemical pesticide and other potentially harmful inputs, and therefore there will be less scope for reduced application.

To assess whether FFS outcomes varied by participant characteristics, impact evaluation data on outcomes relating to farmer knowledge, adoption of practices and agricultural outcomes (from Waddington *et al.* 2014) were merged with data on participation relating to land owned, years of education, female inclusion and age.[8] Impact data were estimated using counterfactual impact evaluation methods, and meta-analysis (Table 5) and meta-regression models (Table 6) were estimated to test for systematic differences in outcomes according to farmer characteristics.

The limited sample size reduced the potential for strong conclusions about knowledge outcomes, and analysis indicates no significant differences in FFS knowledge for better educated farmers or programmes in which women participated in comparison with the total. This suggests that the complexity of the FFS message was not an important constraint to knowledge of improved farming practices, although more evidence is needed.

The meta-analysis for pesticides use suggests that, for programmes in which relatively more educated farmers participated, there were larger impacts in terms of reduced pesticides use (Table 5). Similarly, programmes with relatively more educated farmers appear to have bigger impacts on agricultural outcomes as measured by yields. The data also suggest that farmers with smaller landholdings were more able to improve yields, although the sample size is small. Furthermore, these differences between programmes with better or less educated farmers, or with more or less landholdings, are not statistically significant in bivariate analyses due to limited sample size. There were no programmes for which the data clearly demonstrated that women farmers were not targeted or involved, and limited studies collected data on rates of participation by women. Consequently, it was not possible to examine differences for female-targeted programmes.

The data suggest that younger farmers[9] showed greater knowledge gains than older farmers, but were less likely to put the new knowledge into practice, with older farmers more likely to reduce their pesticide usage or increase yields (see Table 5 and Figure 8). This may be because younger farmers are less likely to have access to or control over the assets needed to implement FFS practices, a conclusion supported by a study of a programme in Kenya that reported that younger farmers were less likely to have access to land of their own and were more likely to leave the FFS for an alternative form of work (Najjar 2009).

[8] In some cases, data from multiple studies (examining the same programme) were merged in order to undertake this analysis. A list of studies by programme is included in Appendix C.
[9] An FFS was defined as being made up of younger farmers if the average age of the FFS group was below 40. This cut-off was based on the kernel diagram for average age in Figure 5.

Table 5: Meta-analysis of knowledge, pesticides use and agriculture outcomes for FFS participants by characteristics of FFS participants

Knowledge	**SMD**	**95% confidence interval**		**Sample size**
FFS farmers: all studies	0.46	0.33	0.58	18
o/w:				
FFS farmer education years exceed national average	0.45	0.22	0.68	6
FFS farmer education years does not exceed national average	-	-	-	No obs.
Women farmers participated in FFS	0.44	0.02	0.85	4
Women did not participate	-	-	-	No obs.
Average farmer ages <=40	0.74	0.17	0.24	3
Average farmer age >40	0.20	0.15	1.32	3
Pesticides use	**RR**	**95% confidence interval**		**Sample size**
FFS participants: all studies	0.69	0.57	0.84	22
o/w:				
Women farmers participated in FFS	0.88	0.62	1.25	6
Women did not participate	-	-	-	No obs.
Farmer education years exceeds local average	0.57	0.39	0.83	5
Farmer education years do not exceed local average	0.91	0.61	1.35	5
Landholdings exceed local average	0.37	0.18	0.78	1
Landholdings do not exceed local average	0.70	0.46	1.07	8
Average farmer age <=40	0.91	0.28	2.94	1
Average farmer age >40	0.61	0.39	0.96	6
Agricultural outcomes (yields)	**RR**	**95% confidence interval**		**Sample size**
FFS participants: all studies	1.23	1.15	1.33	28
o*/w:*				
Women farmers participated in FFS	1.31	1.11	1.54	8
Women did not participate	-	-	-	No obs.
Farmer education years exceed local average	1.19	1.10	1.28	10
Farmer education years do not exceed local average	1.10	0.88	1.39	4
Landholdings are not less than local average	1.08	0.96	1.21	8
Landholding are less than local average	1.36	1.15	1.61	2
Average farmer age <=40	0.97	0.80	1.18	3
Average farmer age >40	1.21	1.09	1.35	7

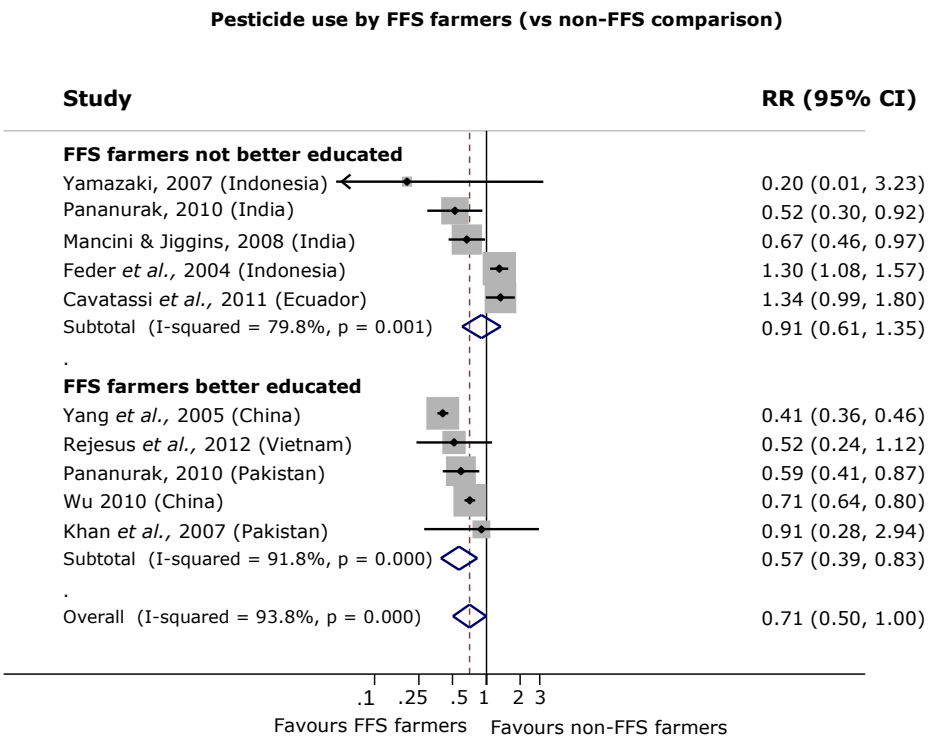
Notes: SMD standardised mean difference; RR response ratio; No obs. no observations.

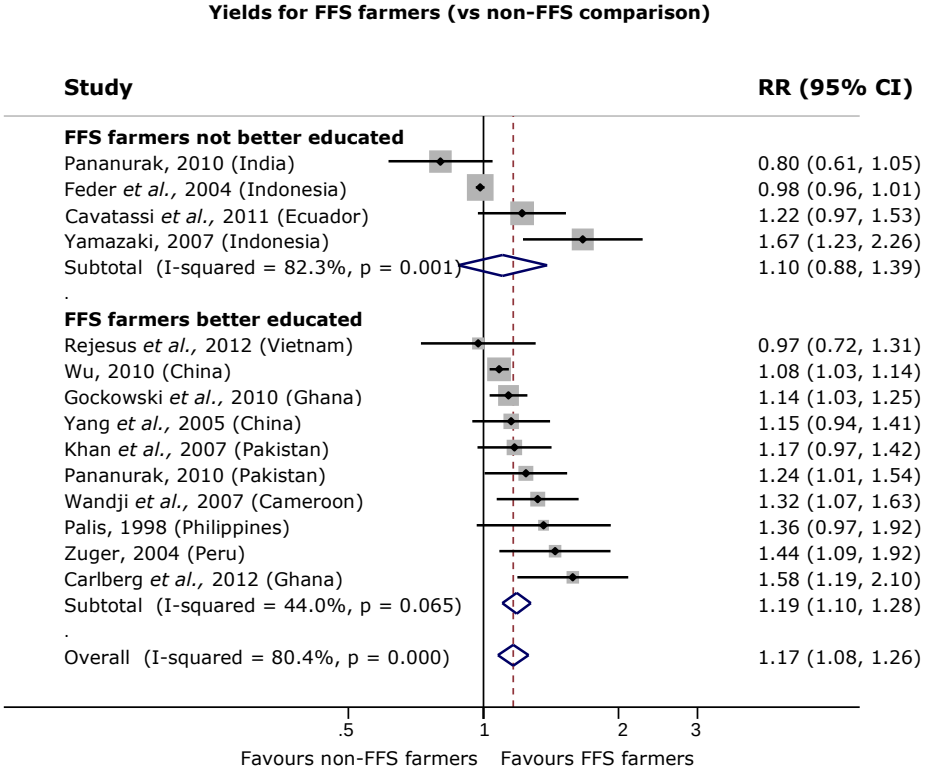
Table 6: Meta-regression analysis of pesticides use and agriculture outcomes

Model 1: Pesticides use			Model 2: Agriculture outcomes (yields)		
	Coeff.	P>t		Coeff.	P>t
Average years of education	**-0.147**	**0.033**	Average years of education	**0.116**	**0.009**
			Length of follow-up (years)	**-0.077**	**0.053**
1=Cotton crop	**-0.364**	**0.028**			
			1=Rice crop	**0.331**	**0.027**
			1=Other staples/ vegetables	**0.307**	**0.040**
1=Medium risk of bias	**0.348**	**0.003**			
			Standard error	**1.119**	**0.089**
Constant	**0.710**	**0.081**	Constant	**-0.677**	**0.019**
Number of observations	19			18	
Tau-squared	0.007			0.004	
I-squared	37.0%			47.9%	
Adjusted R-squared	95.1%			69.8%	
Model F	28.28			3.31	
Prob> F	0.000			0.042	

Notes: Coefficients reported as natural logarithm. Bold indicates coefficient statistically significant at <10% level.

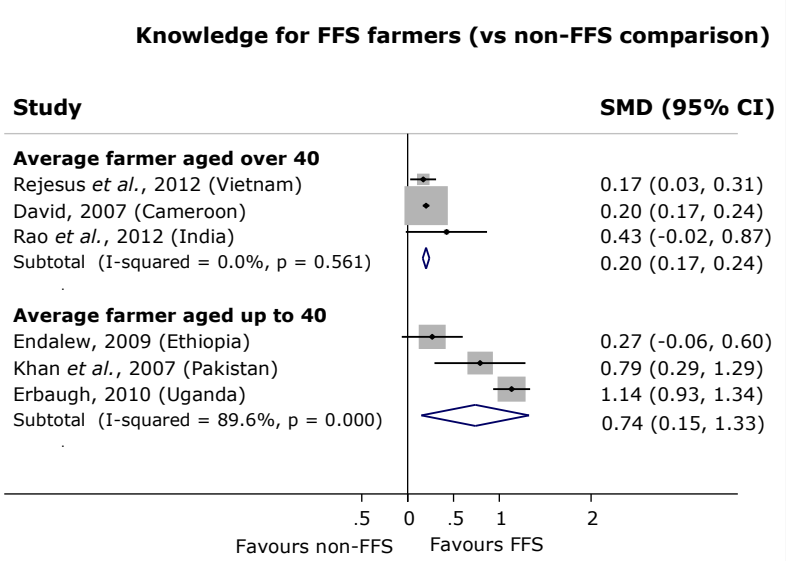
Figure 7: Meta-analysis of outcomes for FFS farmers by education level[10]

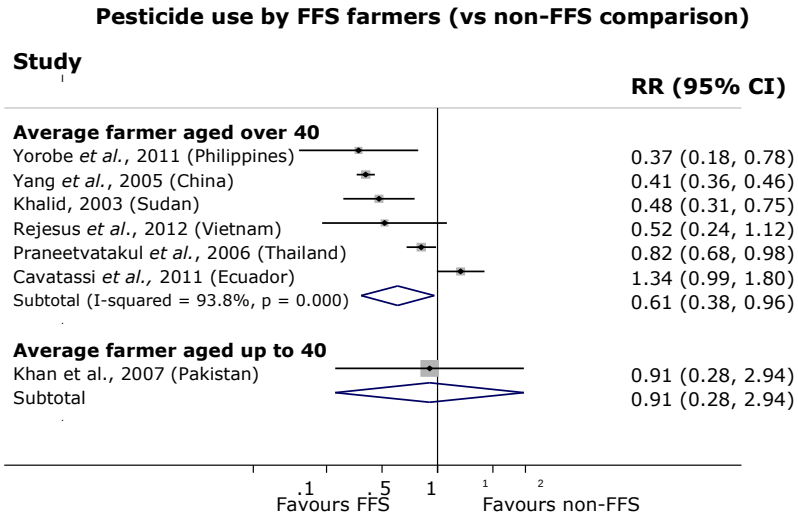


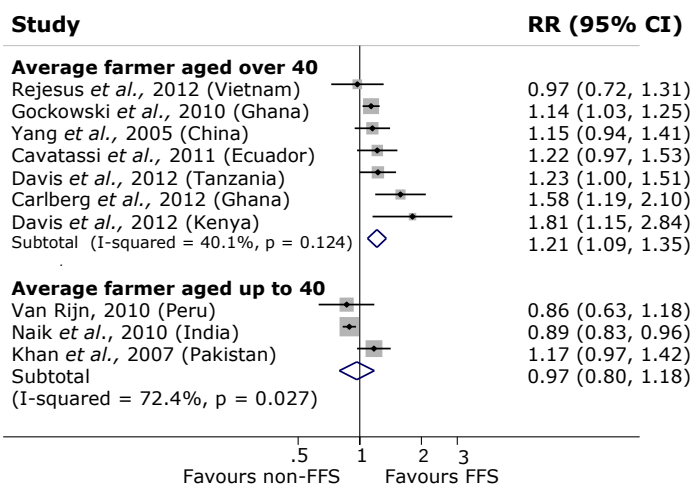


[10] A forest plot displays effect estimates and confidence intervals for both individual studies and findings pooled using meta-analyses. The point estimate and confidence intervals for all studies combined is represented by the diamond at the bottom of each figure. Due to lack of space, some studies have been given shortened names in the forest plots. See Appendix C for a table linking each study included in the forest plots to its full reference.

Figure 8: Meta-analysis of outcomes for FFS farmers by age group







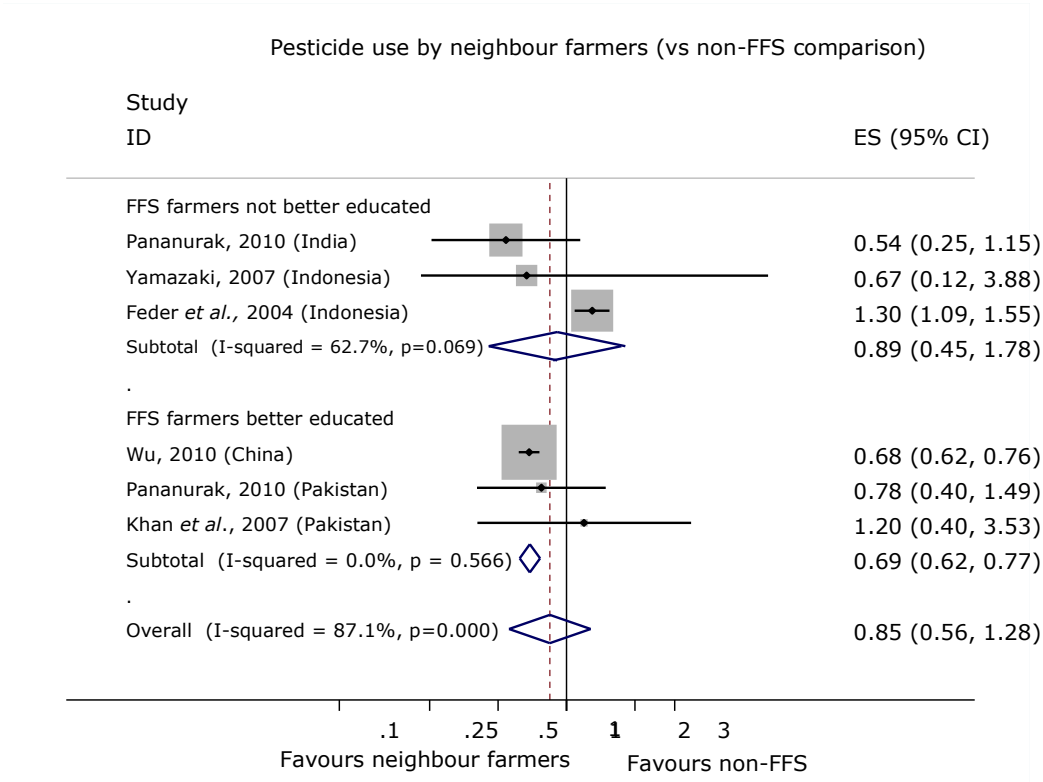
There was significant heterogeneity in effect sizes across programmes due to factors including contextual differences (for example, the types of crops) and study design (such as differential risk of bias and length of follow-up). We therefore explored whether education remained significantly associated with differences in effect sizes after controlling for these other sources of heterogeneity using multivariate meta-regression analysis (Table 6). The findings suggest that, controlling for other variables, years of education are significantly positively correlated with adoption (measured by reduced levels of pesticide usage) and agricultural outcomes (measured by yields). The higher a farmer's level of education, the more likely he or she is to adopt the lessons learnt through FFS training and, consequently, the more likely to see beneficial effects on final outcomes. Meta-regression does not produce significant associations between outcomes and landholdings and gender (results not reported), likely due in large part to the small sample sizes of studies measuring these variables. However, more evidence is needed to investigate this question more fully.

7.2 Do participant characteristics influence the extent to which FFS neighbours learn?

A final meta-analysis examined whether there were systematic differences in outcomes for neighbouring farmers due to FFS participant characteristics. Analysis based on a limited number of studies suggests that neighbour pesticides usage[11] and agricultural yields may indeed have been statistically significantly improved in programmes in which relatively more educated farmers participated. However, the magnitude of impacts, particularly in the case of yields, is small (Figure 9 and Table 7). Furthermore, evidence from the same studies suggests any impacts are limited to the diffusion of simple rather than complex practices, and that there was no evidence that these were sustained in the long term (Feder and Savastano 2006; Pananurak 2010; Ricker-Gilbert *et al.* 2008; Wu 2010).

[11] Here, pesticides usage means spraying of pesticides; there was no evidence for the diffusion of more complex IPM practices.

Figure 9: Meta-analysis of outcomes for FFS neighbours by education level of FFS farmers



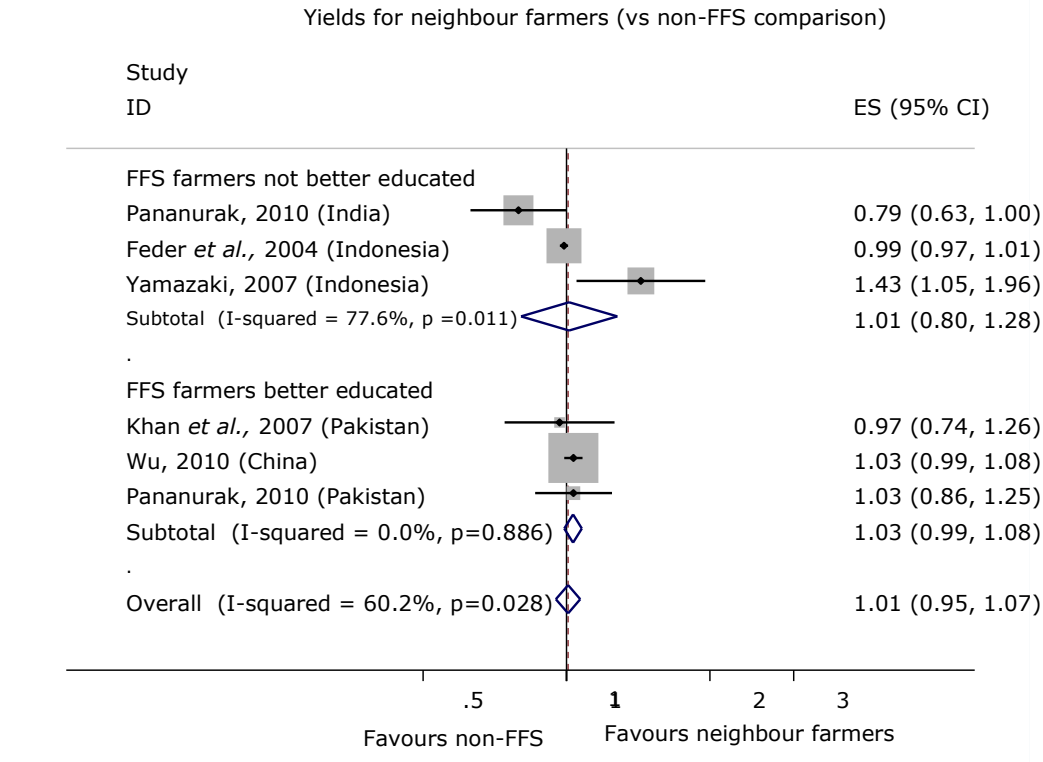


Table 7: Meta-analysis of pesticides use and agriculture outcomes for FFS neighbours by characteristics of FFS participants

	RR	95% confidence interval		Sample size
Pesticides use				
FFS neighbours: all studies	0.91	0.66	1.26	8
o/w:				
FFS farmer education years exceed local average	0.69	0.62	0.76	3
FFS farmer education years does not exceed local average	0.89	0.45	1.78	3
Agricultural outcomes (yields)				
FFS neighbours: all studies	1.00	0.98	1.03	7
o/w:				
FFS farmer education years exceed local average	1.03	0.99	1.08	3
FFS farmer education years does not exceed local average	1.01	0.80	1.28	3

Notes: RR response ratio.

Overall, the findings suggest that programmes which successfully target better-educated farmers may be more effective, both in changing pesticide-use behaviour and improving yields or incomes for FFS farmers, and possibly also in diffusing these benefits to neighbours. However, these results are based on small samples of studies, and more evidence is needed for greater confidence in these findings.

8. Synthesis

This section brings together findings from the different research questions explored so far to examine the targeting process as a whole, and assess barriers and facilitators to female participation specifically.

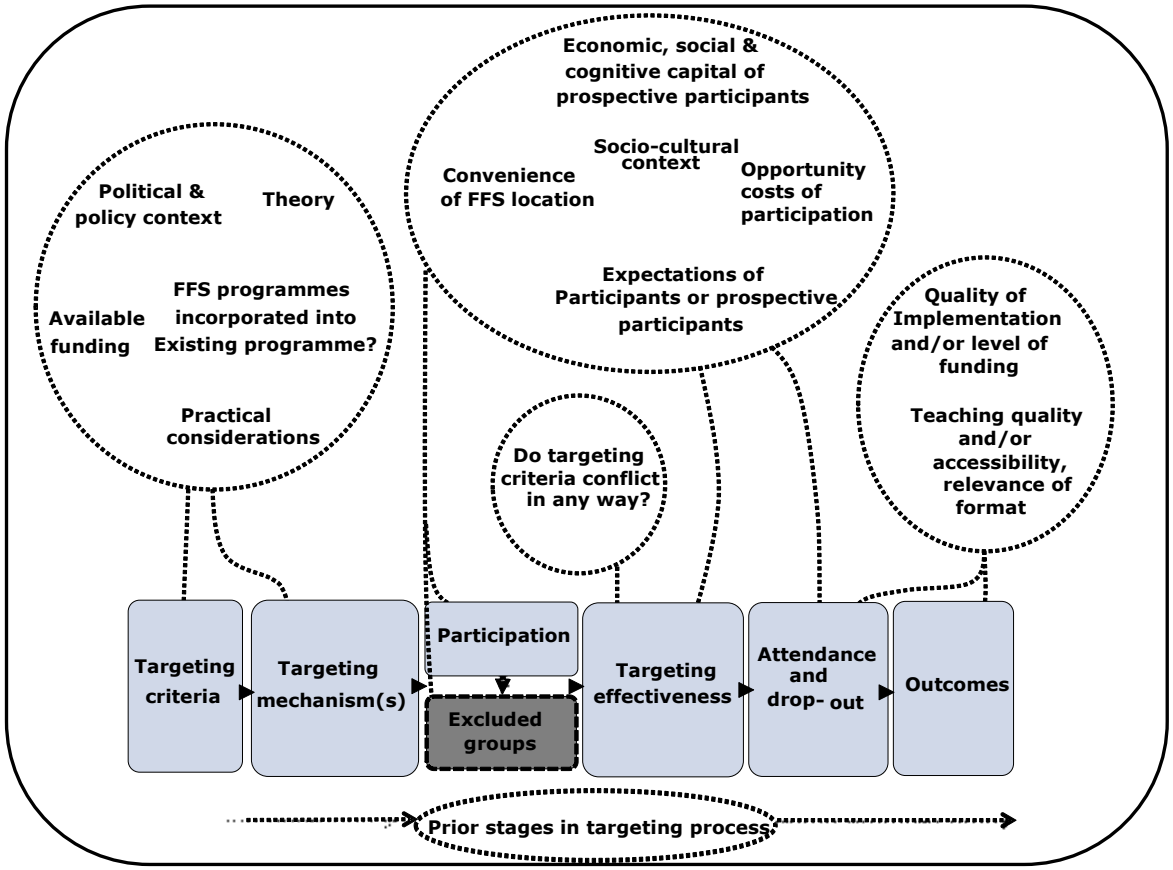
8.1 The targeting process

Targeting means attempting to reach those most in need and helping to improve their access to resources (Coady, Grosh and Hoddinott 2003). With targeting, as with much other work in development, there is a trade-off between tackling poverty and achieving other goals. Farmer field schools were originally put forward as a means of reaching out to marginalised or minority groups who might otherwise not have access to training, knowledge, employment or inputs (Erbaugh *et al.* 2010). However, this analysis suggests that many FFS programmes actually target farmers considered likely to be most effective—those with the education background, and economic and social assets to make the best use of the training that they are given. There are also programmes that target based on equity criteria, and those that include criteria designed to target both more capable and minority groups. Targeting criteria and the choice of targeting mechanism(s) are also determined in part by practical considerations, such as the accessibility or convenience of different locations and whether implementing partners already have operations in place in prospective locations.

Each stage in the targeting process is partly determined by the stages that come before them, as well as by a series of wider contextual factors (see Figure 10). For example, participation is partly determined by the targeting criteria and the mechanism used to select FFS farmers, but is also a function of the characteristics and expectations of the

target population. Where targeting criteria conflict in some way, for example by targeting minorities while making membership of an organised farmer group a prerequisite for participation, the effectiveness of targeting (the degree to which target groups and participants match) will be limited. Given that FFS programmes may be diverse in terms of their objectives, the populations they target, and in the ways they go about targeting them, successful targeting may mean something very different for each FFS programme. However, whatever the targeting criteria, farmer characteristics still play a crucial part in determining whether target groups are able to participate. Likewise, the impact of the schools on outcomes will depend not only on the characteristics of the participants, but also on the quality and relevance of the training provided.

Figure 10: The targeting process



Note: Targeting process in bold, with contextual factors linked to each stage as appropriate.

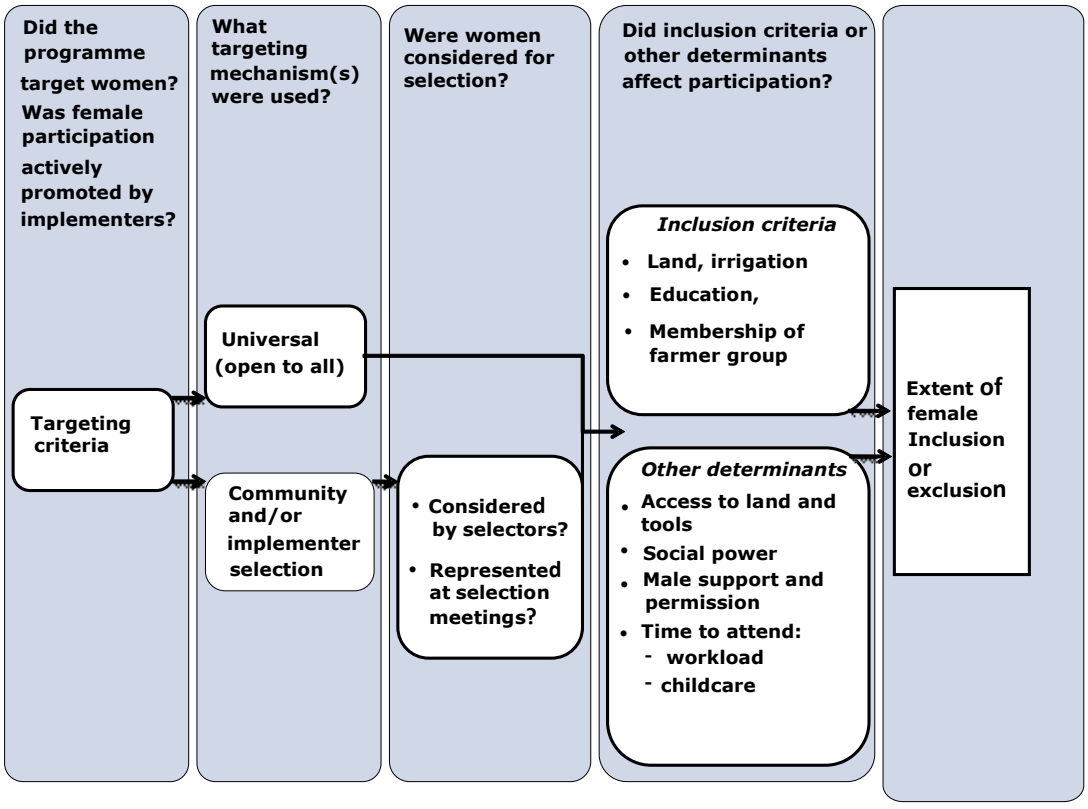
8.2 Barriers and facilitators to female participation

Women make up an average of 43 per cent of the agricultural labour force in developing countries, but often have far less access than men to productive resources and opportunities (FAO 2011). Agricultural extension programmes such as farmer field schools have been employed as a means of supporting female farmers, with some programmes explicitly targeted at women and others designed to be inclusive. This analysis suggests that although women are often targeted for inclusion by FFS programmes, programmes are not always effective in reaching them. Figure 11 provides an overview of the different barriers and facilitators to female involvement, from whether female participation was actively promoted to the targeting criteria and mechanisms employed.

The targeting mechanisms used to select FFS participants played a big part in determining female inclusion. Where selection relied on community-based targeting or implementer selection, or a combination of the two, there were instances where women were excluded from participation, sometimes entirely. There were also occasions where women were either overlooked for participation or were prevented from taking part by the format of the selection procedures (for example, in being denied the opportunity to attend community meetings where selection was determined [Najjar 2009]), while sometimes those tasked with selection completely overlooked them as potential participants (Van de Fliert 1993). Whatever the targeting mechanism used, where basic inclusion criteria for participation were set, some women without sufficient influence or education (Danida 2011; Simpson 1997), access to land (Hofisi 2003; Van Der Wiele 2004) or membership of a pre-existing group (Najjar 2009; Van de Fliert 1993) were effectively precluded from taking part. This was especially true of widows or others from female-headed households (Danida 2011; Simpson 1997; Van de Fliert 1993).

Even where there were no conditions for female participation, a lack of tools or access to land (Hofisi 2003; Van Der Wiele 2004) still limited female involvement, as did time commitments with household work and childcare, and the need to gain the permission of sceptical husbands (Najjar 2009; Tracy 2007; Van Der Wiele 2004). In some cases the number of men choosing to participate was very limited. Rwegasira *et al.* (2004) note that in Tanzania, the absence of men from FFS groups had a knock-on effect in limiting groups' capacity to function, because female participants lacked both assets (land, tools, and so on) and decision making power within their community.

Figure 11: Barriers and facilitators to female participation



9. Conclusion

Farmer field schools programmes employ a variety of targeting criteria to reach a number of different target groups, reflecting often contrasting overarching aims and objectives. Programmes that targeted more educated, innovative and experienced farmers, or those with greater social influence or access to land, had little difficulty in reaching their intended beneficiaries. However, while some programmes succeeded in including a wide cross-section of farmers from different socioeconomic backgrounds, as well as women, others failed to reach these target groups. This is because some of the targeting criteria and mechanisms commonly employed by FFS programmes promote the participation of elites, while the need for access to a minimum level of social and economic capital naturally precludes the participation of some poorer participants. In some cases, programmes failed to be inclusive because of the inclusion of targeting criteria driven by a desire to be effective.

Targeting mechanisms also sometimes precluded the participation of marginal groups, with instances of community-based selection resulting in nepotism, or programmes designed to be open to all, indirectly favouring those with more social power. Elite capture is clearly a problem for some FFS programmes and may stem from the fact that FFS training can largely be regarded as a private and not a public good. Dasgupta and Beard (2007) and Alatas *et al.* (2013) have shown that community-based targeting does not necessarily lead to elite capture and that it can be effective in identifying the most deserving community members, a finding supported by this analysis.

If FFS programmes want to guarantee the participation of poorer groups, they need to ensure that targeting criteria are well-calibrated to meet this objective and that targeting mechanisms are not vulnerable to elite capture. Moreover, even with well-designed criteria and targeting mechanisms, some farmers from poorer or minority groups may not have the economic and social capital to participate unless selection and implementation is explicitly geared towards providing them with the opportunity to be selected and access to necessary assets for participation. This raises the important issue of the cost of targeting; identifying target groups and preventing errors of inclusion and exclusion can require a significant amount of programme funds (Van de Walle 1998). Programmes that want to include poorer and minority groups need to invest in well-designed targeting, but this will have a consequent effect on the overall budget available for the programme.

The meta-analysis and meta-regression suggest that higher levels of education significantly improve adoption of FFS training techniques, providing some justification to those programmes that privilege more educated farmers for selection. However, this finding does not discount the value of equity-based targeting, as the greater effectiveness of programmes targeting effective farmers must be weighed against the potentially lower effectiveness but more equitable impact of pro-poor programmes.

Some programmes also explicitly or implicitly target more capable farmers on the basis that they are most likely to diffuse FFS learning, and the analysis in this paper suggests that diffusion may be more likely for programmes in which more educated farmers participate. This evidence is particularly important, given that targeting for diffusion means prioritising educated and organised farmers in the hope that poorer farmers benefit through a trickle-down effect. This means that where there is no diffusion, poorer farmers miss out entirely on benefits if they are not included as participants. Either way, some poorer groups are unlikely to benefit (either as participants, or indirectly as a result of knowledge diffusion) without complementary interventions to provide tools, ensure access to land, and so on.

Future research on farmer field schools should include more comprehensive reporting on the characteristics of FFS participants and the curriculum itself in order to facilitate analysis of barriers and facilitators and moderators. There is also a need for a greater number of studies to examine knowledge outcomes and whether FFS programmes empower farmers to develop life-long skills, as well as to explore how far outcomes occur among neighbouring farmers further along the causal chain.

Appendix A: Data extracted from source studies

Cells are shaded grey to indicate that an individual study (sometimes a single study was sourced from multiple papers; sometimes multiple studies were provided by a single paper) provided relevant data for a given research question or step in the targeting process.

Study title	Target groups or inclusion criteria	Targeting mechanism(s)	Participation	Descriptive statistics	Exclusion	Targeting effectiveness	Attendance and drop out	Outcomes
Ajayi, Banmeke and Okafor (2009)								
Banu and Bode (2003)								
Bekele *et al.* (2011)								
Belder, Garcia and Jansen (2006)								
Bwalya (2005)								
Carlberg, Kostandini and Dankyi (2012)								
Cavatassi *et al.* (2011)								
Chi *et al.* (1999)								
CORAD (2008)								
Danida (2011)								
David and Asamoah (2011)								
David (2007); Wandji et al. (2007)								
Davis *et al.* (2012) (Kenya) Davis *et al.* (2009)								
Davis *et al.* (2012) (Tanzania) Davis *et al.* (2009)								
Davis *et al.* (2012) (Uganda)								

Study title	Target groups or inclusion criteria	Targeting mechanism(s)	Participation	Descriptive statistics	Exclusion	Targeting effectiveness	Attendance and drop out	Outcomes
Davis *et al.* (2009)								
De Jager *et al.* (2009)								
Dolly (2009)								
Douthwaite *et al.* (2007)								
Duveskog, Mburu and Critchley (2003)								
Endalew (2009)								
Erbaugh *et al.* (2010)								
Esser *et al.* (2012)								
Feder and Savastano (2006); Feder et al. (2004)								
Friis-Hansen and Duveskog (2012)								
Friis-Hansen (2005)								
George and Hegde (2011)								
Gockowski *et al.* (2010)								
Godtland *et al.* (2003)								
Goff, Lidnder and Dolly (2009)								
Gottret and Córdoba (2004)								
Haiyang (2002)								
Hidalgo, Campilan and Lama (2001)								
Hofisi (2003)								
Islam, Mustafi and Haq (2006)								
Isubikalu *et al.* (2007)								

Study title	Target groups or inclusion criteria	Targeting mechanism(s)	Participation	Descriptive statistics	Exclusion	Targeting effectiveness	Attendance and drop out	Outcomes
Jalalzadeh *et al.* (2009)								
Kabir (2006); Kabir and Uphoff (2007)								
Kelemework (2005)								
Khalid (2003)								
Khisa and Heinemann (2005)								
Khan, Iqbal and Ahmad (2007); Khan, Iqbal and Ahmad (2007)								
Kishi (2002)								
Lama, Dhakal and Campilan (2003)								
Lopez Gaytan *et al.* (2008)								
Machacha (2008)								
Mancini, Termorshuizen and Van Bruggen (2006); Mancini, Wesseler and Jiggins (2006); Mancini and Jiggins (2008)								
Mariyono (2007); Mariyono (2009)								
Mauceri *et al.* (2005); Mauceri *et al.* (2007)								
Mitei (2011)								
Nabirye *et al.* (2003)								
Naik *et al.* (2010)								
Najjar (2009)								
Nathaniels (2005)								

Study title	Target groups or inclusion criteria	Targeting mechanism(s)	Participation	Descriptive statistics	Exclusion	Targeting effectiveness	Attendance and drop out	Outcomes
Nederlof and Odonkor (2006)								
Olanya *et al.* (2010)								
Onduru *et al.* (2008).								
Ortiz, Nelson and Orrego (2002)								
Palis (1998); Palis (2002); Palis (2006);								
Pananurak (2010) (China)								
Pananurak (2010) (India)								
Pananurak (2010) (Pakistan)								
Payne *et al.* (2011)								
Pedersen, Rashid and Mzoba (2008)								
Praneetvatakul, Meenakanit and Waibel (2007)								
Rao, Ratnakar and Jain (2012)								
Rejesus *et al.* (2012); Rejesus *et al.* (2009)								
Ricker-Gilbert *et al.* (2008)								
Rola and Baril (1997)								
Rola, Jamias and Quizon (2002)								
Rustam (2010)								
Rwegasira *et al.* (2004)								
Simpson (1997)								
Tracy (2007)								

Study title	Target groups or inclusion criteria	Targeting mechanism(s)	Participation	Descriptive statistics	Exclusion	Targeting effectiveness	Attendance and drop out	Outcomes
Tripp, Wijeratne and Piyadasa (2005)								
Tshiebue (2010)								
Van de Fliert (1993)								
Van den berg and Ragunathan (2006)								
Van den Berg *et al.* (2004)								
Van Rijn, Burger and Den Belder (2010)								
Van Der Wiele (2004)								
Witt, Waibel and Pemsl (2006)								
Wu (2010) (China)								
Wu (2010) (China)								
Wu (2010) (China)								
Yajima (2010)								
Yamazaki and Resosudarmo (2007); Feder and Savastano (2007)								
Yang *et al.* (2005)								
Yang *et al.* (2008)								
Yorobe, Rejesus and Hammig (2011)								
Zuger (2004)								

Appendix B: Summary statistics heuristics

Where figures were not provided in the form of an average, weighted averages were calculated using the data available. For example, where farm area was split into a number of different categories (0–1 hectares, 1–3, hectares, and so on), weighted averages were calculated using category midpoints multiplied by incidence in a given sample (see example 1). Where categories were open (as with >5, below), the midpoint was based on the neighbouring category size.[12] An overall weighted average was calculated by dividing the summed weighted averages for each category by the total sample size.

Example 1					
Farm area (hectares)	0–1	1–3	3–5	>5	Total
Farmers	8	6	2	3	19
Midpoint	0.5	2	4	6	N/A
Category weighted average = midpoint × incidence	4	12	8	18	42

Weighted average for sample: 42/19 = 2.2

A small subset of the studies (5 or 9.6 per cent of the total) relied on data based on the head of the household rather than at the participant level. For the purposes of this analysis, the two data types were treated as the same. Where data for a programme were provided for both a baseline year and a follow-up year, only data for the baseline year were used. Where data were provided for multiple programmes or the same programme in different countries, each programme or country was coded as a separate entry. One paper (Zuger 2004) reported summary statistics over a number of years for a shifting set of FFS programmes in Cajamarca, Peru. An average of all statistics provided was used for the analysis. For sex, summary statistics drew on figures taken from the 25 studies that provided data as part of their summary statistics, plus a further 11 studies that reported figures in-text.

[12] With the exception of age, where 15 was considered to be the minimum and 65 the maximum age for workers. This meant that, were a paper to record the incidence of farmers aged 0–30 in a sample, the midpoint was calculated as 22.5, halfway between the upper bound and the minimum age of 15.

Appendix C: Data merge for effectiveness analysis

In order to undertake the analysis in section 7 of this paper on effectiveness, outcomes effect sizes relating to farmer knowledge, adoption of practices and agricultural outcomes (yields) from impact evaluations (from Waddington et al. 2014) were merged with data on participation relating to land owned, years of education, female inclusion and age. In some cases, one study provided the source for both participant characteristics and outcomes. However, in other cases, multiple studies reporting on the same programme were combined. This was done by carefully checking programme names and locations to ensure they matched. The first column of the table below lists the names given to each data point in our forest plots. The second column provides the full reference(s) for all studies providing data for each of those data points. The third column provides the programme name that the data-point relates to. The final column links each data source to the type of data it provided.

Study reference	Relevant Full reference(s)	Programme	Data provided
Carlberg et al., 2012 (Ghana)	Carlberg, Kostandini and Dankyi, 2012	Ghana: Peanut collaboration research support programme (CRSP)	Outcomes and participation
Cavatassi et al., 2011 (Ecuador)	Cavatassi et al., 2011	Ecuador: Plataformas programme (FAO)	Outcomes and participation
David, 2007	David, 2007	Cameroon: Sustainable tree crops programme (STCP) Phase II	Outcomes and participation
Davis et al., 2012 (Kenya)	Davis et al., 2012	Kenya: East African Sub-regional pilot project phase II (FAO)	Outcomes and participation
Davis et al., 2012 (Tanzania)	Davis et al., 2012	Tanzania: East African Sub-regional Pilot Project Phase II (FAO)	Outcomes and participation
Endalew, 2009 (Ethiopia)	Endalew, 2009	Ethiopia: Jimma and Sidama FFS	Outcomes and participation
Erbaugh, 2010 (Uganda)	Erbaugh et al., 2010	Uganda: IPM collaborative research support programme (CRSP)	Outcomes and participation
Feder et al., 2004 (Indonesia)	Feder et al., 2004 Feder and Savastano, 2006	Indonesia: National IPM training project phase II - Java	Outcomes Participation
Gockowski et al., 2010 (Ghana)	Gockowski et al., 2010 David and Asamoah, 2011	Nigeria: Sustainable tree crops programme (STCP) Phase II (IITA)	Outcomes Participation
Khalid, 2003 (Sudan)	Khalid, 2003	Sudan: Gezira scheme, FAO IPM in vegetables	Outcomes and participation
Khan et al., 2007 (Pakistan)	Khan, Iqbal and Ahmad, 2007 Khan, Soomro and Ahmad, 2004	Pakistan: National IPM programme, Khairpur	Outcomes Participation

Study reference	Relevant Full reference(s)	Programme	Data provided
Mancini & Jiggins, 2008 (India)	Mancini and Jiggins, 2008 Mancini, Termorshuizen and Van Bruggen, 2006; Mancini, Wesseler and Jiggins, 2006	Andhra Pradesh FAO FFS	Outcomes Participation
Naik et al., 2010 (India)	Naik et al., 2010	India: Karnataka community based tank management project (KCBTMP)	Outcomes and participation
Palis, 1998 (Philippines)	Palis, 1998 Palis, 2002; Palis, 2006	Philippines: Barangay integrated pest management (BIPM) project, central Luzon	Outcomes Participation
Pananurak, 2010 (India)	Pananurak, 2010	India: FAO/EU IPM programme for cotton in Asia	Outcomes and participation
Pananurak, 2010 (Pakistan)	Pananurak, 2010	Pakistan: FAO/EU IPM programme for cotton in Asia	Outcomes and participation
Praneetvatakul et al., 2007 (Thailand)	Praneetvatakul, Meenakanit and Waibel, 2007	Thailand: FAO/EU IPM programme for cotton in Asia	Outcomes and participation
Rao et al., 2012 (India)	Rao, Ratnakar and Jain, 2012	India: Sree ram sagar project (SRSP), Andhra Pradesh	Outcomes and participation
Rejesus et al., 2012 (Vietnam)	Rejesus et al., 2012 Rejesus et al., 2009	Vietnam: FAO programme for community IPM in Asia	Outcomes Participation
Van Rijn, 2010 (Peru)	Van Rijn, Burger and Den Belder, 2010	Peru: DE foundation coffee project	Outcomes and participation
Wandji et al., 2007 (Cameroon)	Wandji et al., 2007 David, 2007	Cameroon: Sustainable tree crops programme (STCP) Phase II	Participation Participation
Wu, 2010 (China)	Wu, 2010	China: FAO/EU IPM programme for cotton in Asia	Outcomes and participation
Yamazaki, 2007 (Indonesia)	Yamazaki and Resosudarmo, 2007 Feder and Savastano, 2006	Indonesia: National IPM training project phase II	Outcomes Participation
Yang et al., 2005 (China)	Yang et al., 2005	China: FAO vegetable IPM, Yunnan Province	Outcomes and participation
Yorobe et al., 2011 (Philippines)	Yorobe, Rejesus, and Hammig, 2011	Philippines: IPM CollaborativeResearch support programme (CRSP), Nueva Ecija (USAID)	Outcomes and participation
Zuger, 2004 (Peru)	Zuger, 2004	Peru: Cajamarca FFS (CARE, CIP)	Outcomes and participation

Appendix D: Definitions for targeting criteria themes

Effectiveness-related criteria—*target farmers considered most able to make best use of FFS training*

- **Pre-existing groups**: Pre-existing agricultural or community groups
- **Educated**: Educated, literate or experienced farmers
- **Innovative**: Innovative, modern or model farmers
- **Disseminate**: Farmers willing and able to disseminate FFS concepts among the community
- **Resources**: Only those with access to some land and/or irrigation
- **Prosperous or medium scale**: Farmers that are medium scale or prosperous can handle credit
- **Social standing**: Farmers with social standing or influence

Equity-related criteria—*target farmers considered to be most 'in need'*

- **Women**: Designed to include female farmers
- **Poor**: Smallholders, marginal, poor or those with few resources
- **Inclusive**: Intended to include farmers of all education, resource or socio-economic levels

Farming system criteria

- **Crop**: Farmers cultivating specific crop(s)
- **Disease and/or pest**: Farmers with crop diseases and/or pest problems
- **Pesticide**: Farmers using large amounts of chemical pesticides

Practical criteria

- **Accessibility**: Villages chosen for accessibility, proximity to roads or chosen because of existing development operations
- **Convenience**: Farmers located close to trainer, to FFS site or to one another
- **Availability**: Those available and with time to participate
- **Interest**: Those motivated and interested in participating

References

Alatas, V, Banarjee, AV, Hanna, R, Olken, BA and Tobias, J, 2013. *Involving communities in identifying the poor*. Cambridge, MA: Abdul Latif Jameel, Poverty Action Lab.

Arcand, JL and Wagner, N, 2012. *Elite capture revisited: does community driven development improve inclusiveness? evidence from Senegal*. Geneva: Graduate Institute of International and Development Studies.

Braun, A and Duveskog, D, 2010. *The farmer field school approach—history, global assessment and success stories.* Background Paper for the IFAD Rural Poverty Report 2010.

Charmarbagwala, R, Ranger, M, Waddington, H and White, H, 2005. The determinants of child health and nutrition: A meta-analysis. OED Working Paper. Washington, DC: World Bank.

Coady, D, Grosh, M and Hoddinott, J, 2003. *The targeting of transfers in developing countries: review of experience and lessons*. Washington, DC: World Bank.

Conning, J and Kevane, M, 2002. Community based targeting for social safety nets: a critical review. *World Development*, 30(3), pp.375–94.

Dasgupta, A and Beard, VA, 2007. Community driven development, collective action and elite capture in Indonesia. *Development and Change*, 39(2), pp.229–49.

Dixon-Woods, M, Agarwal, S, Jones, D, Young, B and Sutton, A, 2005. Synthesising qualitative and quantitative evidence: a review of possible methods. *Journal of Health Service Research and Policy*, 10(1), pp.45–53.

FAO, 2011. *The state of food and agriculture 2010–2011. women in agriculture: closing the gender gap for development*. Rome: FAO.

Hammerstrøm, K, Wade, A and KlintJørgensen, AM, 2010. *Searching for studies: a guide to information retrieval for Campbell systematic reviews*. Oslo: Campbell Collaboration. Available at: www.campbellcollaboration.org/lib/download/969/

Higgins, JPT and Green, S eds., 2011. Cochrane handbook for systematic reviews of interventions version 5.1.0 [updated March 2011]. The Cochrane Collaboration. Available at: www.cochrane-handbook.org

Mays, N, Pope, C and Popay, J, 2005. Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field. *Journal of Health Service Research and Policy*, 10(Suppl.1), pp.6–20.

Pontius, J, Dilts, R and Bartlett, A eds., 2002. *Ten years of IPM training in Asia—from farmer field school to community IPM*. Bangkok: FAO.

Sandieson, R, 2006. Pathfinding in the research forest: the pearl harvesting method for effective information retrieval. *Education and Training in Developmental Disabilities*, 41(4), pp.401–09. Available at: http://publish.edu.uwo.ca/robert.sandieson/downloads/ETDD.pdf

Smolensky, Eugene, Reilly, Siobhan and Evenhouse, Eirik, 1995. Should public assistance be targeted? *Journal of Post Keynesian Economics*, 18(1), pp.3–28.

Stouffer, SA, Suchman, EA, DeVinney, LC, Star, SA and Williams Jr., RM, 1949. *Adjustment during army life*. Princeton, NJ: Princeton University Press.

Van den Berg, H and Jiggins, J, 2007. Investing in farmers—the impacts of farmers field schools in relation to integrated pest management. *World Development*, 35(4), pp.663–86.

Van de Walle, D, 1998. Targeting revisited. *The World Bank Research Observer*, 13(2), pp.231–48.

Waddington, H, Snilstveit, B, Hombrados, J, Vojtkova, M, Phillips, D, Davies, P and White, H, 2014. Farmer field schools for improving farming practices and farmer outcomes: a systematic review. *Campbell Systematic Reviews*. Available at: http://campbellcollaboration.org/lib/project/203/

Included studies

Ajayi, MT, Banmeke, TOA and Okafor, C, 2008. Empowering farmers through discovery learning: a case study of farmer field school (FFS) training on cocoa integrated pest management (IPM) in Ondo State, Nigeria. *Journal of Environmental Extension*, 7, pp.37–42. Available at: http://dx.doi.org/10.4314/jext.v7i1.2775

Banu, LJ and Bode, B, 2003. *CARE Bangladesh's FFS approach: new frontiers in farmer empowerment*. Los Baños: CIP-UPWARD.

Bekele, N, Mithöfer, D, Amudavi, D and Obare, G, 2011. Integrated pest management training and information flow among smallholder horticulture farmers in Kenya. In: D Mithöfer and H Waibel, eds. *Vegetable production and marketing in Africa: socioeconomic research*. Wallingfordo: CAB International. pp.243–61.

Belder, ED, Garcia, M and Jansen, D, 2006. Documentation: an effective tool in farmer field schools. *LEISA: ILEIA Newsletter for Low-external-input and Sustainable Agriculture*, 22(1).

Bwalya, M, 2005. Self-assessing local good practices and scaling-up strategies of sustainable agriculture. Eotulelo farmer field school group Likamba village, Arumeru Arusha region, Tanzania. Soil and water conservation to conservation agriculture practices (experiences and lessons from the efforts Eotulelo farmer field school—a community based organisation).

Carlberg, E, Kostandini, G and Dankyi, A, 2012. The effects of integrated pest management techniques (IPM) farmer field schools on groundnut productivity: evidence from Ghana. Selected paper prepared for presentation at the agricultural & applied economics association's annual meeting, Seattle, Washington, 12–14 August.

Cavatassi, R, Salazar, L, Gonzalez-Flores, M and Winters, P, 2011. How do agricultural programs alter crop production? evidence from Ecuador. *Journal of Agricultural Economics*, 62(2), pp.403–28.

Chi, TTN, Tuyen, TQ, Price, LL and Hosain, MM, 1999. Effect of IPM-farmer field school on farmers' insect knowledge and control practices: a case study. *Omonrice*, 7, pp.126–32.

CORAD, 2008. CORAD farmer field schools in Sierra Leone. Consortium for Rehabilitation & Development, Freetown, Sierra Leone.

Cornia, Giovanni Andrea and Stewart, Frances, 1993. Two errors of targeting. *Journal of International Development*, 5(5), pp.459–96.

Danida, 2011. *Evaluation of the farmer field school approach in the agriculture sector program support phase II, Bangladesh*. Copenhagen: Danida.

David, S, 2007. Learning to think for ourselves: knowledge improvement and social benefits among farmer field school participants in Cameroon. *Journal of International Agricultural and Extension Education*, 14(2), pp.35–50.

David, S and Asamoah, C, 2011. Farmer knowledge as an early indicator of IPM adoption: a case study from cocoa farmer field schools in Ghana. *Journal of Sustainable Development in Africa*, 14(4), pp.213–24.

Davis, K, Nkonya, E, Ayalew, D and Kato, E, 2009. Assessing the impact of a farmer field schools project in East Africa. 25th annual conference of the association for international agricultural and extension education (AIAEE), San Juan, Puerto Rico, 24–28 May.

Davis, K, Nkonya, E, Kato, E, Mekonnen, DA, Odendo, M, Miiro, R, Nkuba, J and Okoth, J, 2012. Impact of farmer field schools on agricultural productivity and poverty in East Africa. *World Development*, 40(2), pp.402–13.

De Jager, A, Onduru, D, Gachimibi, L, Muchena, F, Gachini, GN and Van Beek, C, 2009. Farmer field schools for rural empowerment and life-long learning in integrated nutrient management: experiences in Eastern and Central Kenya. In: Pascal C Sanginga, Ann Waters-Bayer, Susan Kaaria, Jemimah Njuki and Chesha Wettasinha, eds. *Innovation Africa: enriching farmers' livelihoods*. London: Earthscan, pp.278–96.

Dolly, D, 2009. An assessment of the implementation and outcomes of recent farmer field schools to improve vegetable production in Trinidad and Tobago. *Journal of International Agricultural and Extension Education*, 16(2), pp.7–19.

Douthwaite, B, Schulz, S, Olanrewaju, AS and Ellis-Jones, J, 2007. Impact pathway evaluation of an integrated Striga Hermonthica control project in northern Nigeria. *Agricultural Systems*, 92(1–3), pp.201–22.

Duveskog, D, Mburu, C and Critchley, JA, 2003. Harnessing indigenous knowledge & innovation in farmer field schools. In: *Farmer field school: emerging issues and challenges*. Los Baños, Laguna: International Potato Center—Users' Perspectives with Agricultural Research and Development (CIP-UPWARD), pp.197–209.

Endalew, BD, 2009. Effectiveness of farmer field school promoting coffee management practices: the case of Jimma and Sidama zones. Thesis, Haramaya University.

Erbaugh, JM, Donnermeyer, J, Amujal, M and Kidoido, M, 2010. Assessing the impact of farmer field school participation on IPM adoption in Uganda. *Journal of International Agricultural and Extension Education*, 17(3), pp.5–17.

Esser, KB, Saethe, MG, Pradhananga, N and Ojha, H, 2012. Midterm review of the national integrated pest management program in Nepal, phase II. Noragric Report no. 67. Norwegian University of Life Sciences.

Feder, G and Savastano, S, 2006. The role of opinion leaders in the diffusion of new knowledge: the case of integrated pest management. *World Development*, 34(7), pp.1287–1300.

Feder, G, Murgai, R and Quizon, JB, 2004. Sending farmers back to school: The impact of farmer field schools in Indonesia. *Review of Agricultural Economics*, vol. 26, no. 1, pp. 45–62.

Friis-Hansen, E, 2005. Agricultural development among poor farmers in Soroti district, Uganda: impact assessment of agricultural technology, farmer empowerment and changes in opportunity structures. Paper presented at the impact assessment workshop at CYMMYT, Mexico, 19–21 October.

Friis-Hansen, E and Duveskog, D, 2012. The empowerment route to well-being: an analysis of farmer field schools in East Africa. *World Development*, 40(2), pp.414–27.

George, S and Hegde, MR, 2011. Impact of farmer field school in popularization of IPM practices in tomato cultivation. *Agricultural Science Digest*, 31(2), pp.116–20.

Gockowski, J, Asamoah, C, David, S, Gyamfi, I and Kumi, MA, 2010. An evaluation of farmer field school induced changes in Ghanaian cocoa production. *Journal of International Agricultural and Extension Education*, 17(3), pp.43–56.

Godtland, E, Sadoulet, E, de Janvry, A, Murgai, R and Ortiz, O, 2003. The impact of farmer-field-schools on knowledge and productivity: a study of potato farmers in the Peruvian Andes. Working Paper Series: 963. Berkeley: Department of Agricultural & Resource Economics, UC.

Goff, S, Lindner, JR and Dolly, D eds., 2009. Farmer field school completers', non-completers', and non-participants' perceptions of integrated pest management: a case study of Trinidad and Tobago. AIAEE proceedings of the 25th annual meeting, InterContinental San Juan Resort, Puerto Rico.

Gottret, MV and Córdoba, DM, 2004. *Políticas y procesos de innovación tecnológica con productores de pequeña escalaen honduras y nicaragua*. PROMIPAC.

Haiyang, W, 2002. Farmer field schools in China: experience in Huoshan county with the China-Netherlands Poverty Alleviation Project. International learning workshop on farmer field schools (FFS): emerging issues and challenges, Yogyakarta, Indonesia, 21–25 October.

Hidalgo, OA, Campilan, DM and Lama, TL, 2001. A report on strengthening farmer capacity for growing a healthy potato crop in Nepal. In: International Potato Center, 2000. *Scientist and farmer: partners in research for the 21st century, program report 1999–2000*. Lima, Peru: CIP, pp.239–44.

Hofisi, F, 2003. *Farmer field schools as a learning process for resource-poor farmers*. Uppsala: 22, Swedish University of Agricultural Sciences, Department of Rural Development Studies, SLU.

Islam, MR, Mustafi, BAA and Haq, M, 2006. Impact assessment of the integrated pest management (IPM) technology on Boro rice cultivation. *The Journal of Rural Development*, 33(2), pp.55–80.

Isubikalu, P, Ur, WURW, Richards, PP and Maat, DH, 2007. Stepping-stones to improve upon functioning of participatory agricultural extension programs: farmer field schools in Uganda. PhD thesis, Wageningen University.

Jalalzadeh, M, Farjadnia, K, Khezerlou, B and Ghasemi, J, 2009. Analysis of the executive components of the farmer field school [FFS] project [grape gardeners] in Uromieh County of West Azerbaijan Province, Iran. *Global Approaches to Extension Practice: A Journal of Agricultural Extension*, 4(2), pp.43–52.

Kabir, H, 2006. Adaptation and adoption of the system of rice intensification (SRI) in Myanmar using the farmer field school (FFS) approach. PhD thesis, Honolulu University.

Kabir, H and Uphoff, N, 2007. Results of disseminating the system of rice intensification with farmer field school methods in northern Myanmar. *Experimental Agriculture*, vol. 43, no. 4, pp. 463–476.

Kelemework, F, 2005. Impact evaluation of farmer field school: the case of integrated potato late blight management in the central highland of Ethiopia. Thesis, University of Antwerp.

Khalid, A, 2003. Assessing the long-term impact of IPM farmer field schools on farmers' knowledge, attitudes and practices. A case study from Gezira Scheme, Sudan. Presented at the international learning workshop on farmer field schools (FFS): emerging issues and challenges, Yogyakarta, Indonesia.

Khan, MA, Iqbal, M and Ahmad, I, 2007. Environment-Friendly Cotton Production Through Implementing Integrated Pest Management Approach, *Pakistan Development Review*, vol. 46, no. 4, Part II, pp. 1119–1135.

Khan, MA, Soomro, MH and Ahmad, I, 2004. Impacts of the group FFS activities on the organizational capacities of the farmers: evidence from Pakistan. Pakistan Agricultural Research Council National IPM Program, NARC, Islamabad, Pakistan, Food and Agriculture Organization of the United Nations.

Khisa, G and Heinemann, E, 2005. Bright spots demonstrate community successes in African agriculture. Working Paper 102. International Water Management Institute (IWMI).

Kishi, M, 2002. Farmers' perceptions of pesticides, and resultant health problems from exposures. *International Journal of Occupational and Environmental Health*, 8(3), pp.75–181.

Lama, TL, Dhakal, SP and Campilan, DM, 2003. Promoting integrated disease management (IDM) through farmer field schools in Nepal. In: *From cultivators to consumers, participatory research with various user groups*. Los Banos, Laguna: CIP-UPWARD. pp. 59–67.

Lopez Gaytan, J, Jimenez Sanchez, L, Leon Merino, A, Figueroa Rodriguez, OL, Morales Guerra, M and Gonzalez Romero, V, 2008. Farmer field school, for dissemination and training in sustainable technologies in indigenous communities. *Agricultura Técnica en México*, 34(1), pp.33–42.

Machacha, A, 2008. Farmer field schools in Bungoma district of Western Kenya: a rapid appraisal. MS Thesis, Iowa State University.

Mancini, F and Jiggins, J, 2008. Appraisal of methods to evaluate farmer field schools. *Development in Practice*, 18(4–5), pp.539–50.

Mancini, F, Termorshuizen, AJ and Van Bruggen, AHC, 2006. Impact of integrated pest management farmer field schools on pesticide use and farmers' ecological knowledge on cotton farming in India. In: Francesca Mancini, ed. *Impact of IPM farmer field schools on the environment, health and livelihoods of cotton growers in southern India*. Doctoral thesis, Biological Farming Systems Group. Wageningen: Wageningen University, pp.27–40.

Mancini, F, Wesseler, J and Jiggins, JLS, 2006. The effects of integrated pest management on labour organization and gender roles in small cotton farms in India. In: Francesca Mancini, ed. *Impact of IPM farmer field schools on the environment, health and livelihoods of cotton growers in southern India*. Doctoral thesis, Biological Farming Systems Group. Wageningen: Wageningen University, pp.41–52.

Mariyono, J, 2007. Adoption and diffusion of integrated pest management technology: a case of irrigated rice farm in Jogjakarta province, Indonesia. *Asia-Pacific Journal of Rural Development*, 17(1), pp.29–38.

Mariyono, J, 2009. Integrated pest management training in Indonesia: does the performance level of farmer training matter? *Journal of Rural and Community Development*, 4(2), pp.93–104.

Mauceri, M, Alwang, J, Norton, G and Barrera, V, 2007. Effectiveness of integrated pest management dissemination techniques: a case study of potato farmers in Carchi, Ecuador. *Journal of Agriculture and Applied Economics*, vol. 39, no. 3, pp. 765–780.

Mauceri, M, Norton, G, Alwang, J and Barrera, V, 2005. Adoption of integrated pest management technologies: a case study of potato farmers in Cachi, Ecuador. Selected paper prepared for presentation at the American agricultural economics association annual meeting, Providence, Rhode Island, 24–27 July.

Mitei, Z, 2011. Growing sustainable tea on Kenyan smallholder farms. *International Journal of Agricultural Sustainability*, 9(1), pp.59–66.

Nabirye, J, Nampala, P, Ogenga-Latigo, MW, Kyamanywa, S, Wilson, H, Odeke, V, Iceduna, C and Adipala, E, 2003. Farmer-participatory evaluation of cowpea integrated pest management (IPM) technologies in Eastern Uganda. *Crop Protection*, 22(1), pp.31–38.

Naik, LGYK, Jahagirdar, KA, Natikar, KV and Hawaldar, YN, 2010. *A study on knowledge and adoption of integrated crop management (ICM) practices by the participants of farmers field school on maize*. Dharwad: University of Agricultural Sciences.

Najjar, D, 2009. *Learning through farmer field schools: a case study of the Taita Hills, Kenya*. MNRM: University of Manitoba.

Nathaniels, NQR, 2005. Cowpea, farmer field schools and farmer-to-farmer extension: a Benin case study. Network Paper No. 148. Agricultural Research & Extension Network.

Nederlof, ES and Odonkor, EN, 2006. Lessons from an experiential learning process: the case of cowpea farmer field schools in Ghana. *The Journal of Agricultural Education and Extension*, 12(4), pp.249–71.

Olanya, M, Nelson, R, Hakiza, J, Ewell, P, El-Bedewy, R, Kakuhenzire, R, Namanda, S *et al.*, 2010. Comparative assessment of pest management practices in potato production at farmer field schools. *Food Security*, 2(4), pp.327–41.

Onduru, DD, Du Preez, CC, Muchena, LN, de Jager Gachimbi, A and Gachini, GN, 2008. Exploring options for integrated nutrient management in semi-arid tropics using farmer field schools: a case study in Mbeere. *International Journal of Agricultural Sustainability*, 6(3), pp.208–28.

Ortiz, O, Nelson, R and Orrego, R, 2002. *Impact evaluation of participatory development of integrated insect and disease management (IPM) for the potato crop in San Miguel, Peru*. Lima: International Potato Center.

Palis, FG, 2002. *The impact of social capital in technology sharing and learning on integrated pest management in Central Luzon, Philippines*. Quezon City: College of Social Sciences and Philosophy, University of the Philippines.

Palis, FG, 2006. The role of culture in farmer learning and technology adoption: a case study of farmer field schools among rice farmers in central Luzon, Philippines. *Agriculture and Human Values*, 23(4), pp.491–500.

Palis, FG, 1998. Changing farmers' perceptions and practices: the case of insect pest control in central Luzon, Philippines. *Crop Protection*, vol. 17, no. 7, pp. 599–607.

Pananurak, P, 2010. Impact assessment of farmer field schools in cotton production in China, India and Pakistan. In: H Waibel, ed. *Pesticide policy project publication series*, special issue no. 14. Hannover: Institute of Development and Agricultural Economics, Leibniz University of Hannover.

Payne, W, Tapsoba, H, Baoua, IB, Malick, BN, N'Diaye, M and Dabire-Binso, C, 2011. On-farm biological control of the pearl millet head miner: realization of 35 years of unsteady progress in Mali, Burkina Faso and Niger. *International Journal of Agricultural Sustainability*, 9(1), pp.186–93.

Pedersen, A, Rashid, M and Mzoba, H, 2008. *Farmer field schools in Mbeya—review 2008* (vol. I: main findings and recommendations, final draft). Mbeya: DADS.

Praneetvatakul, S, Waibel, H and Meenakanit, L, 2007. Farmer field schools in Thailand: history, economics and policy. In: H Waibel, ed. *Pesticide policy project publication series issue no. 12*. Hannover: University of Hannover.

Rao, NV, Ratnakar, R and Jain, PK, 2012. *Impact of farmer field schools in KVK adopted villages on level of knowledge and extent of adoption of improved practices of paddy*. New Delhi: Indira Gandhi National Open University.

Rejesus, RM, Palis, FG, Lapitan, AV, Chi, TTN and Hossain, M, 2009. The impact of integrated pest management information dissemination methods on insecticide use and efficiency: evidence from rice producers in South Vietnam. *Review of Agricultural Economics*, 31(4), pp.814–33.

Rejesus, RM, Yasar, M, Mutuc, MEM, Lapitan, AV, Palis, FG and Chi, TTN, 2012. Sending Vietnamese rice farmers back to school: further evidence on the impacts of farmer field schools. *Canadian Journal of Agricultural Economics,* 60 (30), pp. 407-426.

Ricker-Gilbert, J, Norton, GW, Alwang, J, Miah, M and Feder, G, 2008. Cost-effectiveness of alternative integrated pest management extension methods: an example from Bangladesh. *Review of Agricultural Economics*, 30(2), pp.252–69.

Rola, AC and Baril, TA, 1997. Making rice farmers better decision-makers via the farmer field school. *SEAMEO Update*, 5(5/6), pp.10–12.

Rola, AC, Jamias, SB and Quizon, JB, 2002. Do farmer field school graduates retain and share what they learn?: an investigation in Iloilo, Philippines. *Journal of International Agricultural and Extension Education*, 9(1), pp.65–76.

Rustam, R, 2010. Effect of integrated pest management farmer field school (IPM FFS) on farmers' knowledge, farmers groups' ability, process of adoption and diffusion of IPM in Jember district. *Journal of Agricultural Extension*, 2(2), pp.29–35.

Rwegasira, GM, Marandu, EF, Gibson, RW and Kapinga, RE, 2004. Control of sweet potato virus disease through farmer field schools approach in Kagera region, Tanzania. Presentation at Symposium of International Society of Tropical Root Crops, Africa.

Simpson, D, 1997. The impotence of participation; an examination of the integrated pest management-farmer field school program in Svay Teap. MA thesis, Norman Paterson School of International Affairs.

Todo, Y and Takahashi, R, 2011. *Impact of farmer field schools on agricultural income and skills: evidence from an aid-funded project in rural Ethiopia.* JICA Research Institute Working Paper, No. 30, May 2011.

Tracy, TMM, 2007. *Papas, Plaguicidas y Personas (potatoes, pesticides and people): the farmer field school methodology and human health in Ecuador*. Halifax, Nova Scotia: Saint Mary's University.

Tripp, T, Wijeratne, M and Piyadasa, VH, 2005. What should we expect from farmer field schools? a Sri Lanka case study. *World Development*, 33(10), pp.1705–20.

Tshiebue, GN, 2010. *L'Approche Champ-Ecole Paysanne (CEP): Une Methode de Recherche-Action Impliquant Davantage les Producteurs Rarauxdans la Maitriseet L'Amerlioration de Leur Systeme de Production*. Louvainla-Neuve: Innovation and sustainable development in agriculture and food, Institut d'Etudes du développement Université Catholique de Louvain.

Van de Fliert, E, 1993. *Integrated pest management: farmer field schools generate sustainable practices: a case study in central Java evaluating IPM training*. Wageningen: Agricultural University Wageningen.

Van den Berg, H, Ooi, PAC, Hakim, AL, Ariawan, H and Cahyana, W, 2004. Farmer field research: an analysis of experiences from Indonesia. In: PAC Ooi, S Praneetvatakul, H Waibel and G Walter-Echols, eds. *The impact of the FAO-EU IPM program for cotton in Asia*—special issue publication series no. 9. Hannover: University of Hannover.

Van den Berg, H and Ragunathan, V, 2006. *Evaluation of the integrated pest and vector management (IPVM) project in Sri Lanka: mission report, July 2006*. New Delhi: WHO Regional Office for South-East Asia.

Van Der Wiele, CF, 2004. Understanding the adoption of sustainable natural resource management practices and the role of ecological design within the milieu of chronic conflict and political instability: a case study of smallholder households in Nimba County, Liberia. PhD thesis, North Carolina State University, Raleigh, North Carolina, USA.

Van Rijn, F, Burger, K and Den Belder, E, 2010. Impact assessment in the sustainable livelihood framework—a case of the DE Foundation Coffee Support Project. Paper presented at the impact evaluation conference ISS & AIID, Amsterdam, The Netherlands, 6–7 October.

Wandji, N, Binam, N, David, S, Mva Mva, J and Gockowski, J, 2007*. Assessing potential impact of a farmer field school training on perennial crop in Cameroon.* The role of Agriculture in Poverty Reduction: Recent Experiences from Africa 2, AAAE Conference Proceedings.

Witt, R, Waibel, H and Pemsl, D, 2006. Training intensity and diffusion of information from farmer field schools in Senegal. Working Paper No. 3. Development and Agricultural Economics, Faculty of Economics and Management, University of Hannover, Germany.

Wu, L, 2010. Farmer field school and Bt cotton in China—an economic analysis. In: H Waibel, ed. *Pesticide policy project publication series—special issue no. 15*. Hannover: Institute of Development and Agricultural Economics, Leibniz University of Hannover.

Yajima, M, 2010. Livelihoods of Cassava farmers in the context of HIV/AIDS in Northern Malawi. PhD thesis, Wageningen University.

Yamazaki, S. and Resosudarmo, B.P. 2007. Does sending farmers back to school have an impact? a spatial econometric approach, Research School of Pacific and Asian Studies, Division of Economics, Acton, Australian National University.

Yang, P, Li, K, Shi, S, Xia, J, Guo, R, Li, S and Wang, L, 2005. Impacts of transgenic Bt cotton and integrated pest management education on smallholder cotton farmers. *International Journal of Pest Management*, 51(4), pp.231–44.

Yang, P, Liu, W, Shan, X, Li, P, Zhou, J, Lu, J and Li, Y, 2008. Effects of training on acquisition of pest management knowledge and skills by small vegetable farmers. *Crop Protection*, 27(12), pp.1504–10.

Yorobe, J, Rejesus, RM and Hammig, MD, 2011. Insecticide use impacts of integrated pest management (IPM) farmer field schools: evidence from onion farmers in the Philippines. *Agricultural Systems*, 104(7), pp.580–87.

Zuger, R, 2004. Impact assessment of farmer field schools in Cajamarca, Peru: an economic evaluation. Social Sciences Working Paper No. 2004-1. International Potato Center, Lima, Peru.

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