Better targeting of farmers as a channel for poverty reduction: a systematic review of Farmer Field Schools targeting

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Farmer Field Schools (FFSs) are an adult education and agricultural extension approach designed to empower farmers, increase productivity and improve livelihoods. We systematically review the literature and undertake content analysis, meta-analysis and meta-regression analysis to explore how FFSs are targeted and how the targeting affects participation and performance. Some FFS programs are found to include ‘equity’ criteria targeting the poorest or those judged to be most in need of the benefits FFSs offer. However, many FFS programs include ‘effectiveness’ targeting criteria designed to promote inclusion of farmers with more resources, education and social agency, with the aim of maximizing the impact of the program. While programs typically achieved the effectiveness-related inclusion objectives, some failed to fulfil the equity-related inclusion goals. This was because either conflicting targeting criteria and participant-selection mechanisms favored elite capture, or the need for a minimum level of social and economic capital precluded participation for some. There is also evidence that the FFS program participants’ characteristics can significantly impact outcomes. Programs with relatively more educated participants may be more effective in improving the adoption of farming practices, increasing yields and passing on FFS learning to neighboring farmers living in the same communities. However, poorer farmers benefit more when they participate directly in programs than when they receive knowledge indirectly.

Keywords: farmer field schools; FFS; targeting; effectiveness; systematic review

1. Introduction

Farmer Field Schools (FFSs) have been used as a way of tackling rural poverty since they were first implemented as a means of introducing Integrated Pest Management (IPM) in 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 to 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 programs also promote the introduction of sustainable farming techniques and the reduction in pesticide usage, with the intention of protecting the environment, improving the health of communities and increasing production levels and food security.

FFSs 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 2008; Waddington et al. 2014). They have been widely adopted by international organizations 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 labor 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 program, 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 intervention program faces a potential trade-off between impact and equity, and FFSs are no exception. Should FFS programs target better-off farmers who are...
better placed to innovate – for example, by selecting experienced and educated farmers with considerable productive assets as in the CIP-CARE FFSs in Peru (Godtland et al. 2003)? Alternatively, should they attempt to fulfill current developmental priorities and target the poor and priority groups, such as women, as with the Sustainable Tree Crops Program in Cameroon (David 2007), or young people or ethnic minorities, as with Danida’s Agricultural Support Program in Bangladesh (Danida 2011)?

This paper assesses the targeting choices and performance of FFS programs around the world. It is part of a broader systematic review of FFSs (Waddington et al. 2014). This analysis also adopted a systematic review approach for the identification of included studies and the coding of targeting mechanisms and outcomes. A total of 683 studies were identified by the broader review, from which we identified 90 papers containing targeting data on 92 different programs. The 90 papers are listed in the ‘included studies’ list at the end of this article. Qualitative data were analyzed using a content analytical approach organized around 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 customized forms. Pooled $t$-statistics together with statistical significance tests are reported for the assessment of FFS and neighbors, and FFS and comparison farmers. In order to examine what effect targeting has on the impact of FFS programs, 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, and meta-analysis and meta-regression models were then estimated. A more comprehensive summary of the review methodology is presented in Appendix 1.

Figure 1 provides a framework for the analysis, organizing it around the targeting process. Specifically, the research tackles the following six questions:

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

The following sections of this paper address each of these questions in turn, with a final section offering some conclusions. Two final sections synthesize findings from

Figure 1. The FFS targeting process.
the review questions to explore the targeting process as a whole, and the barriers and facilitators to female participation, before offering some conclusions.

2. Who do FFSs Target?

The different targeting criteria reported by the studies are set out in Figure 2. Many programs 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% of programs, was being a member of an organized farmer group or cooperative. One-fifth of programs target educated farmers with at least a basic level of literacy and numeracy; for example, a study of Indonesia’s National IPM Program reported that literate farmers were targeted on the assumption that they would be most able to learn and diffuse the FFS message (Van de Fliert 1993). Around 7% of programs, targeted more prosperous farmers (Mariyono 2007, 2009) or those with high social standing (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 program in Nicaragua and Honduras targeted ‘producers with potential’ – those with land, water and a good credit record. Sixteen per cent of programs targeted those seen to be both willing and able to disseminate the FFS message (as with Field schools in Ethiopia, Endalew 2009), while 19% targeted innovative farmers, as was the case with a UNDP program in Kenya which encouraged the inclusion of farmers who had already innovated in their fields (Duveskog, Mburu and Critchley 2003).

In contrast, there were also programs that employed ‘equity’ criteria. Over one quarter of programs explicitly targeted women with examples including Nepal’s (Esser et al. 2012) and Ghana’s National IPM Programs (Carlberg, Kostandini, and Dankyi 2012), while 15% directly targeted the poor (Hofisi 2003). A further 10% of programs were designed to be inclusive of all farmers or sizes of farm. For example, the Lipton Tea – Kenya Tea Development Agency FFSs were designed to include a mix of different farm sizes (Mitei 2011). However, programs were not clearly divided between those that used effectiveness or equity targeting criteria; some programs contain a mixture reflecting both a desire to be more inclusive (for example, by including women and/or poorer farmers), and the intention to choose participants considered most likely to make use of the 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/crop disease problems (for example, the Striga Control Program in Nigeria; Douthwaite et al. 2007) or those seen to be over-reliant on chemical pesticides, such as the FAO-EU IPM Program 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 potato was a principal crop (Mauceri et al. 2005). Many programs also include ‘practical criteria’ based on the motivation (11%) and availability (14%) of farmers and the convenience (16%) and accessibility (21%) of their locations. For example, one program 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 Sri Lanka program

![Figure 2. Targeting criteria (percentage of programs, n = 48).](image-url)
3. What targeting mechanisms are used by FFSs programs?
Targeting mechanisms can be divided into three broad types (Coady, Grosh and Hoddinott 2003). ‘Individual/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 program implementers. ‘Categorical’ targeting identifies target groups using easily identifiable criteria at either the individual or household level (e.g. gender, age, ownership of land and membership of farmer group) or the community level (e.g. specific locations, areas with pest or pesticide problems). ‘Self-selection’ occurs where a program is universally available.

Data on 93 targeting mechanisms from 58 programs showed that most programs 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/household assessment or self-selection determining who ultimately participated in the FFSs. Figure 3 depicts how these mechanisms were combined in the FFS programs.

Over 80% of the programs for which we have data used categorical targeting, just under half, 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, Simpson’s (1997) study of the National IPM Program in Cambodia reported that the national team designed the selection criteria and had the host NGO choose FFS participants in collaboration with the village leader. One exception to this was that of a Peru-based FFS program (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 diagnostic survey as belonging to middle-income groups.

Just under one-third report self-selection as the 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 eligibility criteria: just 9% of programs were open to all potential participants, as with a study of FFSs from the Bangladesh National IPM Program (Ricker-Gilbert et al. 2008). A further 22% of programs were made available to all those that 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, where the program was made available to all onion farmers based at locations close to agricultural support offices (Yorobe, Rejesus and Hammig 2011).

There are also a few cases in which the implemented targeting mechanism differed from that intended at the design stage. In Ecuador, the Ecosalud FFS program was nominally open to all those with access to some land, though in practice locations and participants were identified by program implementers in collaboration with local government (Tracy 2007). Similarly, a program 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. It may also be indicative of a tension present in some programs between the intentions 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. Participation and exclusion
4.1. Who participates in FFSs?
Table 1 presents summary statistics for participants in the FFS programs. 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 portion of the table provides a meta-analysis of pooled / statistics for all studies that compared FFS participants with non-participant farmers. Means are reported...
separately for all FFS participants, then for any neighbors in the same locations, and then for comparison groups in comparable non-FFS locations. Statistical significance is reported first for the comparison between FFS farmers and neighbors 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 neighbors. As we have seen above, many programs target more educated farmers based on the assumption that these farmers will be most likely to develop skills, learn new knowledge, implement new practices and help their neighbors either through formally facilitating field schools or informally through diffusion. The education gap is even larger with comparison communities (the non-FFS farmers in FFS communities have more education than the mean in the comparison communities), suggesting selection of communities of relatively higher socio-economic status.

On average, FFS farmers also had a statistically significantly smaller amount of land than comparison groups based at other locations, but no significant differences were found between FFS farmers and neighbors for land size. This could indicate that some effort was made to target areas with comparably fewer resources, but that it was not necessarily the poorer farmers within a given

| Mean | $n$ | Mean | $n$ |
|------|-----|------|-----|
| FFS participants: summary statistics<sup>a</sup> | | Meta-analysis of FFS farmers and comparison groups in (1) the same location and (2) different locations | | |
| Age (years) | 41.3 | 35 | Age (years) FFS | 41.9 | 25 |
| Household size (people) | 5.6 | 21 | Age (years) neighbors | 43.4*** | 13 |
| Farm size (hectares) | 2.8 | 28 | Age (years) comparison | 44.3** | 15 |
| Sex (% female) | 39.5 | 36 | Household size (people) FFS | 5.7 | 17 |
| Education (years) | 6.8 | 25 | HH size (years) neighbors | 5.4*** | 11 |
| Literacy (%) | 72.2 | 6 | HH size (years) comparisons | 5.9 | 12 |
| Farming experience (%) | 18.3 | 15 | Farm size (hectares) FFS | 2.8 | 25 |
| Household head = male (%) | 85.8 | 3 | Farm size (ha) neighbors | 2.6 | 16 |
| HH head = FFS farmer (%) | 71.5 | 2 | Farm size (ha) comparisons | 3.3*** | 14 |
| Married (%) | 83.4 | 2 | Sex (% female) FFS | 33.9 | 14 |
| Landowner | 48.2 | 2 | Sex (% female) neighbors | 37.0*** | 10 |
| | | | Sex (% female) comparisons | 28.6*** | 7 |
| Education (years) FFS | 6.8 | 24 | Education (years) neighbors | 6.4*** | 14 |
| Education (years) neighbors | 6.4*** | 14 | Education (years) comparisons | 5.7*** | 17 |
| In agricultural assoc. FFS (%) | 41 | 1 | In agric. assoc. neighbors (%) | 13** | 1 |
| Farming experience (years) FFS | 17.9 | 11 | Farming experience (years) neighbors | 19.3 | 7 |
| Farming experience (years) comparisons | 20 | 5 | Farming experience (years) comparisons | 20 | 5 |
| Household head = male (%) FFS | 85.9 | 3 | HH head = male (%) FFS | 87.6 | 3 |
| HH head = male (%) neighbors | 87.6 | 3 | HH head = male (%) comparisons | 94 | 3 |
| Married (%) FFS | 83.4 | 2 | Married (%) neighbors | 86.5*** | 1 |
| Married (%) comparisons | 73.8 | 2 | Married (%) comparisons | 73.8 | 2 |
| Distance from road (km) FFS | 0.3 | 1 | Distance from road (km) neighbors | 0.5*** | 1 |
| Distance from road (km) neighbors | 0.5*** | 1 | Distance from road (km) FFS | 2 | 2 |
| Distance from road (km) comparisons | 4.1*** | 2 | Distance from road (km) FFS | 6.8 | 2 |
| Distance to extension office (km) FFS | 7.6** | 2 | Distance to extension office (km) neighbors | 4.3 | 1 |
| Distance to extension office (km) FFS | 4.3 | 1 | Distance to extension office (km) comparisons | 5.3** | 1 |

Notes: $n$ equals the total number of studies on which the mean is based. Tests of significance are pooled $t$ tests, based on Stouffer et al.'s method. 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.).

<sup>a</sup>Based on all summary statistics for FFS farmers.

*Statistical significance is given at the 0.1 level.

**Statistical significance is given at the 0.05 level.

***Statistical significance is given at the 0.001 level.
community that ended up as FFS participants. However, the differences are not large in magnitude, suggesting that FFS farmers did not have landholdings that were substantively different-sized from that of others.

On average, women are under-represented in FFS. The proportion of women taking part in FFS is significantly lower than non-participants in the community, though the absolute difference is negligible. However, the proportion of female FFS participants is significantly higher than that of female farmers in non-FFS communities. This may show that women are better represented in FFS programs than in farming communities. However, it might also be because FFS programs 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 neighbor farmers and, though there are only a handful of studies to draw on, they were also likely to be based in more accessible locations than comparison and neighbor farmers.

Due to the variation in targeting criteria implemented, there is also variation in farmer characteristics across FFS programs. Indeed, looking beyond averages, analysis across the different programs 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 4). Indeed, it is due to this variation that an analysis of the relationship between the characteristics of FFS participants and program effectiveness is undertaken in Section 7 of this paper.

4.2. Who is excluded from FFSs and why?

Although some pro-poor programs successfully targeted resource-poor or socially marginalized groups, these groups were also most likely to be excluded. In particular, women (half of the studies reporting 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 5 matches the groups most commonly excluded with the causes of exclusion.

In around half of the cases, either targeting criteria precluded some groups from taking part or the mechanisms used to select participants meant that groups were less likely to be selected or not even considered. Some were excluded because programs’ 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/literate and have good social standing in order to participate (Simpson 1997; Van de Fliert 1993). In the National IPM Program in Cambodia (Simpson 1997), the targeting criteria were designed to encourage the participation of literate farmers with good social...
standing, combined with the chosen targeting mechanism of community-implementer selection, which resulted in elites being favored and poorer farmers being overlooked. In four cases, a combination of inclusion criteria intended to recruit pre-existing groups or literate farmers, combined with community-implementer-based participant selection, resulted in women being excluded (Danida 2011; Najjar 2009; Simpson 1997; Van de Fliert 1993). In the case of the Kenya Promoting Farmer Innovation FFS, female-headed households were simply not represented at the village meeting at which program participants were selected (Najjar 2009).

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 or travel to FFSs and the likely impact on earnings and production, meant that potential participants felt unable to participate. Even where programs did not necessarily 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 laborers 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 participate due to the opportunity costs of participation, such as the potential loss of productive output or the cost of traveling to an FFS site (Bwalya 2005; Davis et al. 2009, 2012). Others emphasized the need for some form of compensatory payment to offset the opportunity cost of attendance (Gottret and Córdoba 2004). In a 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 program 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 some cases of women being unable to obtain permission from their husbands to take part (Hofisi 2003; Van der Wiele 2004).

5. Is FFS targeting effective?

Effective or successful targeting means minimizing errors of exclusion and inclusion so that FFS programs reach their intended beneficiaries (Cornia and Stewart 1993; Smolensky, Reilly, and Evenhouse 1995). Errors of inclusion are targeting errors that result in a program including participants who are not in the core target group. Errors of exclusion result in incomplete coverage of the target group(s). We compared each program’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 2 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). The majority of source studies reported only limited information on target groups and actual participants, if they reported on them at all. Furthermore, even fewer provided data for target groups that corresponded to that available on participants (for example, reporting both that a program explicitly targeted the inclusion of women and providing data on female participation).

The targeting criteria and mechanisms used sometimes resulted in errors of inclusion that favored elites to the detriment of farmers with fewer assets or social power. In Uganda (Isubikalu et al. 2007), though selection was intended to be open to all, in practice community leaders’

| 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/medium scale                  | 2                           | No data                       |
| Inclusive/open to all                    | 1                           | 2                             |
| Women                                    | 5                           | 2                             |
| Poor                                     | 3                           | No data                       |
| Crop                                     | 15                          | No data                       |
| Disease/pest                             | 8                           | No data                       |
| Pesticide                                | 5                           | No data                       |
involvement in the recruitment process meant that ultimately most participants had social connections to recruiters or already belonged to pre-existing community groups. Conversely, the AFFOREST FFS Program 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 program was designed such that 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 the 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 organized community-groups sometimes still monopolized 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 further study 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 favoring 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).

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

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

6. What factors determine levels of participant attendance and dropout?

Some FFS programs reported experiencing significant problems with attendance and dropout. For example, a study of an FFS in Iloilo in the Philippines found that around 25% of initial participants dropped out before the FFS was completed (Rola and Baril 1997), while a further study of the Ecosalud Program in Ecuador reported that often 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 3 provides an analysis of 11 studies that explored the different reasons for FFS non-attendance or dropout. The studies are not always clear whether the factors they described resulted in non-attendance or dropout, and therefore the analysis here combines the two. In general, poor attendance and dropout resulted from a number of different factors, some to do with the accessibility and relevance of FFS sessions, and others relating to poor program implementation, or economic constraints and the perceived returns and opportunity costs of attendance.

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 (Fris-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 programs that had

Table 3. Attendance and dropout (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/training                           | • Trainer quit (3)                                                         |
|                                             | • Poor trainer attendance (2)                                              |
|                                             | • Training format too ‘academic’ (1)                                      |
| Time                                        | Attendance too time-consuming/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)                                                      |
| Poor health                                 | Health prevented attendance (2)                                           |

Note: Frequencies in parentheses.
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 by the FFS sessions was too great 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/dropout in two cases (Gottret and Córdoba 2004; Tracy 2007), while the difficulties associated with FFS trainers traveling to school sites and visiting dispersed farmers was also reported to have negatively affected some groups (Hofisi 2003).

Three programs 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 reported that the training was not delivered in local languages (Najjar 2009; Tracy 2007), one reported 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 program in Kenya reported that FFS groups were unable to find a new site for an FFS 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 one case (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 dropout (Najjar 2009; Van der Wiele 2004).

7. Targeting and impact

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

Given that FFS programs may 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, such as IPM, adoption of innovative farming practices and agricultural output. The logic behind programs that employ ‘effectiveness’ targeting is that participants with better education, more assets and better social networks will be more likely and better able to learn, adopt FFS teaching, improve yields and potentially to foster learning among neighboring farmers, either through formal methods of training or informally through diffusion. The same logic suggests that FFS programs that successfully target according to ‘equity’-based criteria will lead to 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, possibly due to the complexity of the message, or the inability to attend training sessions or to adopt beneficial practices. However, this may not necessarily be true as there may 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 and female inclusion. Impact data were estimated using counterfactual impact evaluation methods, and meta-analysis (Table 4) and meta-regression models (Table 5) 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 suggests that there are no significant differences in knowledge for less educated farmers or programs in which women participated. This suggests that complexity of 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 programs in which relatively more educated farmers with larger landholdings participated, there were larger impacts in terms of reduced pesticides use (Figure 6). Similarly, programs with relatively more educated farmers appeared to have bigger impacts on yields and other agricultural outcomes (Figure 6). However, although there is a clear pattern, these differences between programs with better or lesser educated farmers or with more or less landholdings are not statistically significant in bivariate analyzes due to limited sample size. Furthermore, there were no programs 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, so it was not possible to examine differences for female-targeted programs.

Owing to the significant heterogeneity in effect sizes across programs due to a range of factors, including
contextual differences (for example, the types of crops) or study design (such as differential risk of bias, length of follow-up and measures of outcome), we explored whether gender, education or landholdings were significantly associated with differences in effect sizes through multivariate meta-regression analysis (Table 5). The findings suggest that, controlling for other variables, years of education exert a statistically significant positive impact on adoption (measured by reduced levels of pesticide usage) and agricultural outcomes. The higher a farmer’s level of education, the more likely he or she is to adopt the lessons learnt through FFS training and

| Knowledge                                    | SMD  | 95% confidence interval | Sample size |
|----------------------------------------------|------|-------------------------|-------------|
| FFS farmers: all studies                     | 0.46 | 0.33 0.58               | 18          |
| o/w: FFS farmer education years exceeds 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. |                |            |
| Pesticides use                               |      |                        |             |
| 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 | 0.70 | 0.63 0.78               | 4           |
| Farmer education years does not exceed local average | 0.72 | 0.39 1.34               | 6           |
| Landholdings exceeds local average           | 0.61 | 0.37 1.03               | 6           |
| Landholdings do not exceed local average     | 0.81 | 0.44 1.50               | 4           |
| Agricultural outcomes (yields and incomes)   |      |                        |             |
| FFS participants: all studies                 | 1.33 | 1.23 1.43               | 42          |
| o/w: women farmers participated in FFS       | 1.52 | 1.18 1.95               | 11          |
| Women did not participate                    | No obs. |                |            |
| Farmer education years exceeds local average | 1.45 | 1.20 1.75               | 12          |
| Farmer education years does not exceed local average | 1.23 | 1.05 1.44               | 10          |
| Landholdings exceeds local average           | 1.24 | 0.55 2.81               | 2           |
| Landholdings do not exceed local average     | 1.18 | 1.05 1.33               | 11          |

Note: SMD, standardized mean difference and RR, response ratio.

Table 5. Meta-regression analysis of pesticide use and agriculture outcomes.

| Coeff. | t-stat | P > |t |
|--------|--------|-----|---|
| Average years of education | −0.143 | −2.39 | 0.033 |
| Length of follow-up >2 years | 0.091 | 1.93 | 0.076 |
| 1 = Cotton crop | −0.409 | −3.10 | 0.008 |
| 1 = Medium risk of bias | 0.279 | 2.53 | 0.025 |
| Constant | 0.677 | 1.83 | 0.091 |
| Number of observations | 19 | | |
| Tau-squared | 0.002 | | 0.003 |
| I-squared | 23.6% | | 42.7% |
| Adjusted R-squared | 98.5% | | 82.2% |
| Model F | 26.3 | | 5.5 |
| Prob > F | 0.000 | | 0.001 |

Notes: Coefficients reported as natural logarithm. Bold indicates coefficient statistically significant at <10% level. Dependent variables measured as natural logarithm of response ratio.
consequently the more likely to see beneficial impacts 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, but more evidence is needed to investigate this more fully.
7.2. Do participant characteristics influence the extent to which FFS neighbors learn?

A final meta-analysis examined whether there were systematic differences in diffusion outcomes for neighboring farmers due to FFS participant characteristics. Analysis based on a limited number of studies suggests that neighbor pesticides-usage and agricultural outcomes may indeed have been statistically significantly improved in programs that included relatively more educated farmers, however the magnitude of impacts, particularly in the case of Figure 7. Meta-analysis of outcomes for FFS neighbors by education level of FFS farmers.

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**Pesticide use by neighbour farmers (vs non-FFS comparison)**

| Study ID | ES (95% CI) |
|----------|-------------|
| FFS farmers on average not better educated | |
| Pananurak, 2010 (India) | 0.54 (0.25, 1.15) |
| Yamazaki & Resosudarmo, 2007 (Indonesia) | 0.67 (0.12, 3.88) |
| Feder et al., 2004 (Indonesia) | 1.30 (1.09, 1.55) |
| Subtotal (I-squared = 62.7%, p = 0.069) | 0.89 (0.45, 1.78) |
| FFS farmers on average better educated | |
| Wu, 2010 (China) | 0.68 (0.62, 0.76) |
| Pananurak, 2010 (Pakistan) | 0.78 (0.40, 1.49) |
| Khan et al., 2007 (Pakistan) | 1.20 (0.40, 3.53) |
| Subtotal (I-squared = 0.0%, p = 0.566) | 0.69 (0.62, 0.77) |
| Overall (I-squared = 67.1%, p = 0.000) | 0.85 (0.56, 1.28) |

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**Yields for FFS neighbour farmers (vs non-FFS comparison)**

| Study ID | ES (95% CI) |
|----------|-------------|
| FFS farmers on average not better educated | |
| Pananurak, 2010 (India) | 0.79 (0.63, 1.00) |
| Feder et al., 2004 (Indonesia) | 0.99 (0.97, 1.01) |
| Yamazaki & Resosudarmo, 2007 (Indonesia) | 1.43 (1.05, 1.96) |
| Subtotal (I-squared = 77.6%, p = 0.011) | 1.01 (0.60, 1.28) |
| FFS farmers on average better educated | |
| Khan et al., 2007 (Pakistan) | 0.97 (0.74, 1.26) |
| Wu, 2010 (China) | 1.03 (0.99, 1.08) |
| Pananurak, 2010 (Pakistan) | 1.03 (0.86, 1.25) |
| Subtotal (I-squared = 0.0%, p = 0.886) | 1.03 (0.99, 1.08) |
| Overall (I-squared = 60.2%, p = 0.028) | 1.01 (0.95, 1.07) |

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Figure 7. Meta-analysis of outcomes for FFS neighbors by education level of FFS farmers.
yields, is small (Figure 7 and Table 6). Furthermore, evidence from the same studies suggests that any impacts are limited to 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).

Overall, the findings suggest that programs that 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 neighbors. 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 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. FFSs were originally put forward as a means of reaching out to marginalized 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 programs actually target farmers considered likely to be most effective — those with the educational background and economic and social assets necessary to make the best use of the training that they are given. There are also programs 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 (Figure 8). For example, participation is partly determined by the targeting criteria and the mechanism used to select FFS farmers, but 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 organized 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 programs 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 program. 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.

8.2. Barriers and facilitators to female participation

Women make up an average of 43% of the agricultural labor force in developing countries, but often have far less access than men to productive resources and opportunities (FAO 2011). Agricultural extension programs such as FFSs have been employed as a means of supporting female farmers, with some programs explicitly targeted at women and others designed to be inclusive. This analysis suggests that although women are often targeted for inclusion by FFSs, programs are not always effective in reaching...
them. Figure 9 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

Figure 8. The targeting process (targeting process in bold, with contextual factors linked to each stage as appropriate).

Figure 9. Barriers and facilitators to female participation.
were instances where women were excluded from participation, sometimes entirely. There were also occasions where women were either overlooked for participation or 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 skeptical husbands (Najjar 2009; Tracy 2007; Van der Wiele 2004). In some cases the number of men choosing to participate was very limited, and 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, etc.) and decision-making power within their community.

9. Conclusions

FFS programs employ a variety of targeting criteria to reach a number of different target groups, reflecting often contrasting overarching aims and objectives. Programs 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 programs succeeded in including a wide cross-section of farmers from different socio-economic backgrounds and women, others failed to reach these target groups. This is because some of the targeting criteria and mechanisms commonly employed by FFS programs 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, programs failed to be inclusive because of accepting 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 programs designed to be open to all indirectly favoring those with more social power. ‘Elite capture’ is clearly a problem for some FFS programs and may stem from the fact that FFS training can largely be regarded as a private, not a public good. As noted earlier, elite capture is also a recurring problem for poverty-targeted programs in a variety of other policy spheres. 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 programs 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 are explicitly geared toward providing them with the opportunity to be selected and the 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 program funds (Van de Walle 1998). Programs 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 program.

The meta-analysis and meta-regression suggest that higher levels of education significantly improve adoption of FFS training techniques, providing some justification to those programs that privilege more educated farmers for selection. However, this conclusion is based on few studies with high threats to internal validity and should be interpreted cautiously. Moreover, this finding does not discount the value of equity-based targeting, as the greater impact of programs targeting ‘effective’ farmers must be weighed against the potentially lower effectiveness but more equitable impact of pro-poor programs.

Some programs also explicitly or implicitly target more capable farmers on the assumption that they are most likely to diffuse FFS learning, and the analysis in this paper suggests that diffusion may be more likely for programs in which more educated farmers participate. This evidence is particularly important given that targeting for diffusion means prioritising educated and organized 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.

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Notes
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).
2. Targeting themes are not necessarily mutually exclusive, so percentages do not sum to 100%, as programs typically include multiple criteria. It is also likely that studies only reported some of the targeting criteria that were actually applied to programs, with the result that these figures underestimate the frequency with which they were applied.
3. Studies did not always clearly explain the basis for figures for female FFS participation. However, typically, these figures were reported either as a number of female participants or a proportion of total participants.
4. Poverty/poor target groups were variably defined, but typically a program was classified as having targeted the poor if it explicitly referred to the targeting of poor, marginal or smallholder farmers.
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.
6. ‘No data’ indicates that there were no cases in which there were data showing targeting failures, which cannot be taken to indicate either success or failure.
7. Here, pesticides usage means spraying of pesticides; there was no evidence for the diffusion of more complex IPM practices.
8. Higgins and Green (2011) Chapter 7.

References
Alatas, V., A. V. Banarjee, R. Hanna, B. A. Olken, and J. Tobias. 2013. Involving Communities in Identifying the Poor. Cambridge, MA: Abdul Latif Jameel, Poverty Action Lab.
Arcand, J. L., and N. Wagner. 2012. Elite Capture Revisited: Does Community Driven Development Improve Inclusiveness? – Evidence from Senegal. Geneva: Graduate Institute of International and Development Studies.
Charmarbagwala, R., M. Ranger, H. Waddington, and H. White. 2005. The Determinants of Child Health and Nutrition: A Meta-Analysis. OED Working Paper. Washington, DC: World Bank.
Coady, D., M. Grosh, and J. Hoddinott. 2003. The Targeting of Transfers in Developing Countries: Review of Experience and Lessons. Washington, DC: World Bank.
Coxing, J., and M. Kevane. 2002. “Community Based Targeting for Social Safety Nets: A Critical Review.” World Development 30 (3): 375–394.
Dasgupta, A., and V. A. Beard. 2007. “Community Driven Development, Collective Action and Elite Capture in Indonesia.” Development and Change 39 (2): 229–249.
Dixon-Woods, M., S. Agarwal, D. Jones, B. Young, and A. Sutton. 2005. “Synthesising Qualitative and Quantitative Evidence: A Review of Possible Methods.” Journal of Health Service Research and Policy 10 (1): 45–53.
FAO. 2011. The State of Food and Agriculture 2010–2011. Women in Agriculture: Closing the Gender Gap for Development. Rome: FAO.
Hammerstrom, K., A. Wade, and A. M. Klint Jørgensen. 2010. Searching for Studies: A Guide to Information Retrieval for Campbell Systematic Reviews. Oslo: Campbell Collaboration. www.campbellcollaboration.org/lib/download/969/
Higgins, J. P. T., and S. Green, eds. 2011. “Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011].” The Cochrane Collaboration, 2011. www.cochrane-handbook.org
Mays, N., C. Pope, and J. Popay. 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): 6–20.
Pontius, J., R. Dilts, and A. Bartlett, 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): 401–409. http://publish.edu.uwo.ca/robert.sandieson/downloads/ETDD.pdf
Smolensky, Eugene, Siobhan Reilly, and Eirik Evenhouse. 1995. “Should Public Assistance be Targeted?” Journal of Post Keynesian Economics 18 (1): 3–28.
Stouffer, S. A., E. A. Suchman, L. C. DeVinney, S. A. Star, and R. M. Williams Jr. 1949. Adjustment during Army Life. Princeton, NJ: Princeton University Press.
Van den Berg, H., and J. Jiggins. 2007. “Investing in Farmers – The Impacts of Farmers Field Schools in Relation to Integrated Pest Management.” World Development 35 (4): 663–686.
vande Walle, D. 1998. “Targeting Revisited.” The World Bank Research Observer 13 (2): 231–248.
Waddington, H., B. Nilsstveit, J. Hombrados, M. Vojkova, D. Phillips, P. Davies, and H. White. 2014. “Farmer Field Schools for Improving Farming Practices and Farmer Outcomes: A Systematic Review.” Campbell Systematic Reviews. http://campbellcollaboration.org/lib/project/203/

Included studies
Ajayi, M. T., T. O. A. Banmeke, and O. Okafor. 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: 37–42. http://dx.doi.org/10.4314/jext.v7i1.2775
Banu, L. J., and B. Bode. 2003. CARE Bangladesh’s FFS Approach: New Frontiers in Farmer Empowerment. Los Baños: CIP-UPWARD.
Bekete, N., D. Mithöfer, D. Amudavi, and G. Obare. 2011. “Integrated Pest Management Training and Information Flow among Smallholder Horticulture Farmers in Kenya.” In Vegetable Production and Marketing in Africa: Socioeconomic Research, edited by D. Mithöfer and H. Waiel, 243–261. Wallingford: CAB International.
Belder, E. d., M. Garcia, and D. Jansen. 2006. Documentation: An Effective Tool in Farmer Field Schools. LEISA: ILEIA newsletter for low-external-input and sustainable agriculture 22 (2006) 1, ISSN: 1569-8424.
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., G. Kostandini, and A. Dankyi. 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, August 12–14.

Cavatassi, R., L. Salazar, M. Gonzalez-Flores, and P. Winters. 2011. “How do Agricultural Programs Alter Crop Production? Evidence from Ecuador.” Journal of Agricultural Economics 62 (2): 403–428.

Chi, T. T. N., T. Q. Tuyen, L. L. Price, and M. M. Hosain. 1999. “Effect of IPM-Farmer Field School on Farmers’ Insect Knowledge and Control Practices: A Case Study.” Omonrice 7: 126–132.

CORAD. 2008. “CORAD Farmer Field Schools in Sierra Leone.” Consortium for Rehabilitation & Development, Freetown, Sierra Leone.

Cornia, Giovanni Andrea, and Frances Stewart. 1993. “Two Errors of Targeting.” Journal of International Development 5 (5): 459–496.

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): 35–50.

David, S., and C. Asamoah. 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): 213–224.

Davis, K., E. Nkonya, D. Ayalew, and E. Kato. 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, May 24–28, TGT108.

Davis, K., E. Nkonya, E. Kato, D. A. Mekonnen, M. Odendo, R. Miiro, J. Nkuba, and J. Okoth. 2012. “Impact of Farmer Field Schools on Agricultural Productivity and Poverty in East Africa.” World Development 40 (2): 402–413.

De Jager, A., D. Onduru, L. Gachimbi, F. Muchena, G. N. Gachini, and C. Van Beek. 2009. “Farmer Field Schools for Rural Empowerment and Life-Long Learning in Integrated Nutrient Management: Experiences in Eastern and Central Kenya.” In Innovation Africa: Enriching Farmers’ Livelihoods, edited by Pascal C. Sanginga, Ann Waters-Bayer, Susan Kaaria, Jemimah Njuki, and Chessa Wettasinha, 278–296. London: Earthscan.

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): 7–19.

Douthwaite, B., S. Schulz, A. S. Olaranwaju, and J. Ellis-Jones. 2007. “Impact Pathway Evaluation of an Integrated Striga Hermonthica Control Project in Northern Nigeria.” Agricultural Systems 92 (1–3): 201–222.

Duveskog, D., C. Mburu, and J. A. Critchley. 2003. “Harnessing Indigenous Knowledge & Innovation in Farmer Field Schools.” In Farmer Field School: Emerging Issues and Challenges, 197–209. Los Baños, Laguna: International Potato Center – Users’ Perspectives With Agricultural Research and Development (CIP-UPWARD).

Endalew, B. D. 2009. “Effectiveness of Farmer Field School Promoting Coffee Management Practices: The Case of Jimma and Sidama Zones.” Thesis, Haramaya University.

Erbaugh, J. M., J. Donnemeyer, M. Amujal, and M. Kidioido. 2010. “Assessing the Impact of Farmer Field School Participation on IPM Adoption in Uganda.” Journal of International Agricultural and Extension Education 17 (3): 5–17.

Esser, K. B., M. G. Saethe, N. Pradhangananda, and H. Ojha. 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 S. Savastano. 2006. “The Role of Opinion Leaders in the Diffusion of New Knowledge: The Case of Integrated Pest Management.” World Development 34 (7): 1287–1300.

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, October 19–21.

Friis-Hansen, E., and D. Duveskog. 2012. “The Empowerment Route to Well-being: An Analysis of Farmer Field Schools in East Africa.” World Development 40 (2): 414–427.

George, S., and M. R. Hegde. 2011. “Impact of Farmer Field School in Popularization of IPM Practices in Tomato Cultivation.” Agricultural Science Digest 31 (2): 116–120.

Gockowski, J., C. Asamoah, S. David, I. Gyanfli, and M. A. Kumi. 2010. “An Evaluation of Farmer Field School Induced Changes in Ghanaian Cocoa Production.” Journal of International Agricultural and Extension Education 17 (3): 43–56.

Godtland, E., E. Sadoulet, A. de Janvry, R. Murgai, and O. Ortiz. 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., J. R. Lindner, and D. Dolly, 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, M. V., and D. M. Córdoba. 2004. Políticas y procesos de innovación tecnológica con productores de pequeña escala en 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, October 21–25.

Hidalgo, O. A., D. M. Campilan, and T. L. Lama. 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, 239–244. Lima, Peru: CIP.

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, M. R., B. A. A. Mustafi, and M. Haq. 2006. “Impact Assessment of the Integrated Pest Management (IPM)
Technology on Boro Rice Cultivation.” The Journal of Rural Development 33 (2): 55–80.

Isukختار، P. W. R. W. Ur, P. P. Richards, and D. H. Maat. 2007. “Stepping-stones to Improve upon Functioning of Participatory Agricultural Extension Programs: Farmer Field Schools in Uganda.” PhD thesis, Wageningen University.

Jalalzadeh, M., K. Farjadnia, B. Khezerlou, and J. Ghaseemi. 2009. “Analysis of the Executive Components of the Farmer Field School [FFS] Project [Grape Gardeners] in Uromieh County of West Azerbaijain Province, Iran.” Global Approaches to Extension Practice: A Journal of Agricultural Extension 4 (2): 43–52.

Kahir, 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, USA.

Kelemework, F. 2005. “Impact Evaluation of Farmer Field School: The Case of Integrated Potato Late Blight Management in the Central Highland of Ethiopia.” Diss., 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, M. A., M. H. Soomro, and I. Ahmad. 2004. Impacts of off 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 E. Heinemann. 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): 175–181.

Lama, T. L., S. P. Dhakal, and D. M. Campilan. 2003. “Promoting Integrated Disease Management (IDM) through Farmer Field Schools in Nepal.” In From Cultivators to Consumers, Participatory Research With Various User Groups, 59–67. Los Banos, Laguna: CIP-UPWARD.

Lopez Gaytan, J., L. Jimenez Sanchez, A. Leon Merino, O. L. Figueroa Rodriguez, M. Morales Guerra, and V. Gonzalez Romero. 2008. “Farmer Field School, for Dissemination and Training in Sustainable Technologies in Indigenous Communities.” Agricultura Técnica en México 34 (1): 33–42.

Machacha, A. 2008. “Farmer Field Schools in Bungoma District of Western Kenya a Rapid Appraisal.” M.S. Thesis, Iowa State University.

Mancini, F., and J. Jiggins. 2008. “Appraisal of Methods to Evaluate Farmer Field Schools.” Development in Practice 18 (4–5): 539–550.

Mancini, F., A. J. Termorshuizen, and A. H. C. Van Bruggen. 2006. “Impact of Integrated Pest Management Farmer Field Schools on Pesticide Use and Farmers’ Ecological Knowledge on Cotton Farming in India.” In Impact of IPM Farmer Field Schools on the Environment, Health and Livelihoods of Cotton Growers in Southern India, doctoral thesis, Biological Farming Systems Group, edited by Francesca Mancini, 27–40. Wageningen: Wageningen University.

Mancini, F., J. Wesseler, and J. L. S. Jiggins. 2006. “The Effects of Integrated Pest Management on Labour Organization and Gender Roles in Small Cotton Farms in India.” In Impact of IPM Farmer Field Schools on the Environment, Health and Livelihoods of Cotton Growers in Southern India, doctoral thesis, Biological Farming Systems Group, edited by Francesca Mancini, 41–52. Wageningen: Wageningen University.

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): 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): 93–104.

Mauceri, M., G. Norton, J. Alwang, and V. Barrera. 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, July 24–27.

Mitei, Z. 2011. “Growing Sustainable Tea on Kenyan Smallholder Farms.” International Journal of Agricultural Sustainability 9 (1): 59–66.

Nabirye, J., P. Nampala, M. W. Ogenga-Latigo, S. Kyamanywa, H. Wilson, V. Odeke, C. Iceduna, and E. Adipala. 2003. “Farmer-participatory Evaluation of Cowpea Integrated Pest Management (IPM) Technologies in Eastern Uganda.” Crop Protection 22 (1): 31–38.

Naik, L. G. Y. K., K. A. Jahagirdar, K. V. Natikar, and Y. N. Hawaldar. 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.

Najar, D. 2009. “Learning through Farmer Field Schools: A case study of the Taita Hills, Kenya.” M.N.R.M., University of Manitoba (Canada).

Nathaniels, N. Q. R. 2005. Cowpea, Farmer Field Schools and Farmer-To-Farmer Extension: A Benin Case Study. Network Paper no. 148. Agricultural Research & Extension Network.

Nederlof, E. S., and E. N. Odonkor. 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): 249–271.

Olanya, M., R. Nelson, J. Hakiza, P. Ewell, R. El-Bedewy, R. Kakuhenzire, S. Namanda, et al. 2010. “Comparative Assessment of Pest Management Practices in Potato Production at Farmer Field Schools.” Food Security 2 (4): 327–341.

Onduru, D. D., C. C. Du Preez, L. N. Muchena, A. de Jager, and G. N. Gachini. 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): 208–228.

Ortiz, O., R. Nelson, and R. Orrego. 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, F. G. 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, F. G. 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.” 

Panamurak, P. 2010. “Impact Assessment of Farmer Field Schools in Cotton Production in India, China and Pakistan.” Pesticide Policy Project Publication Series – Special Issue No. 14, edited by H. Waibel. Hannover: Institute of Development and Agricultural Economics, Leibniz University of Hannover.

Payne, W., H. Tapsoba, I. B. Baoua, B. N. Malick, M. N, Ricker-Gilbert, J., G. W. Norton, J. Alwang, M. Miah, and G. Feder. 2008. “Cost-Effectiveness of Alternative Integrated Pest Management Extension Methods: An Example from Bangladesh.” Review of Agricultural Economics 30 (2): 252–269.

Rola, A. C., and T. A. Baril. 1997. “Making Rice Farmers Better Decision-makers via the Farmer Field School.” SEAMEO Update 5 (5/6): 10–12.

Rola, A. C., S. B. Jamias, and J. B. Quizon. 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): 65–76.

Rusike, J., D. Masendekte, S. J. Twomlow, and G. M. Heinrich. 2004. “Impact of Farmer Field Schools on Adoption of Soil Water and Nutrient Management Technologies in Dry Areas of Zimbabwe: Global Theme on Agro-Ecosystems Report no. 14.” Research Report. International Crops Research Institute for the Semi-Arid Tropics, Bulawayo, Zimbabwe.

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): 29–35.

Rwegasira, G. M., E. F. Marandu, R.W. Gibson, and R. E. Kapinga. 2004. “Control of Sweetpotato Virus Disease through Farmer Field Schools Approach in Kagere 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 Svyat Teap.” MA Thesis, Norman Paterson School of International Affairs.

Tracy, T. M. M. 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., M. Wijeratne, and V. H. Piyadasa. 2005. “What Should We Expect from Farmer Field Schools? A Sri Lanka Case Study.” World Development 33 (10): 1705–1720.

Tshiebue, G. N. 2010. L’Approche Champ-Ecole Paysanne (CEP): Une Methode de Recherche-Action Impliquant Davantage les Producteurs Raraux dans la Maitrise et L’Amerloration de L’Systeme de Production. Louvain-la-Neuve: Innovation and Sustainable Development in Agriculture and Food, Institut d’Etudes du développement Université Catholique de Louvain.
Knowledge and Skills by Small Vegetable Farmers.” *Crop Protection* 27 (12): 1504–1510.

Yorobe, J. R. M. Rejesus, and M. D. Hammig. 2011. “Insecticide Use Impacts of Integrated Pest Management (IPM) Farmer Field Schools: Evidence from Onion Farmers in the Philippines.” *Agricultural Systems* 104 (7): 580–587.

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, ISSN 0256-8748.*

**Appendix 1. Methodology**

**Search strategy**

This research drew on the materials retrieved by 3ie’s systematic review of farmer field schools (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, including AgEcon, CAB Abstracts, Social Science Citation Index, 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 Hammerstrom, Wade and Klint Jørgensen (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 organizations working in the field of agricultural extension were identified.

**Inclusion criteria**

The 683 full texts identified were assessed for inclusion in the targeting analysis according to the following inclusion criteria:

1. Projects involving FFSs 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 it 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 keyword terms (Target*, Beneficiary*, Participa*, Select*, Drop*, Absen*, Attend*, Poverty, Poor, Landholding, Landholding, Educat*, Women, Female, Gender and 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 being factual reporting of an FFS program’s design and implementation, and therefore such information was includable regardless of the 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. Where studies reported statistics for a town or village without disaggregating data for FFS farmers from non-participants, they were excluded.

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

**Data extraction and analytical approach**

As some full texts contained data relating to multiple FFS programs, throughout the review all analysis was carried out at the study level. Data 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 organized 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 in Excel 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 customized forms. As studies provided these statistics in a variety of formats, a number of heuristics were developed to facilitate data synthesis and analysis (for details, see Author Citation). 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 (neighbors 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 Stouffer et al.’s (1949) method to synthesize z-transformed p-values where $t_i$ 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. 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 neighboring 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 the assessment of FFS and neighbors, and FFS 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 that also reported means for neighbor 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 neighbors, and for those studies reporting means for comparison groups, in order to account for the different scales of distances being measured.

In order to examine the question of how the characteristics of participants influence the effectiveness of FFS programs, 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.

### Search results

An initial analysis of the 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 programs or multiple studies of the same program in different countries, while some studies were reported on in 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. Figure A1 provides an overview of the search results and stages of the screening process.

The data available for each of the included studies were varied both in terms of its detail and its 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 A1 provides an overview of the data available for each stage in the targeting process. Appendix 2 provides an overview of the data provided by each study by research question.

### Table A1. Data extracted from source studies.

| Targeting criteria | Targeting mechanism | Participation: descriptive statistics | Excluded groups | Targeting effectiveness | Attendance and drop-out | Program effectiveness |
|--------------------|---------------------|---------------------------------------|-----------------|------------------------|-------------------------|------------------------|
| No. of studies (total = 92) | 52                  | 58                                    | 55              | 12                     | 48                      | 11                     | 43                     |

Figure A1. Search results and screening overview.

Table A1. Data extracted from source studies.
Appendix 2  The chart below provides an overview of the targeting process. Cells are shaded gray to indicate that an individual study provided relevant data for a given research question or step in the targeting process.

| Study title | Target groups/ 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) |                      |                        |               |                       |           |                        |                          |          |
| Davis et al. (2012) (Kenya) Davis et al. (2009) |                      |                        |               |                       |           |                        |                          |          |
| Davis et al. (2012) (Tanzania) Davis et al. (2009) |                      |                        |               |                       |           |                        |                          |          |
| Davis et al. (2012) (Uganda) 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) |                      |                        |               |                       |           |                        |                          |          |
| Friis-Hansen and Duveskog (2012) |                      |                        |               |                       |           |                        |                          |          |
| Friis-Hansen (2005) |                      |                        |               |                       |           |                        |                          |          |
| George and Hegde (2011) |                      |                        |               |                       |           |                        |                          |          |
| Gockowski et al. (2010) |                      |                        |               |                       |           |                        |                          |          |
| Godtland et al. (2003) |                      |                        |               |                       |           |                        |                          |          |
| Goff, Lindner, and Dolly (2009) |                      |                        |               |                       |           |                        |                          |          |
| Gottret and Córdoba (2004) |                      |                        |               |                       |           |                        |                          |          |
| Haiyang (2002) |                      |                        |               |                       |           |                        |                          |          |
| Hidalgo, Campilan, and Lama (2001) |                      |                        |               |                       |           |                        |                          |          |
| Hofisi (2003) |                      |                        |               |                       |           |                        |                          |          |

(Continued)
| Appendix 2  Continued |
|------------------------|
| Islam, Mustafi, and Haq (2006) |
| Isubikalu et al. (2007) |
| Jalalzadeh et al. (2009) |
| Kabir (2006) |
| Kelemework (2005) |
| Khalid (2003) |
| Khisa and Heinemann (2005) |
| Kishi (2002) |
| Lama, Dhakal, and Campilan (2003) |
| Lopez Gaytan et al. (2008) |
| Machacha (2008) |
| Mancini and Jiggins (2008) |
| Khan, Soomro, and Ahmad (2004) |
| Mancini, Termorshuizen, and Van Bruggen (2006); Mancini, Wesseler, and Jiggins (2006) |
| Mariyono (2007, 2009) |
| Mauceri et al. (2005) |
| Mitei (2011) |
| Nahiry et al. (2003) |
| Naik et al. (2010) |
| Najjar (2009) |
| Nathaniels (2005) |
| Nederlof and Odonkor (2006) |
| Ong et al. (2010) |
| Onduru et al. (2008) |
| Ortiz, Nelson, and Orrego (2002) |
| Palis (2002, 2006) |
| Pananurak (2010) (China) |
| Pananurak (2010) (India) |
| Pananurak (2010) (Pakistan) |
| Payne et al. (2011) |
| Pedersen, Rashid, and Mzoba (2008) |
| Praneevatakul, Waibel, and Meenakanit (2007) |
| Rao, Ratnakar, and Jain (2012) |
| Rejesus et al. (2009) |
| Ricker-Gilbert et al. (2008) |
| Rola and Baril (1997) |
| Reference                                      |
|-----------------------------------------------|
| Rola, Jamias, and Quizon (2002)               |
| Rusike et al. (2004)                          |
| Rustam (2010)                                 |
| Rwegasira et al. (2004)                       |
| Simpson (1997)                                |
| Tracy (2007)                                  |
| 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)                          |
| Waarts et al. (2012)                          |
| Witt et al. (2006)                            |
| Wu (2010) (China)                             |
| Wu (2010) (China)                             |
| Wu (2010) (China)                             |
| Yajima (2010)                                 |
| Yang et al. (2005)                            |
| Yang et al. (2008)                            |
| Yorobe, Rejesus, and Hammig (2011)            |
| Zuger (2004)                                  |