

SUMMARY OF FINDINGS:

survey to assess farmers' economic perceptions, preferences and decision-making criteria relating to climate-smart soil protection & rehabilitation in Benin, Burkina Faso, Ethiopia, India and Kenya

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Key findings

This document reports on a study to assess farmers' economic perceptions, preferences and decision-making criteria relating climate-smart soil protection and rehabilitation (CSS) measures in Benin, Burkina Faso, Ethiopia, India and Kenya. Specifically, it aims to answer the question: what do farmers perceive as the key costs, benefits, barriers and enabling conditions that influence their uptake (or rejection) of different land management practices? The study applies the Evaluating Land Management Options (ELMO) tool, a participatory method that has been developed by CIAT to investigate farmers' own perceptions and explanations of the advantages, disadvantages and trade-offs associated with different land management choices as they relate to their needs, aspirations, opportunities and constraints.

The study is able to highlight farmers' preferences for different CSS measures in the five study sites, as well as to identify the main inputs, outcomes, barriers and enabling conditions that influence their uptake (or rejection) of different land management practices. While there remain key differences between (and within) the study sites, a number of common lessons emerge which relate to the assessment and design of CSS measures.

One is the need to take account of farmers' constraints and limitations as concerns their ability to access the cash, labour and technical knowhow that are required to implement new land management practices. Even when a land management technique may be perceived to be of great interest and high potential benefit, many farmers are simply not in a position to allocate the extra inputs that are required to implement it. The other is to recognise that most farmers do not merely strive to achieve one outcome or maximise a single stream of benefits when they make land management choices. Rather, it is the array of values, and the interactions between them, that matter and shape their preferences. The most desirable and viable land management alternatives are seen to be those which not only increase the flow of physical products (for example cash, food and other items), but also enhance livelihood diversity and security (such as filling critical food and cash gaps over the course of the year), at the same time as helping to secure longer-term improvements in the production base (most importantly soil fertility and moisture).

The study findings serve to underline the fact that the most preferred land management are not necessarily those that yield the highest production gains, generate the greatest income, or entail the lowest costs (the characteristics that would traditionally be deemed important when land management interventions are designed). The metrics that are used to determine the desirability and viability of different land management options, measure their desired effects, and weigh up their advantages and disadvantages do not just concern cash costs and benefits or physical inputs and outputs, but encompass a wide array of monetary and non-monetary factors (such as the type and diversity of benefits generated and costs incurred, their timing, certainty, risk and relative ease of delivery). Unless these broader needs, constraints and preferences are identified, and addressed in the land management 'solutions' that are presented to farmers, CSS measures are unlikely to be acceptable, effective or sustainable in practice.

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List of Acronyms & Abbreviations

BAU	Business as usual
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (German Federal Ministry for Economic Cooperation and Development)
CIAT	International Center for Tropical Agriculture
CSS	Climate-smart soil protection and rehabilitation
ELMO	Evaluating land management options
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German Agency for International Cooperation)
Ha	Hectare

INTRODUCTION

About the project

Launched in 2014, “One World – No Hunger” is a special initiative of BMZ, the German Federal Ministry for Economic Cooperation and Development. It addresses two of the greatest challenges facing humankind: the need to eradicate hunger and malnutrition, and to create a framework based on sustainable, socially and environmentally-responsible agriculture that will serve to ensure that future generations will also have sufficient, affordable and healthy food.

A wide variety of activities and investments are taking place under this initiative, including the project “Soil Protection and Rehabilitation for Food Security”. Under the coordination of Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), activities are being carried out to support agricultural land management practices to rehabilitate and conserve degraded soils in Benin, Burkina Faso, Ethiopia, India and Kenya, as well as policy development on soil rehabilitation, information and extension systems.

The International Centre for Tropical Agriculture (CIAT) is implementing a sub-component of the project. The focus of “Climate-smart Soil Protection and Rehabilitation” is on widening the scope of soil protection and rehabilitation for food security to incorporate the goals of climate smart agriculture. This involves assessing the climate-smartness of selected soil protection and rehabilitation measures, so as to identify viable, appropriate and sustainable climate-smart soil protection and rehabilitation (CSS) measures in the five partner countries. The current document reports on a study being carried out under this sub-project.

Study background and aims

The objective of the study is to assess farmers’ economic perceptions, preferences and decision-making criteria relating to CSS. Specifically, it aims to answer the question: what do farmers perceive as the key costs, benefits, barriers and enabling conditions that influence their uptake (or rejection) of different land management practices? The intention is that the resulting socio-economic information will serve to supplement and further explain biophysical data that is being generated via other activities of the sub-project about the climate-smartness of selected ongoing, planned and potentially suitable CSS measures in the field sites.

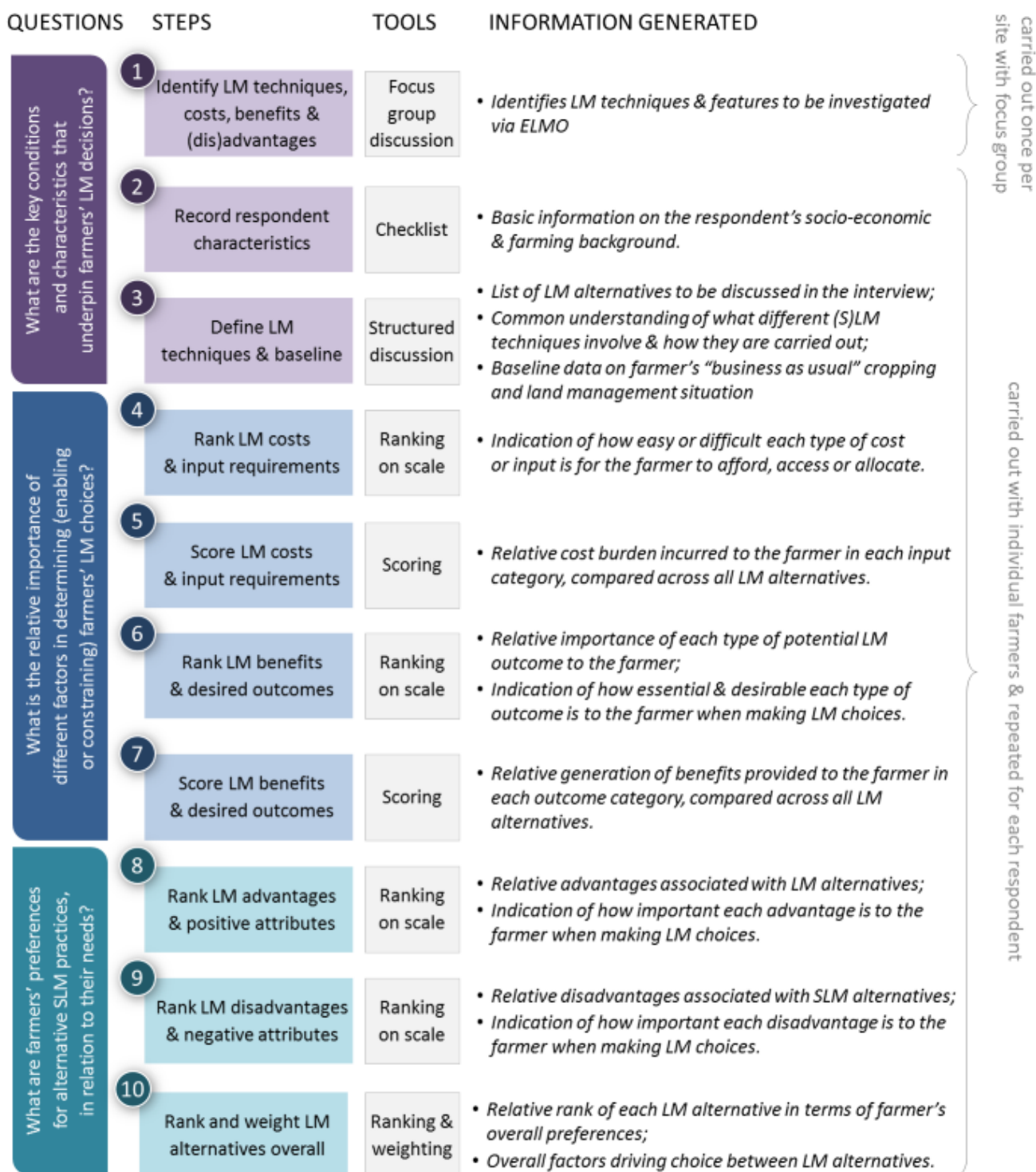
The study involved field surveys in selected sites in Benin, Burkina Faso, Ethiopia, India and Kenya to investigate the various costs, benefits, advantages and disadvantages that farmers seek (or strive to avoid) when they make land management choices. Findings about these preferences and decision-making criteria can then be combined with, and measured against, the results of the biophysical assessments. The ultimate goal is to identify CSS practices and portfolios which will not only be effective in protecting and rehabilitating soils under climate change in a technical or technological sense, but will at the same time target farmers’ economic and livelihood needs, preferences and constraints.

Survey methods

The study applies the Evaluating Land Management Options (ELMO) tool. ELMO is a novel method that has been developed by CIAT to assist in identifying the main factors driving land management decisions and, specifically, to better understand farmers’ preferences when choosing between different land management

alternatives¹. It uses participatory techniques to investigate farmers' own perceptions and explanations of the advantages, disadvantages and trade-offs associated with different land management choices as they relate to their needs, aspirations, opportunities and constraints.

Figure 1: Summary of ELMO process, content and outputs



¹ See Emerton, L., Snyder, K. and Cordingley, J. (2015) Evaluating Land Management Options (ELMO): a participatory tool for assessing farmers' sustainable land management decision preferences and trade-offs. International Center for Tropical Agriculture (CIAT), Nairobi.

ELMO involves ten iterative steps (Figure 1), organised around three basic questions about the context, drivers and preferences which shape farmers' land management decisions: (1) What are the key conditions and characteristics that underpin farmers' land management decisions? (2) What is the relative importance of different factors in determining (enabling or constraining) farmers' land management choices? and (3) What are farmers' preferences for alternative land management practices, in relation to their needs?

After focus groups at the community level, interviews are carried out with individual farmers in order to discuss between three and five land management practices which are – together with the 'business as usual' (BAU) no CSS option – ranked, weighted and scored against four sets of features or characteristics:

- costs/inputs: the physical materials that the farmer needs to buy, contribute or otherwise use to undertake different land management practices;
- benefits/outcomes: the results of farming in terms of the monetary and non-monetary outputs and benefits that are produced;
- advantages/positive attributes: the 'pluses' associated with different land management practices, in other words the characteristics that make them more appealing, easier to take up and sustain, or assist in overcoming particular bottlenecks or livelihood constraints; and
- disadvantages/negative attributes: the 'minuses' associated with different land management practices, in other words the characteristics that make them less appealing, harder to take up and sustain, or contribute towards particular bottlenecks or livelihood constraints.

An updated version of ELMO was used in the Ethiopia and Kenya surveys. There are, therefore, slight differences in the way that data are presented for those countries as compared to Benin, Burkina Faso and India (in which surveys were carried out earlier, using an older version of ELMO).

Survey sample & coverage

ELMO interviews were conducted with a total of 30 farmers: between 4 and 10 in each country (Table 1).

Table 1: Survey coverage

Country	Survey sites	No. farmers interviewed
Benin	Azozoundji, Govi, Houto, Kintagare & Mamatchoke Villages	5
Burkina Faso	Karankasso-Vigue Kokoleka & Lena Villages	4
Ethiopia	Amhara & Oromyia National Regional States	10
India	Ahmednagar, Amaravati, Dhule & Yavatmal Districts	4
Kenya	Kakamega & Bungoma Counties	7

It should be emphasised that the study was a pilot exercise which aimed to test ELMO among the farmers involved in the farm modelling exercise being carried out under another component of the "Climate-smart Soil Protection and Rehabilitation" project. As such, the samples are extremely small. It however remained beyond the financial scope and timing of the project to conduct a full-scale survey. The farmers included in the study are also unusually diverse, given this small sample size: the respondents selected for interview were spread over a relatively large area, and display great variation in their socio-economic characteristics (such as family size, wealth, gender, access to land and participation in off-farm activities). This variety makes it somewhat difficult to draw any meaningful or generalizable conclusions to the overall site from the survey data. Thus the

results cannot be taken to be representative of the preferences and perceptions of anything more than the few farmers that were selected to be surveyed due to their farm typology. A fuller application of the survey across the country sites could produce more accurate data on farmers' preferences, constraints and decision-making processes throughout the area.

A number of other limitations should also be noted at the start of the study, which also influence the validity and comparability of the results:

- In several cases, such a large number of costs, benefits, advantages, disadvantages and land management alternatives were selected for discussion relative to the very small number of farmers interviewed that data on a particular land management practice or feature only reflect the views of a single respondent. For example, in one country, a total of 27 characteristics or features were selected for ranking and weighting across 10 land management alternatives. It is thus often difficult to draw out any clear or generalizable conclusions from the data, or to triangulate or corroborate the results;
- There was not always consistency in the land management features and characteristics that were discussed in different interviews (within the same study site). For example, in two countries, respondents were provided with different lists of benefits, advantages and disadvantages against which to rank land management practices. This limits the extent to which results can be compared between farmers;
- In some instances, the same or similar features were replicated in different steps of the survey. For example, in one country, effects on soil erosion, moisture and fertility were repeated across both benefit and advantage categories. This leads to some confusion and repetition in the results;
- Several of the surveys omitted to rank or weight the BAU/no CSS option in some interviews, while including it in others. For example, four of the countries have selectively or inconsistently included (or excluded) the BAU/no CSS option. This means that there is often no control against which potential CSS measures can be compared; and
- Some problems also arose in data entry, with interview data being incorrectly entered or even missing completely from the data sheets. For example, in at least two countries, respondents have been omitted from one or more of the data entry sheets.

Such gaps and inconsistencies in the data mean that many of the findings that are presented in the report should be treated with extreme caution. Ethiopia represents the only country in which a complete and comparable set of ELMO data has been generated. The results from Benin, Burkina Faso, India and Kenya should be understood as being the outcomes of pilot applications of the ELMO survey tool rather than as any kind of definitive or conclusive statement about farmers' economic perceptions, preferences and decision-making criteria relating to climate-smart soil protection and rehabilitation.

Scope & content of the report

The results of the ELMO ranking, scoring and weighting exercises were recorded using tailor-made excel spreadsheet templates in each country. Brief field notes were also compiled for Benin, Burkina Faso, India and Kenya, recording key points or explanations that arose in the course of carrying out farmer interviews. For

Ethiopia, a stand-alone technical report² was produced which provides in-depth analysis and conclusions regarding farmers' land use motivations, preferences and drivers.

The current report synthesises and analyses this information. Data are aggregated for each survey site, and each country's findings are presented in a separate chapter which describes the costs, benefits, advantages and disadvantages associated with different land management alternatives. The final section of the report draws more general conclusions about farmers' economic perceptions, preferences and decision-making criteria as regards CSS.

² Dessalegn, M. (2016) Assessment of Farmers' Perceptions, Land Management Preferences and Drivers of Decisions Using A Participatory Tool for Evaluating Land Management Options. Report presented to International Center for Tropical Agriculture (CIAT), Nairobi.

FINDINGS FROM BENIN

Introduction to the study site

Five interviews were carried out in May 2016 involving four men and one woman, spread across five villages (Azozoundji, Govi, Houto, Kintagare and Mamatchoke). Household size in the survey villages ranges from nine to eleven people, cultivated areas vary between 1.2 ha to more than 20 ha (all rainfed), and all of the farmers interviewed keep livestock (mostly sheep, goats and poultry). The main crops grown are maize, cowpeas, pigeon peas, groundnuts, rice, cassava, cotton, soya, beans and vegetables. Farm production is grown both for subsistence and for the market. Only one of the surveyed households includes a member who is employed (as a school teacher), and three of the five farmers are involved in business in some way (selling food and other household products, producing charcoal and, providing solar charging).

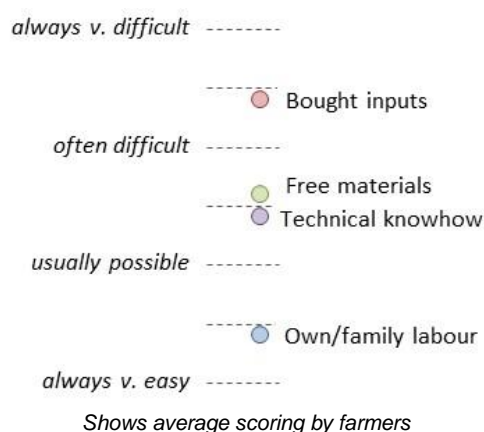
The following nine land management practices were discussed with farmers (in addition to the BAU/no CSS baseline): cowpeas; improved seeds; intercropping; crop rotation; manure; mulching; NPK & urea; pigeon peas and tree planting.

Perceptions of land management characteristics & attributes

Costs and input requirements

Four categories of costs or inputs were identified as having the most impact on farm decision-making and household livelihoods: own or family labour, bought inputs (including hired labour), free materials and technical knowhow. Whereas most farmers find own/family labour relatively easy to obtain at most times, technical knowhow and free materials are considered to be somewhat harder – although still usually possible – to access (Figure 2). Not only are bought inputs usually difficult to afford but they are also challenging to access. Improved seeds and chemical fertilisers are, for example, often in short supply in local shops and markets, while hired labour can be hard to find because very few people in the locality are interested to work as casual agricultural labourers.

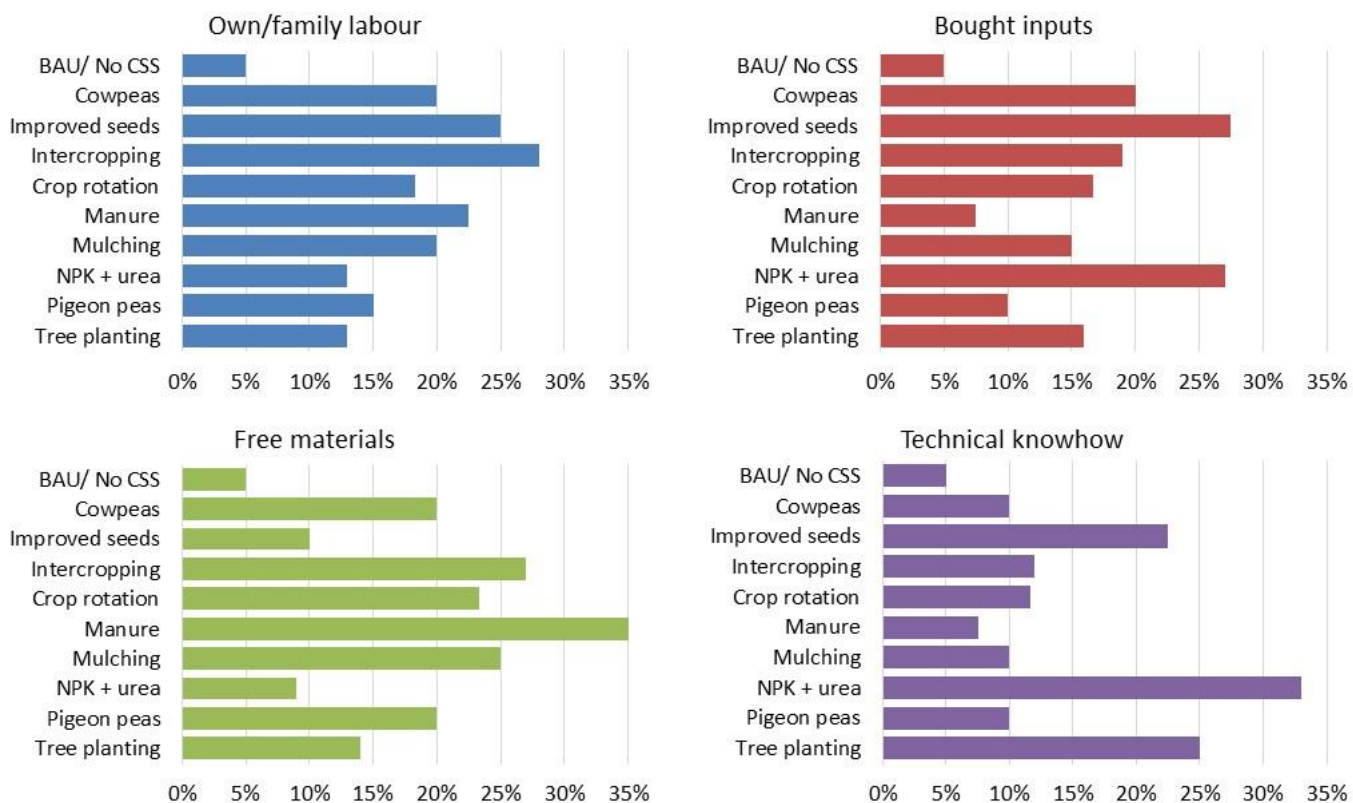
Figure 2: Benin – relative difficulty in accessing or affording costs/inputs



There is considerable variation in the cost and input requirements of different land management practices (Figure 3, Figure 4). It is noticeable that BAU/no CSS is associated with much lower spending and input levels. Other land management alternatives have varying cost/input implications. It is perhaps hardly surprising that the application of NPK/urea and improved seeds are associated with high requirements for both bought inputs and technical knowhow. Not only are both these inputs relatively expensive to purchase, but they can be complicated to implement as information is required about the correct type, quantity and timing of applications. Tree planting, too, is seen to demand a relatively high level of technical knowhow, mainly relating to variety, spacing and maintenance. In contrast, cowpeas, crop rotation, intercropping, manure, mulching and pigeon peas are all land management practices that farmers have long been practicing and are relatively familiar with, and are perceived to require little additional technical knowhow and for the most part also have a relatively lower demand for purchased inputs. There is not a great deal of variation in demand for family

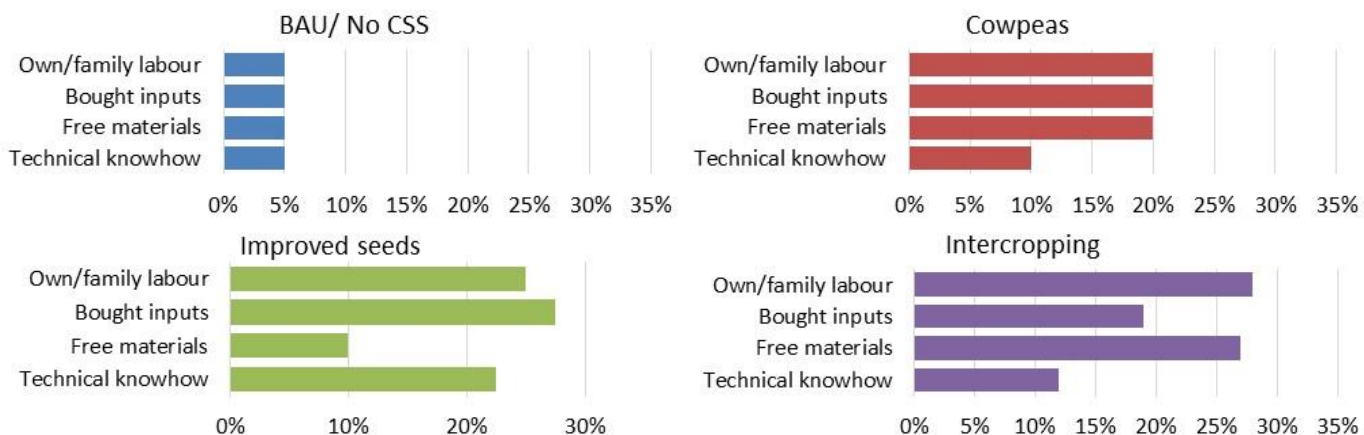
labour, although slightly higher averages are registered for intercropping and – to a lesser extent – manure and mulching. These land management practices can be quite cumbersome and time-consuming to implement (it is necessary to collect manure and apply it to the fields on a regular basis, while intercropping requires additional labour due to the intensity of cultivation on the same plot). The relatively high labour demands of improved seeds is explained as “seeds are expensive and therefore require more attention”, and because “improved seeds are expensive and the family has to avoid waste”.

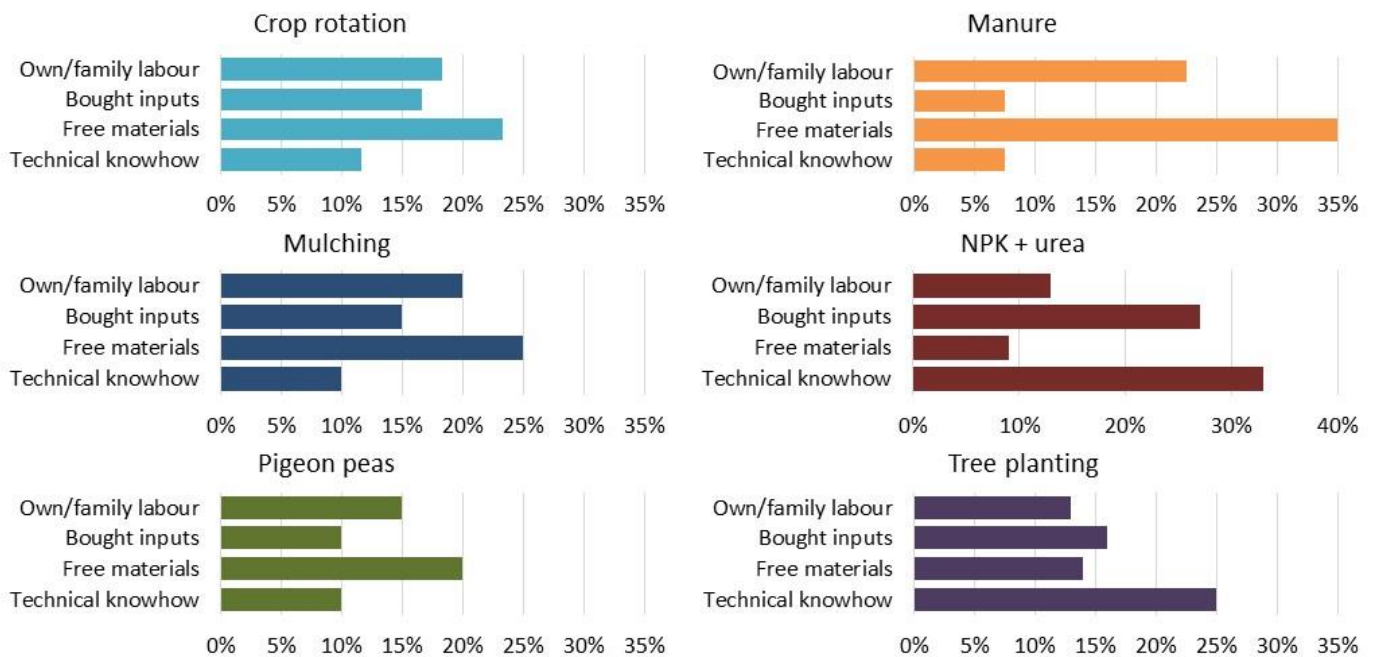
Figure 3: Benin – land management cost/input requirements (by cost/input category)



Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 4: Benin – land management cost/input requirements (by land management practice)



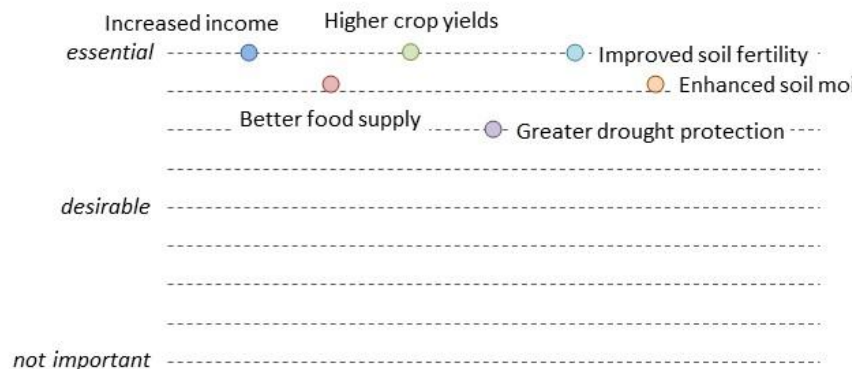


Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Benefits and desired outcomes

Six categories of benefits and desired outcomes were identified as being the most sought-after in relation to household livelihood needs: increased income, better food supply, higher crop yields, greater drought protection, improved soil fertility and enhanced soil moisture. All are considered to be of high importance, with increased income, higher crop yields and – especially – improved soil fertility generally being deemed to be the most essential (Figure 5).

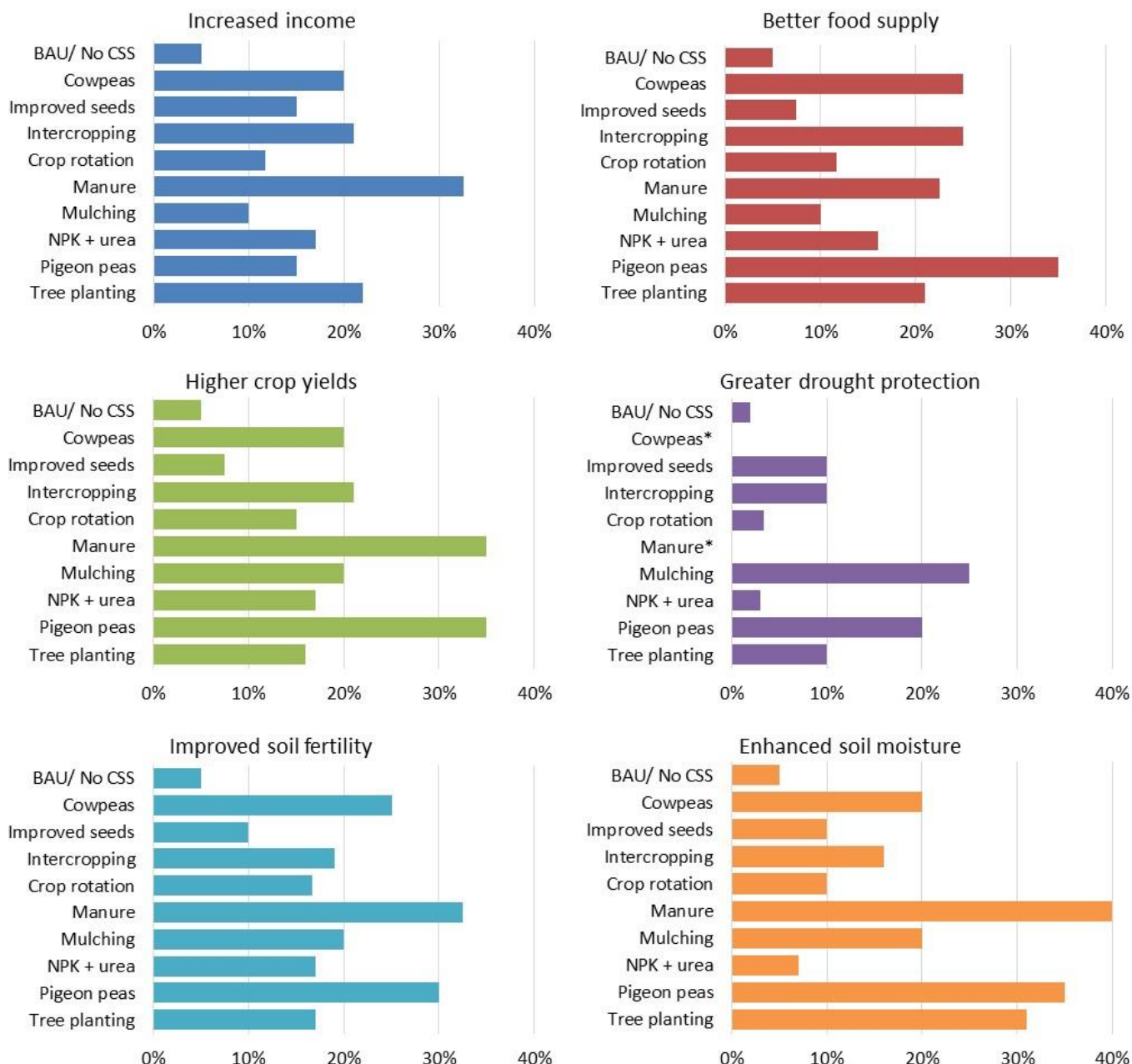
Figure 5: Benin – relative importance of land management benefits



Shows average scoring by farmers

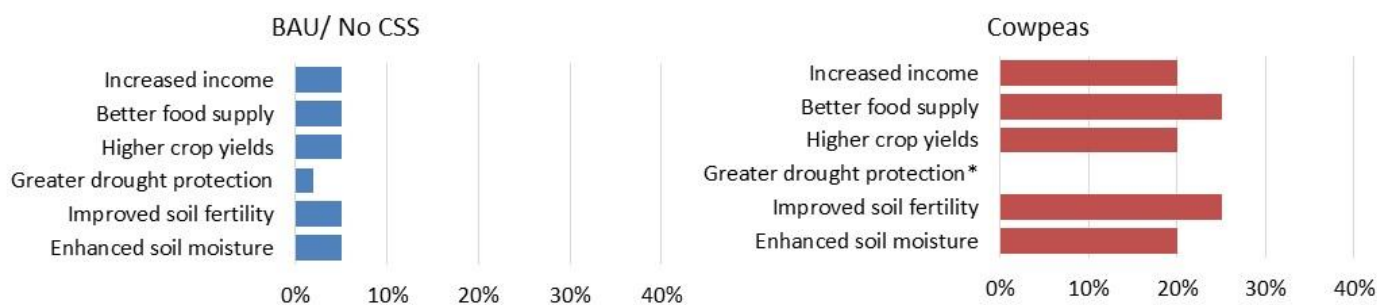
Different land management practices are perceived to vary in the extent to which they are able to generate these benefits and desired outcomes (Figure 6, Figure 7). The BAU/no CSS option achieves a markedly lower level of all types of desired outcomes. Meanwhile, manure scores high as compared to other land management alternatives for all categories of benefits. Pigeon peas, too, are perceived to perform relatively well in helping to improve crop yields, food supplies, soil fertility and soil moisture. Improved seeds and crop rotation and – to a lesser extent – NPK and urea are in most cases seen as giving relatively low levels of benefits. It should be noted that some respondents were not asked to weight the land management practices being discussed against the full set of benefits/outcomes. As neither cowpeas nor manure were scored in relation to drought protection, these results remain blank in the figures below, and reflect non-responses rather than zero scores.

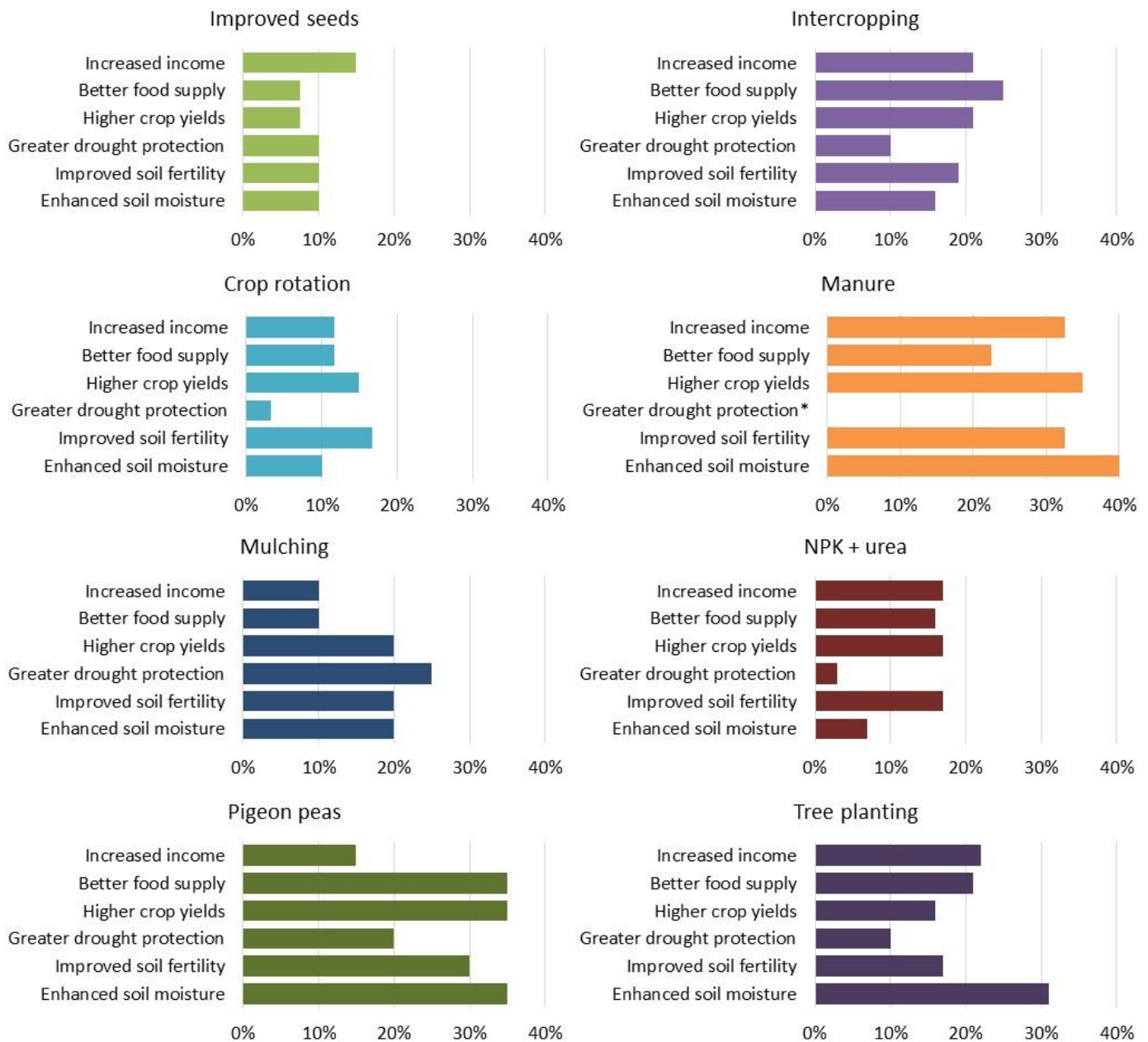
Figure 6: Benin – achievement of land management benefits (by benefit category)



Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices. *omitted from weighting – does not reflect zero score.

Figure 7: Benin – achievement of land management benefits (by land management practice)



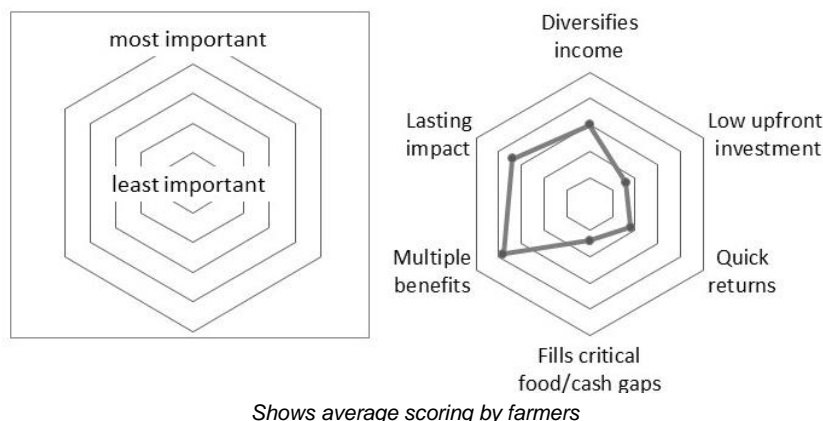


Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices. *omitted from weighting – does not reflect zero score.

Advantages and positive attributes

Farmers identified six categories of advantages and positive attributes as being of the greatest relevance to their needs, aspirations and socio-economic circumstances: the ability to diversify income, have a lasting impact, generate multiple benefits, fill food and cash gaps at critical times of the year, yield quick returns and only require a low upfront investment. Multiple benefits, lasting impacts and Income diversification were identified as having the greatest importance (Figure 8). It is interesting to note that most farmers considered the two attributes that relate directly to cash outlays and earnings – low upfront investment and quick returns – as being of relatively little importance to them when choosing between land management alternatives, and also gave a relatively low emphasis to the timing of (food and cash) benefits over the course of the year.

Figure 8: Benin – relative importance of land management advantages

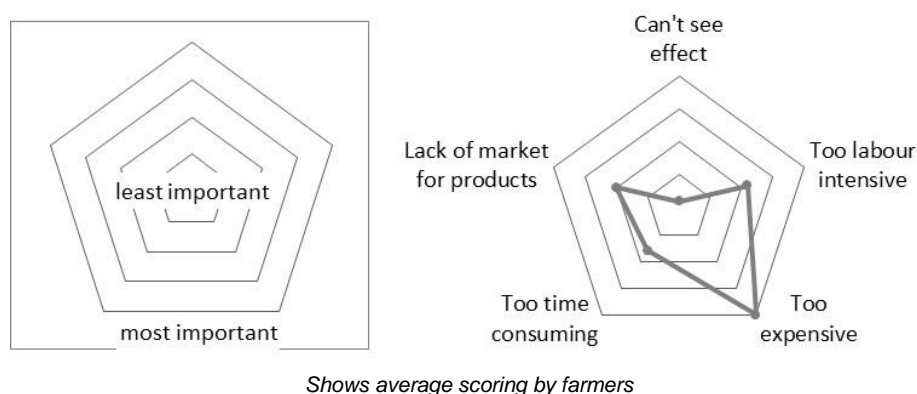


The ELMO step of ranging land management practices on a scale according to the extent to which they display different advantages and positive attributes was not carried out in Benin, so no information is available on this.

Disadvantages and negative attributes

Farmers identified five categories of disadvantages and negative attributes as posing the most binding constraints in relation to the choice of land management practice: their being too time-consuming, too labour-intensive or too expensive to implement, lack of markets for the products generated, and low evidence of any positive effect. There was consensus that the most critical disadvantage in discouraging uptake is when a land management practice is considered too expensive to implement, with labour demands also being ranked as an important factor (Figure 9). In contrast, inability to see a tangible effect or impact was considered relatively unimportant by most farmers.

Figure 9: Benin – relative importance of land management disadvantages



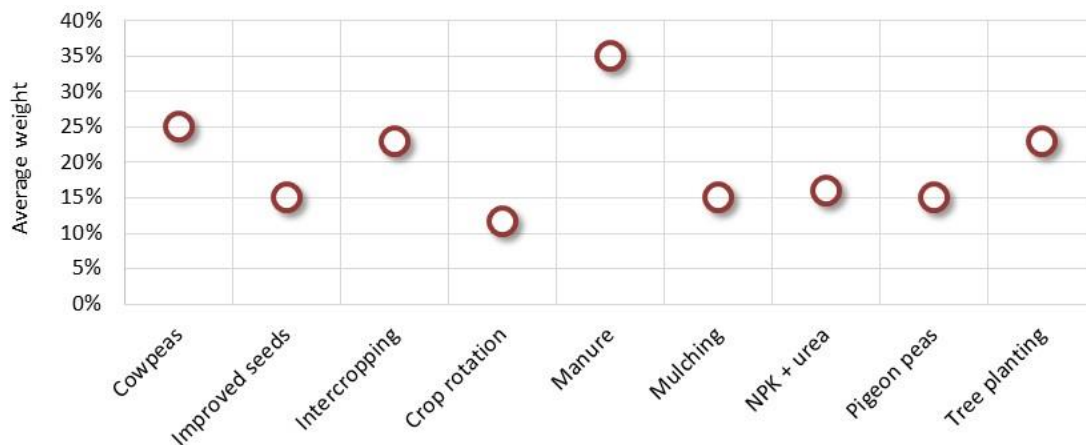
The Benin survey did not rank land management practices on a scale according to the extent to which they manifest different disadvantages and negative attributes, so no information is available on this.

Overall land management preferences

Overall, manure stands out as the most frequently favoured land management practices, followed by cowpeas, intercropping and tree planting (Figure 10, Figure 11). Crop rotation is accorded the lowest preference, while pigeon peas and mulching also rank low as compared to other land management practices. It is interesting to

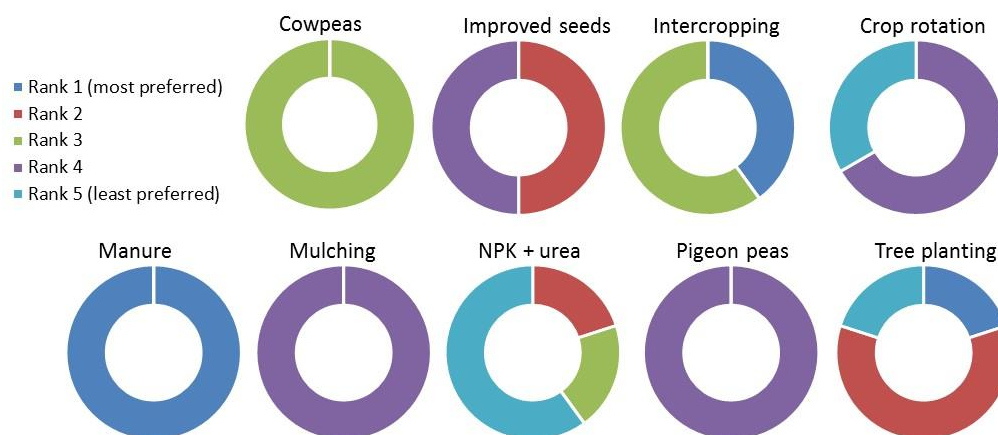
note that one reason that is given as to why chemical fertiliser and improved seeds are not ranked higher is that, despite their clear effects in terms of higher yields and quick returns, they remain expensive to implement and do not have a lasting effect – the investment must be repeated every year. In contrast, land management practices such as intercropping and manure secure good yields at the same time as permanently improving the condition of the soil. No ranking and weighting of land management practices against the BAU/no CSS alternative was carried out, so no information is available on this.

Figure 10: Benin – overall preference for different land management alternatives



Shows average weight attributed according to overall preference relative to other land management practices. Note that total exceeds 100%, because interviews cover different combinations of land management practices.

Figure 11: Benin – relative ranking of different land management alternatives



Shows percentage of respondents allocating different ranks to each land management practice.

The survey identifies various factors that serve to enable or constrain farmers in taking up different land management practices (Table 2). In Benin, it is clear that access to cash and considerations of expense pose a major barrier to investing in new land management practices. Along similar lines, high cash and labour demands are perceived as one of the greatest disadvantages. Many farmers lack the liquidity to hire labour or purchase inputs, and must rely on family labour and materials that are already to hand. At the same time, if a land management practice is to be attractive and viable, it must be able to show demonstrable improvements in soil fertility, crop yields and income generation and – preferably – also contribute towards better food supplies. This multiplicity or diversity of benefits is an important factor shaping farmers' land use preferences: farmers seek not just to improve the level of direct physical products generated (such as cash, food or other items), but also to diversify income sources and at the same time secure longer-term outcomes such as improved soil moisture and fertility. Land management practices which display a balanced combination of

these features are tend to be seen as more advantageous than ones which demonstrate only one or two in isolation – even when the level of benefits generated is lower.

Table 2: Benin - summary of land management practices most and least preferred characteristics

	Most preferred characteristic(s)	Least preferred characteristic(s)
Cowpeas	Not expensive, has a lasting impact, involves known practices	Lack of market for products, takes time to benefit
Improved seeds	Quick returns, fill food and cash gaps, gives good yields	Demands a lot of work because seeds are expensive and therefore require more attention, expensive and high cash requirements, does not have a lasting impact
Intercropping	Multiple benefits due to increased number of harvests in a season (improved income, food security, higher fertility), quick returns, not expensive, involves known practices	Expensive to implement - requires purchase of different seeds and allocation of more (often hired) labour
Crop rotation	Not expensive and not time consuming, doesn't depend on market, involves known practices	Not as efficient as other practices ; time consuming without a visible effect; effect of practice not really evident;
Manure	Good yields, enhances income, has a lasting impact, not expensive, involves known practices, low demand for purchased inputs, significant impacts on soil fertility and moisture,	Time consuming
Mulching	Not expensive, doesn't depend on purchased items, involves known practices	Can't see effect
NPK/urea	Quick effect and returns	Expensive and high cash requirements, without a lasting impact, needs to be applied each new season, requires cash to purchase inputs
Pigeon peas	Lasting impact, not expensive, involves known practices, low demand for purchased inputs	Can't see effect
Tree planting	Lasting impact, not expensive, fills food/cash gaps good income which assures food security and financial needs of the family	Impossible to grow anything in the shadow of big trees, takes time to benefit, requires lots of work, expensive, requires market for products, requires technical knowhow

FINDINGS FROM BURKINA FASO

Introduction to the study site

Four interviews were carried out in May 2016 involving three men and one woman, spread across three villages (Karankasso-Vigue, Koloko and Lena). Household size in the survey villages ranges from four to nineteen people, cultivated areas vary between 2.5 - 20 ha (all rainfed), and all of the male farmers interviewed keep livestock (mostly sheep, goats and poultry). The main crops grown are maize, cowpeas, groundnuts, sorghum, rice, sesame and cotton. Farm production is used for subsistence by all respondents, and is also reported as being sold by male farmers. All of the household surveyed are involved in some kind of business (carpentry, maize mill, street restaurant and transportation), although only one includes members who are employed.

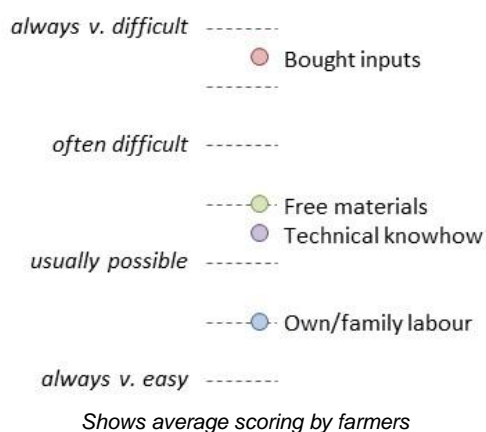
The following seven land management practices were discussed with farmers (in addition to the BAU/no CSS baseline): herbicide & pesticide, improved seeds, manure, manure pits, NPK/urea, crop rotation and stone bunds.

Perceptions of land management characteristics & attributes

Costs and input requirements

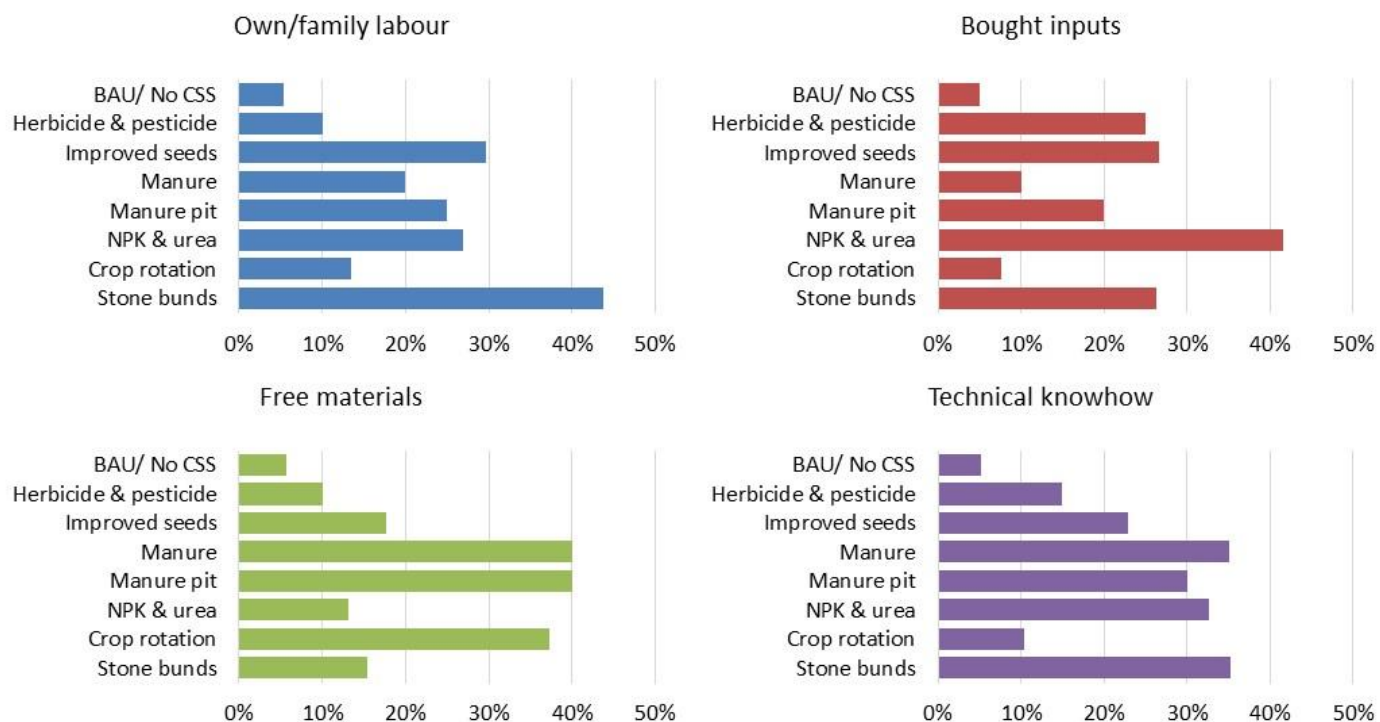
Four categories of costs or inputs were identified as having the most impact on farm decision-making and household livelihoods: own or family labour, bought inputs (including hired labour), free materials and technical knowhow. Whereas most farmers find own/family labour relatively easy to obtain at most times, technical knowhow and free materials are considered to be somewhat harder – although still usually possible – to access (Figure 12). As is the case in Benin, bought inputs are often difficult to afford as well as to access. Hired labour is, for example, often not available at the time at which it is needed, and the correct inputs cannot always be found in local markets and shops.

Figure 12: Burkina Faso – relative difficulty in accessing or affording costs/inputs



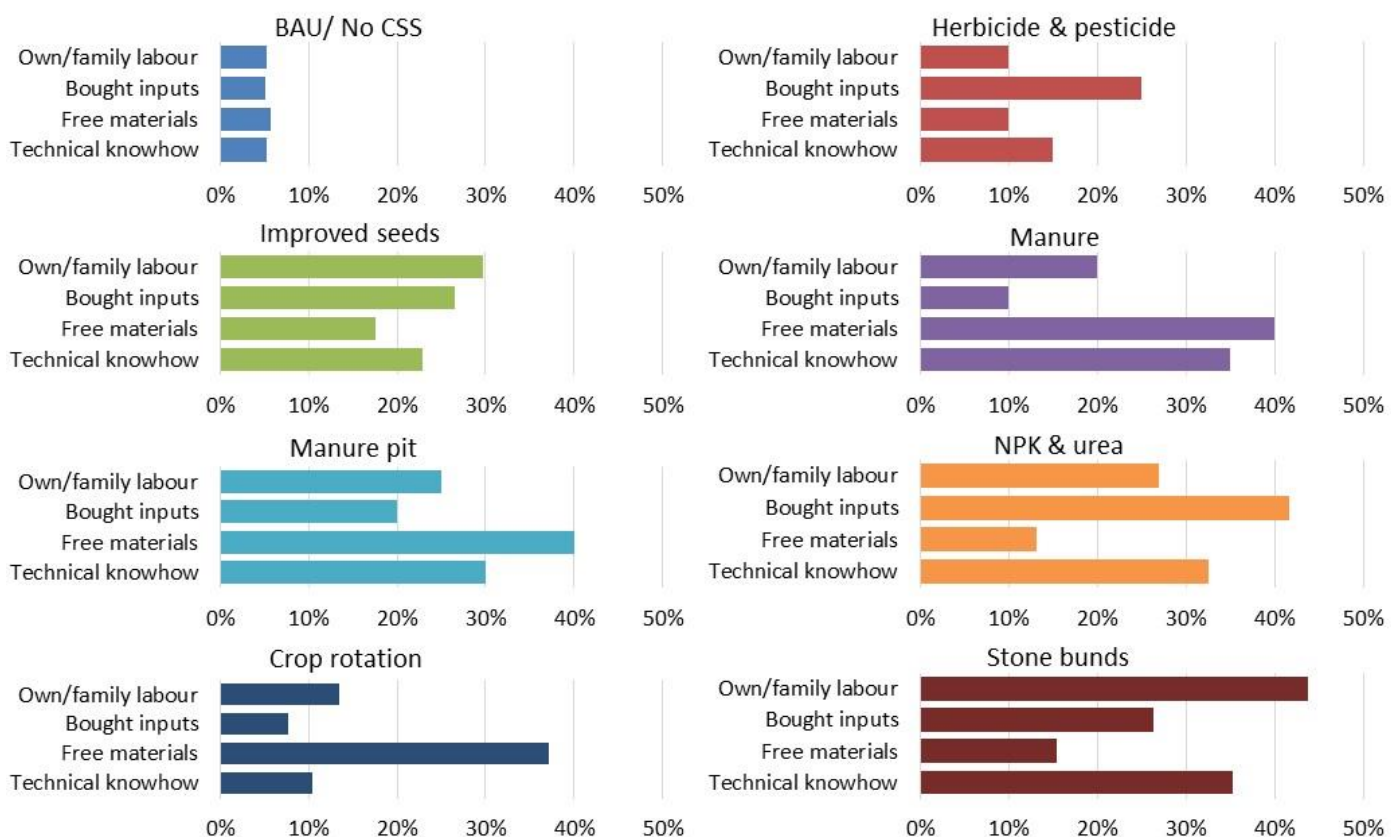
As was already noted in Benin, BAU/no CSS demands a much lower level of all inputs and spending than other land management alternatives (Figure 13, Figure 14). Other practices vary in their costs and input requirements. Crop rotation, for example, demands relatively little labour, bought inputs or technical knowhow to implement (although, along with manure, requires a high level of free materials). Unsurprisingly, NPK/urea, herbicides/pesticides, improved seeds and stone bunds all show high requirements for bought inputs, while improved seeds and stone bunds are also relatively demanding of labour. Stone bunds, in particular, are time consuming to construct, and must be maintained and realigned each season, meaning that technical knowhow is required for their successful implementation. Manure and manure pits are also seen as being demanding of technical knowhow (mainly concerning methods of storage and application), while NPK/urea is similarly perceived to be relatively complex to apply correctly.

Figure 13: Burkina Faso – land management cost/input requirements (by cost/input category)



Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 14: Burkina Faso – land management cost/input requirements (by land management practice)

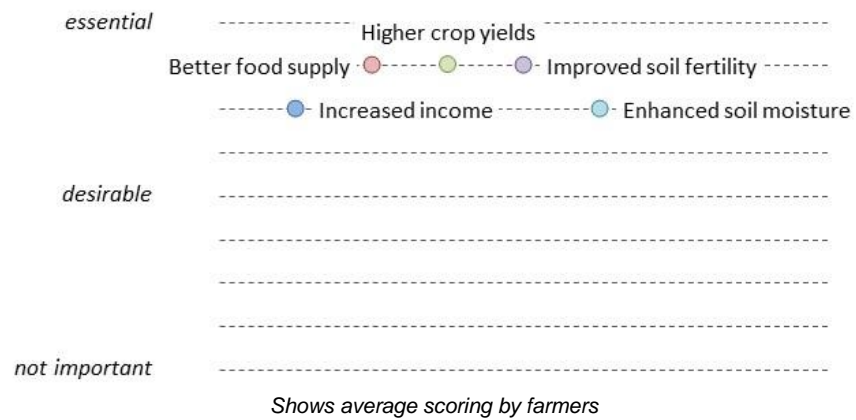


Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Benefits and desired outcomes

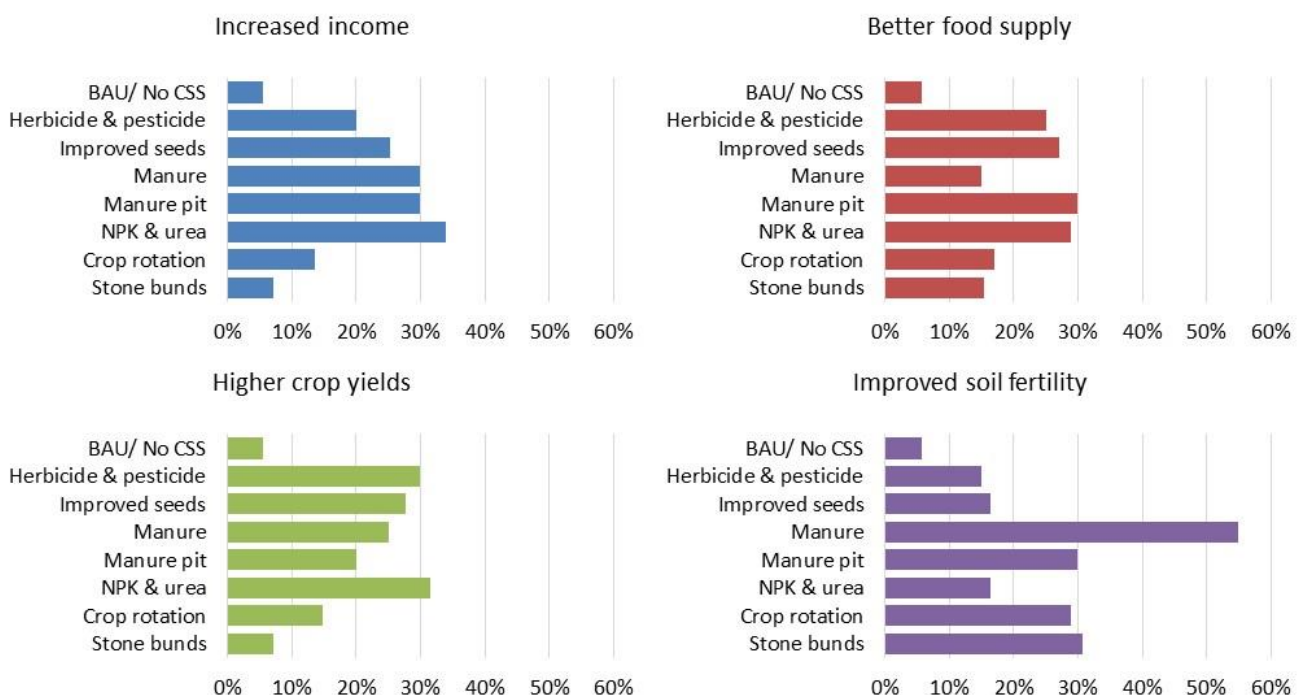
Five categories of benefits and desired outcomes were identified as being the most sought-after in relation to household livelihood needs: increased income, better food supply, higher crop yields, improved soil fertility and enhanced soil moisture. All are considered to be of high importance, although none are considered to be absolutely essential. Better food supply, higher crop yields and improved soil fertility most commonly highlighted as the most important benefits (Figure 15).

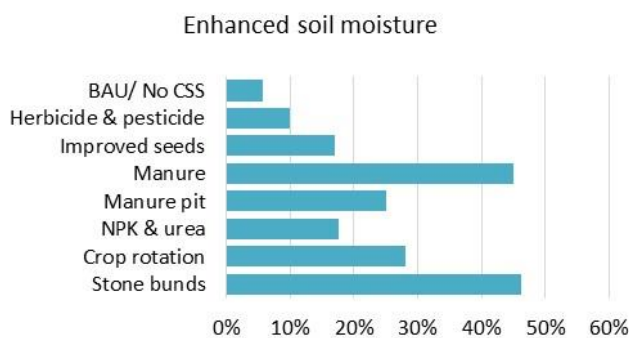
Figure 15: Burkina Faso – relative importance of land management benefits



It is noticeable that, again, the BAU/no CSS option is perceived to generate low levels of benefits or positive outcomes as compared to other land management options (Figure 16, Figure 17). While NPK/urea, improved seeds and herbicides/pesticides are seen to deliver relatively high crop yields (and thus increased income and better food supply), they perform less well in relation to improved soil fertility and enhanced soil moisture. Manure and manure pits, meanwhile, are perceived as achieving relatively good outcomes both in terms of yields, income and food supply as well as in relation to soil fertility and moisture. Crop rotation and stone bunds are associated with improved soil fertility and moisture, but are perceived as having relatively little impact in increasing income, good supplies or crop yields.

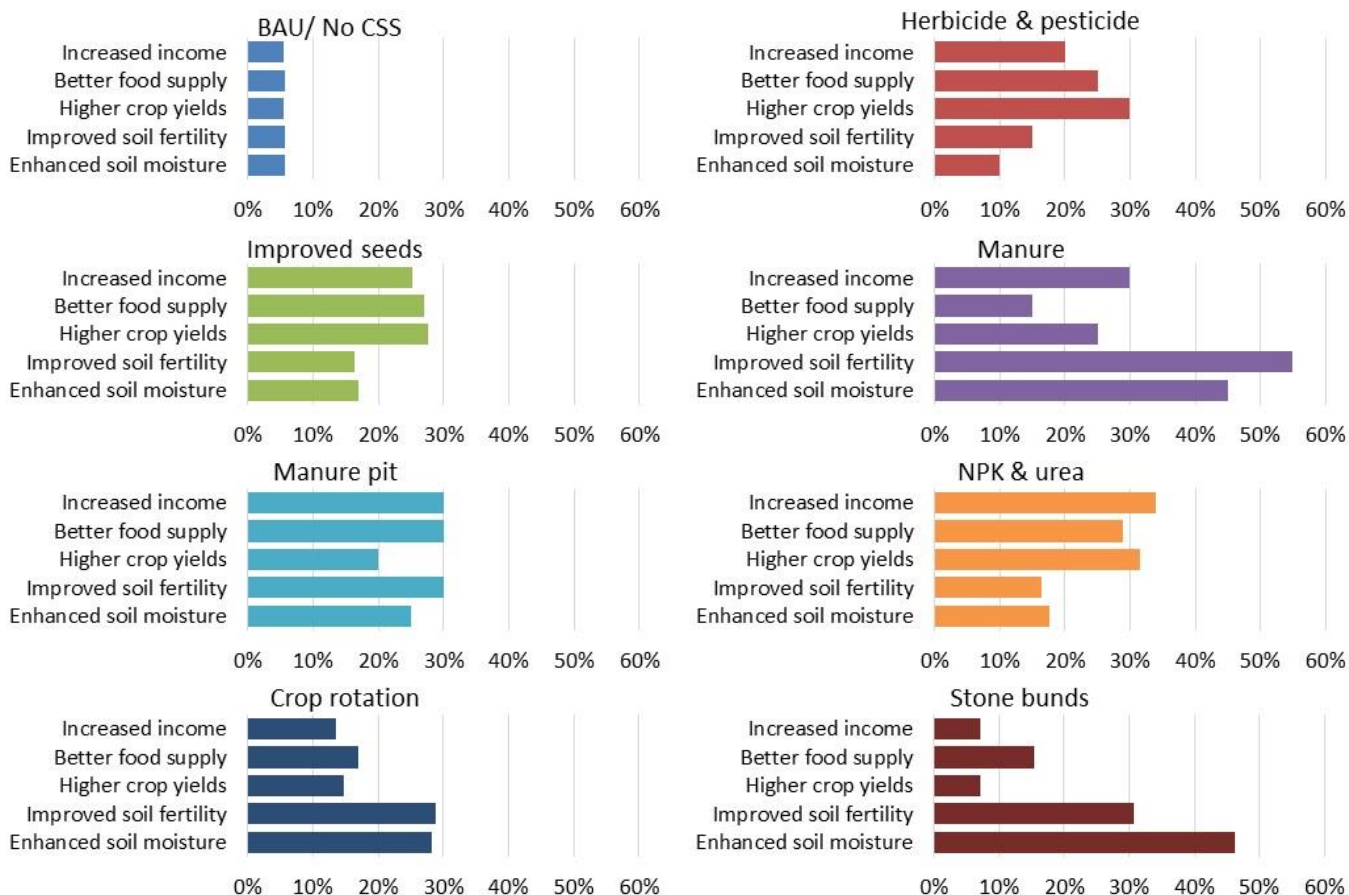
Figure 16: Burkina Faso – achievement of land management benefits (by benefit category)





Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 17: Burkina Faso – achievement of land management benefits (by land management practice)

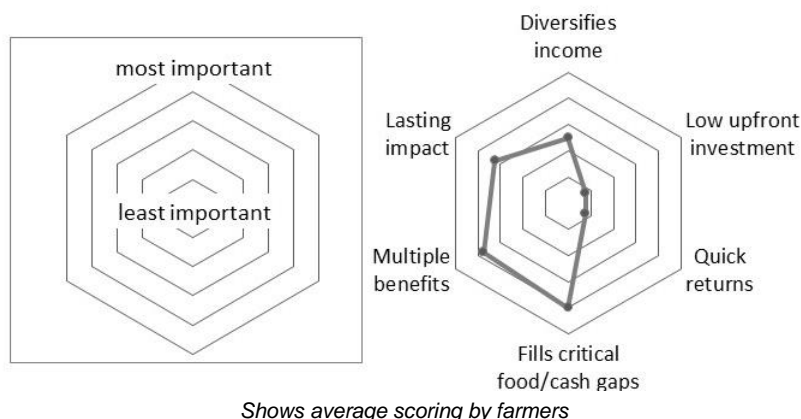


Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Advantages and positive attributes

Farmers identified six categories of advantages and positive attributes as being of the greatest relevance to their needs, aspirations and socio-economic circumstances: the ability to diversify income, have a lasting impact, generate multiple benefits, fill food and cash gaps at critical times of the year, yield quick returns and only require a low upfront investment. The most critical ones are perceived to be filling food and cash gaps, multiple benefits and lasting impacts (Figure 18). As is the case in Benin, low upfront investment costs and quick returns (both of which are linked directly to cash liquidity) are considered to be of relatively minor importance as a factor in land management decision-making.

Figure 18: Burkina Faso – relative importance of land management advantages

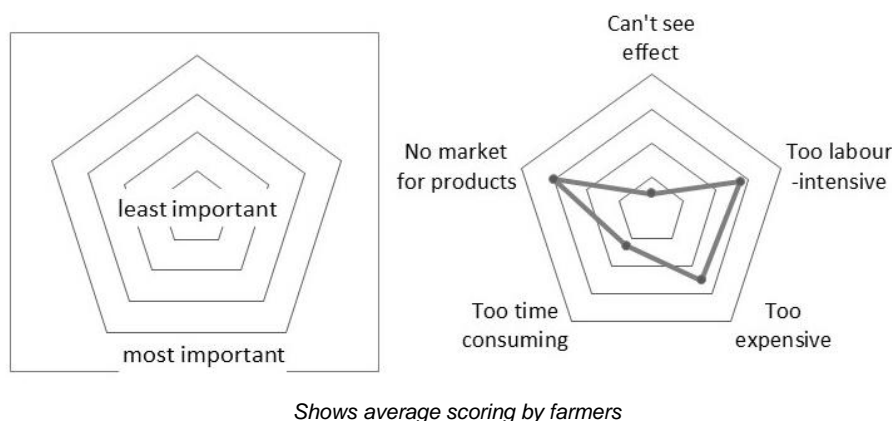


The ELMO step of ranging land management practices on a scale according to the extent to which they display different advantages and positive attributes was not carried out in Burkina Faso, so no information is available on this.

Disadvantages and negative attributes

Farmers identified five categories of disadvantages and negative attributes as posing the most binding constraints in relation to the choice of land management practice: their being too time-consuming, too labour-intensive or too expensive to implement, lack of markets for the products generated, and low evidence of any positive effect. Farmers generally agreed that land management practices that are labour intensive or expensive to implement or which generate products for which there is no market are considered to be the most disadvantageous, while lack of evidence of effects and time requirements are considered to be relatively unimportant.

Figure 19: Burkina Faso – relative importance of land management disadvantages



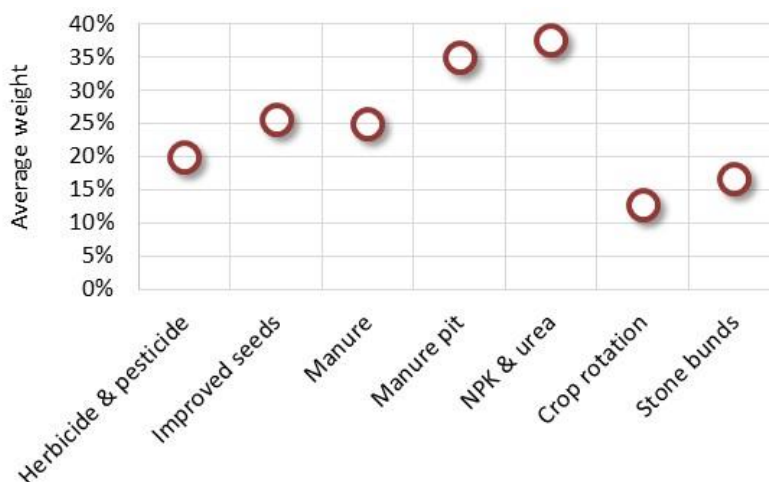
The ELMO step of ranking land management practices on a scale according to the extent to which they manifest different disadvantages and negative attributes was not carried out in Burkina Faso, so no information is available on this.

Overall land management preferences

Overall, NPK/urea and manure pits stand out as the most frequently preferred land management practices), followed by improved seeds and manure (Figure 20, Figure 21). Stone bunds and – especially - crop rotation

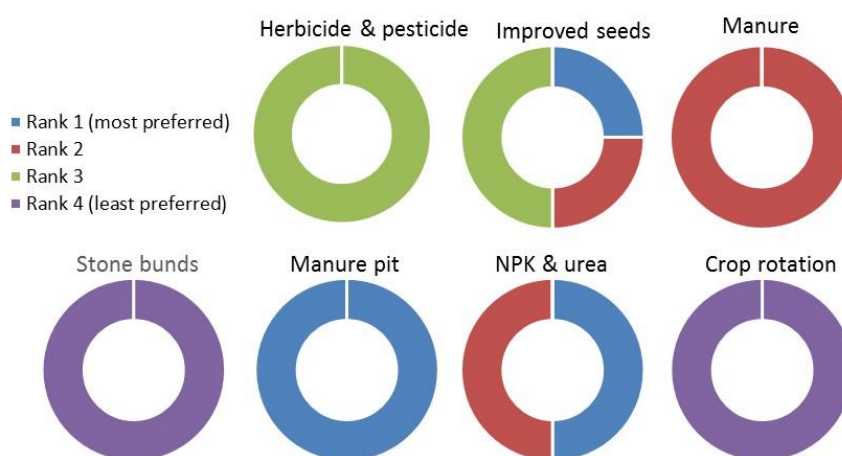
are accorded the lowest preference by most farmers. Land management practices were not ranked and weighted relative to the BAU/no CSS alternative, so no information is available on this.

Figure 20: Burkina Faso – overall preference for different land management alternatives



Shows average weight attributed according to overall preference relative to other land management practices. Note that total exceeds 100%, because interviews cover different combinations of land management practices.

Figure 21: Burkina Faso – relative ranking of different land management alternatives



Shows percentage of respondents allocating different ranks to each land management practice.

A number of findings emerge about the main considerations that shape farmers' preferences and possibilities as regard land management decisions in Burkina Faso (Table 3). As was the case in Benin, difficulties in affording and accessing bought inputs (including hired labour) mean that land management practices that demand large amounts of labour and other purchased items are beyond the reach of many farmers – even if the benefits generated are substantial. The issue of additionality and multiplicity of benefits is also important. There is a strong preference for land management approaches which can simultaneously serve to improve household food and cash status at the same time as enhancing crop productivity and leading to lasting improvements in the quality of soils. Being able to demonstrate quick wins in monetary terms (for example through low start-up costs or rapid returns), although desirable, are not by themselves enough to make a land management alternative the most preferred choice or most viable option for the farmer.

Table 3: Burkina Faso - summary of land management practices most and least preferred characteristics

	Most preferred characteristic(s)	Least preferred characteristic(s)
Herbicide & pesticide	Nothing outstanding (except that it kills weeds & pests)	Expensive and not good for human health, little permanent effect on soil fertility and moisture
Improved seeds	Helps to diversify income, gives quick returns, efficient with good yields, fills food and cash gaps quickly	Expensive to implement, time consuming and uses a lot of labour, lack of market for products, little permanent effect on soil fertility and moisture
Manure	Has a lasting impact, gives multiple benefits (both income/production and soil improvements)	Time consuming to implement, high labour demand, technical knowhow is required
Manure pit	Not expensive, gives quick returns and multiple benefits (production, income and soil improvements)	Demands a lot of work, technical knowhow is required
NPK/urea	Helps to diversify income, fills food and cash gaps, improves yields, gives quick returns	Expensive to implement, requires cash, complex to carry out and so requires technical knowhow, little permanent effect on soil fertility and moisture
Crop rotation	Requires little capital or labour, gives multiple benefits, helps to diversify income, has a lasting impact	Can't see effect, less impact on yield and income
Stone bunds	Has a lasting impact, fills food and cash gaps, improved soil fertility and moisture	Time consuming to implement, high labour demands, technical knowhow is required, less impact on yield and income

FINDINGS FROM ETHIOPIA

Introduction to the study site

Ten interviews were carried out in July 2016 involving seven men and three women, spread across three villages and two states (Abibe Doyo, Birbirsa Kulit, Habibe Doyo, Keleti Birbirsa, Lay Nifasamo, Merechitlayenech, Nifasamo and Yenech villages in west Gojam zone of Amhara National Regional State and west Shewa zone of Oromyia National Regional State). Household size in the survey villages ranges from two to nine people, cultivated areas vary between 0.25 - 6.0 ha (all rainfed), and half of the farmers interviewed keep livestock. The main crops grown are wheat and teff. Farm production is mainly used for subsistence, with just two farmers also selling their crops. None of the interviewed households include members who are employed, and just three are engaged in business activities.

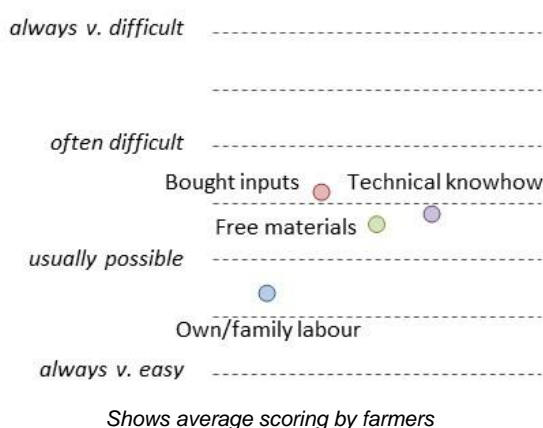
The following six land management practices were discussed with farmers (in addition to the BAU/no CSS baseline): bunds, double cropping, fertiliser, intercropping, high-quality seeds and tree planting.

Perceptions of land management characteristics & attributes

Costs and input requirements

Four categories of costs or inputs were identified for discussion: own or family labour, bought inputs (including hired labour), free materials and technical knowhow. Whereas most farmers find that own/family labour is easy to obtain at most times, free materials, technical knowhow and bought inputs are considered to be sometimes difficult – although still usually possible – to access or afford (Figure 22). It should however be noted that perceptions and experiences vary between farmers, with some respondents reporting much greater difficulty than others in sourcing key inputs and costs.

Figure 22: Ethiopia – relative difficulty in accessing or affording costs/inputs

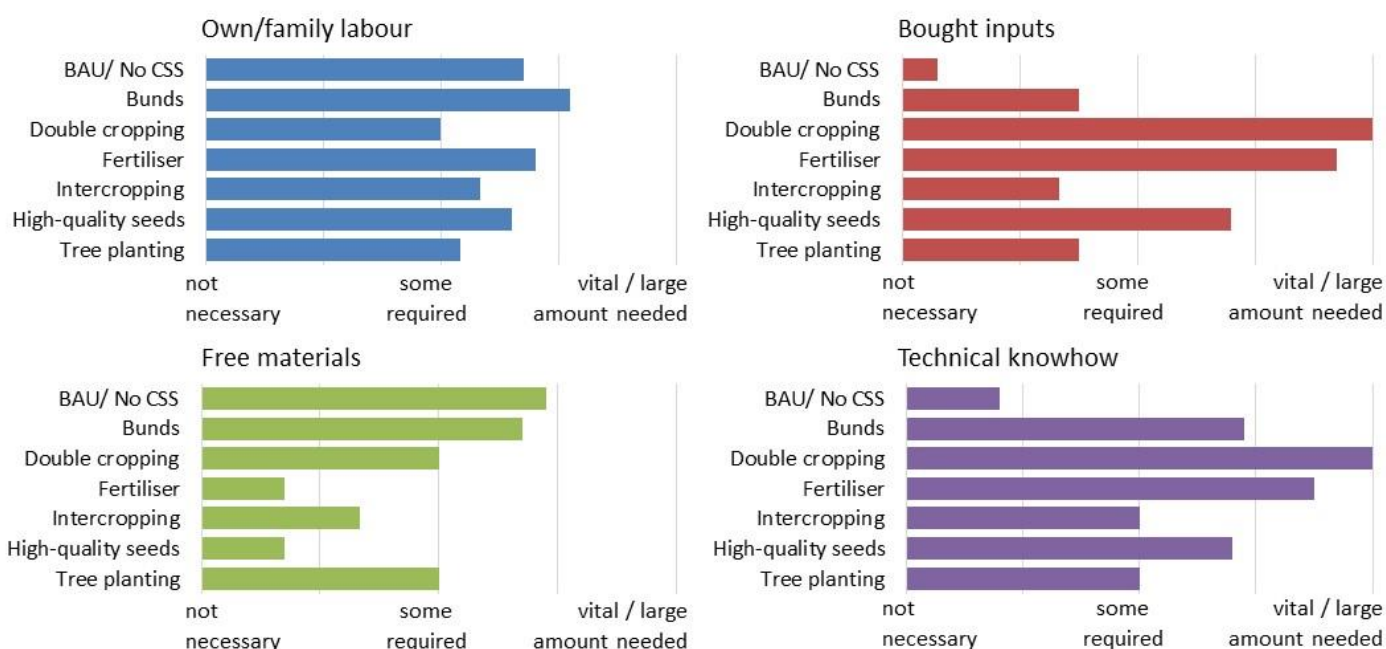


It is interesting to note that there appear to be substantial differences between male and female farmers' perceptions of the availability, affordability and accessibility of own/family labour. Whereas male farmers tend to indicate that own/family labour is "always very easy" or "usually possible" for them to access, women farmers state that it is more difficult, and often depend on hired labour. Although worth emphasising, it is perhaps hardly surprising to note that perceptions of the affordability of bought inputs vary widely between farmers with different wealth status. Both poor and female-headed households perceived that bought inputs are "always very difficult" for them to afford. On the other hand, relatively rich and market-oriented farmers perceived that bought inputs are "always very easy" or "often possible" for them to afford. Similar patterns emerge in relation to free materials. Interesting differences also emerge in relation to farmers' differing perceptions (and relative ranking) of the access and availability of technical knowhow also differed. While poor farmers often associated their difficulty in terms of technical knowhow with lack of education, interviewed women described their difficult access to technical knowhow in relation to agricultural labour. In contrast,

relatively rich and market-oriented farmers stated that they have such skills, knowledge and labour availability, meaning that technical knowhow is “always very easy” or “often possible” for them to access.

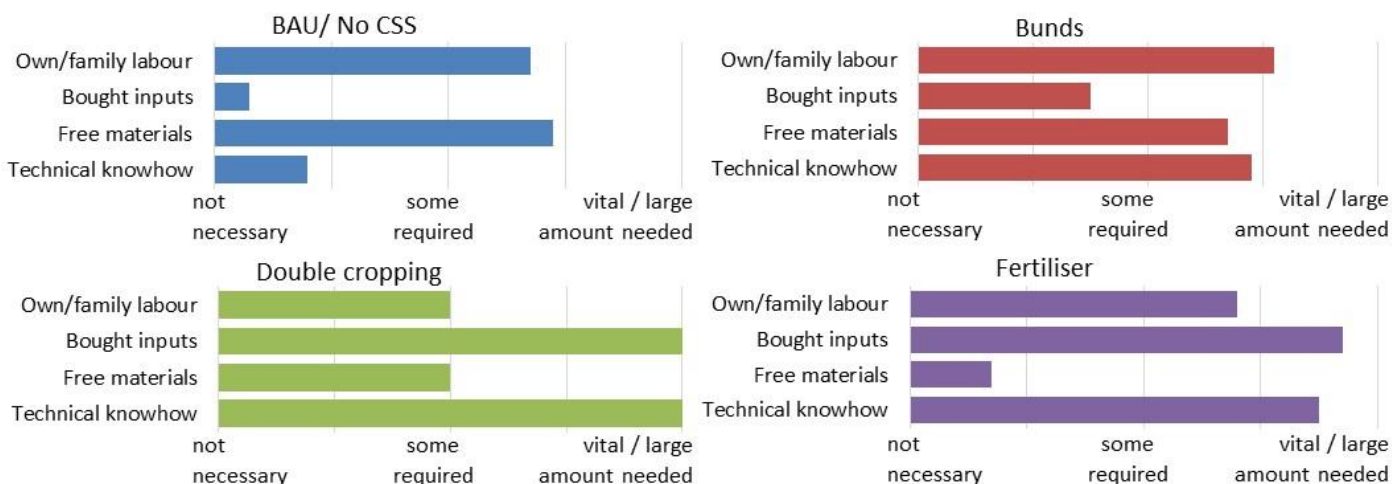
The cost and input requirements of different land management practices vary considerably (Figure 23, Figure 24). While all of the land management practices discussed require a moderate or moderate to large amount of labour, practices such as high quality seeds, fertiliser and double cropping are obviously linked much more to bought inputs (for which BAU/no CSS has a much lesser demand than other land management practices). In contrast, BAU/no CSS and bunds rely more on free materials, while fertiliser, high quality seeds, bunds and (especially) double cropping require high amounts of technical knowhow.

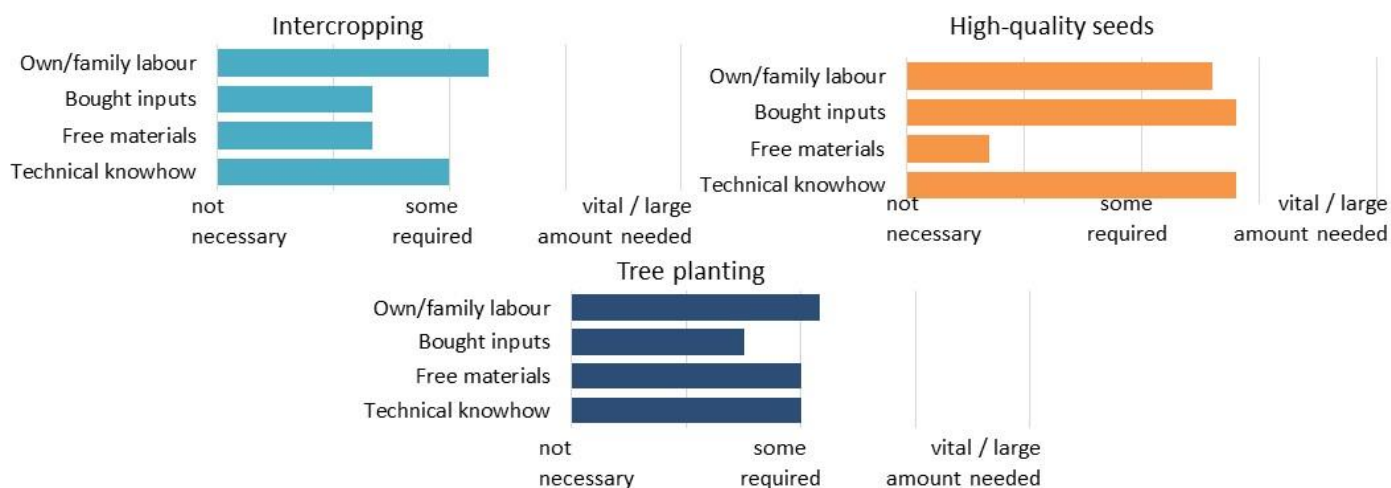
Figure 23: Ethiopia – land management cost/input requirements (by cost/input category)



Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 24: Ethiopia – land management cost/input requirements (by land management practice)



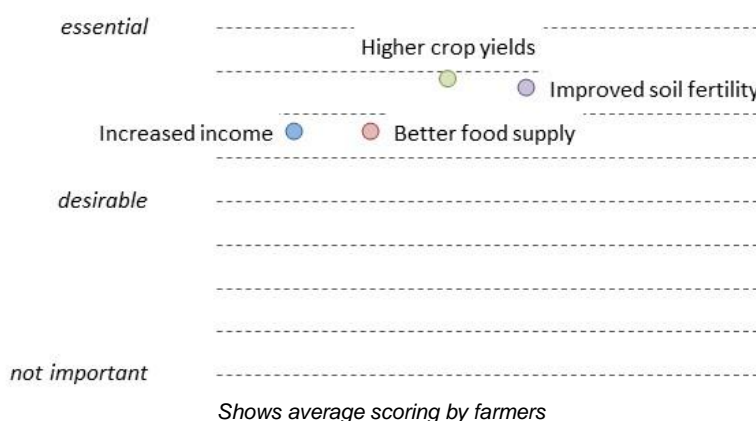


Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Benefits and desired outcomes

Four categories of benefits and desired outcomes were identified as being the most sought-after in relation to household livelihood needs: increased income, better food supply, higher crop yields and improved soil fertility. All are considered to be of high importance, with higher crop yields and improved soil fertility most commonly highlighted as the most critical overall, and as preconditions for improving household income and food supplies (Figure 25).

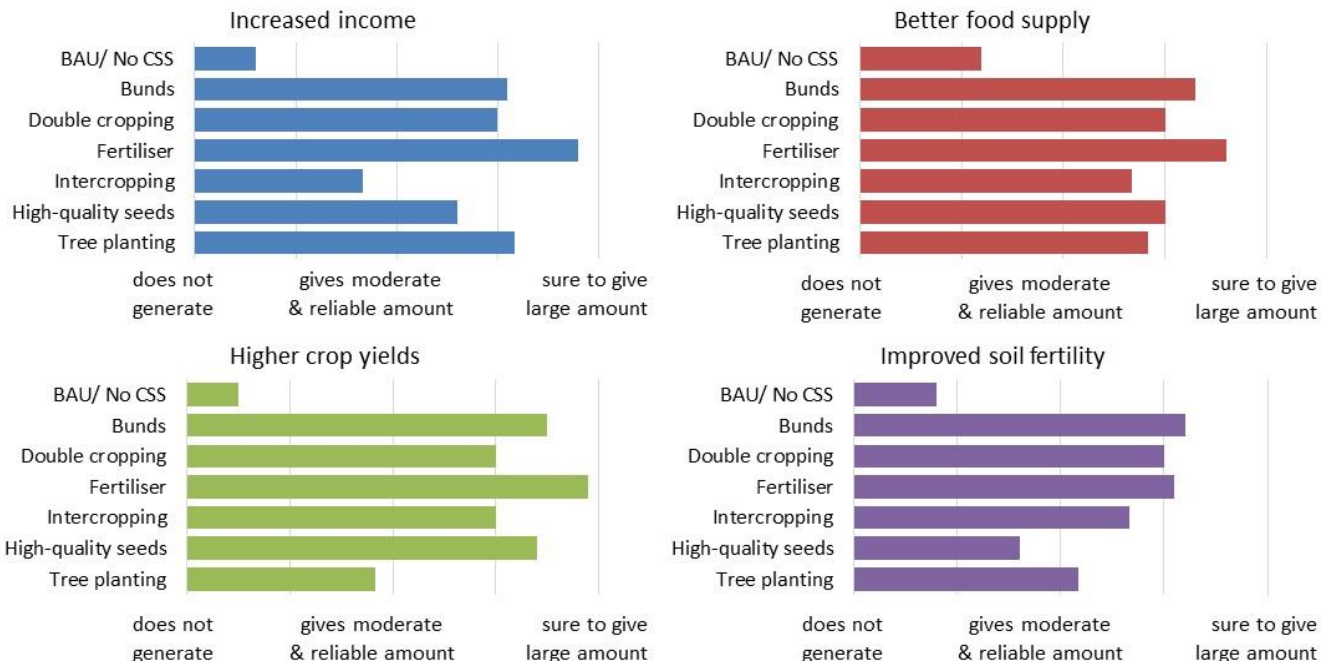
Figure 25: Ethiopia – relative importance of land management benefits



It is useful to note that farmers differ considerably in their perception of the importance of different benefits or positive outcomes. These differences largely reflect variation in socio-economic positions, livelihood circumstances and needs. While the poorest identified better food supply and increased income as the most essential benefits, poor farmers focused on food supply and crop yields, medium farmer favoured increased income and crop yields, relatively rich farmers consistently emphasised increased income as the most essential benefit, and market-oriented farmers tended to rank soil fertility as the most important factor.

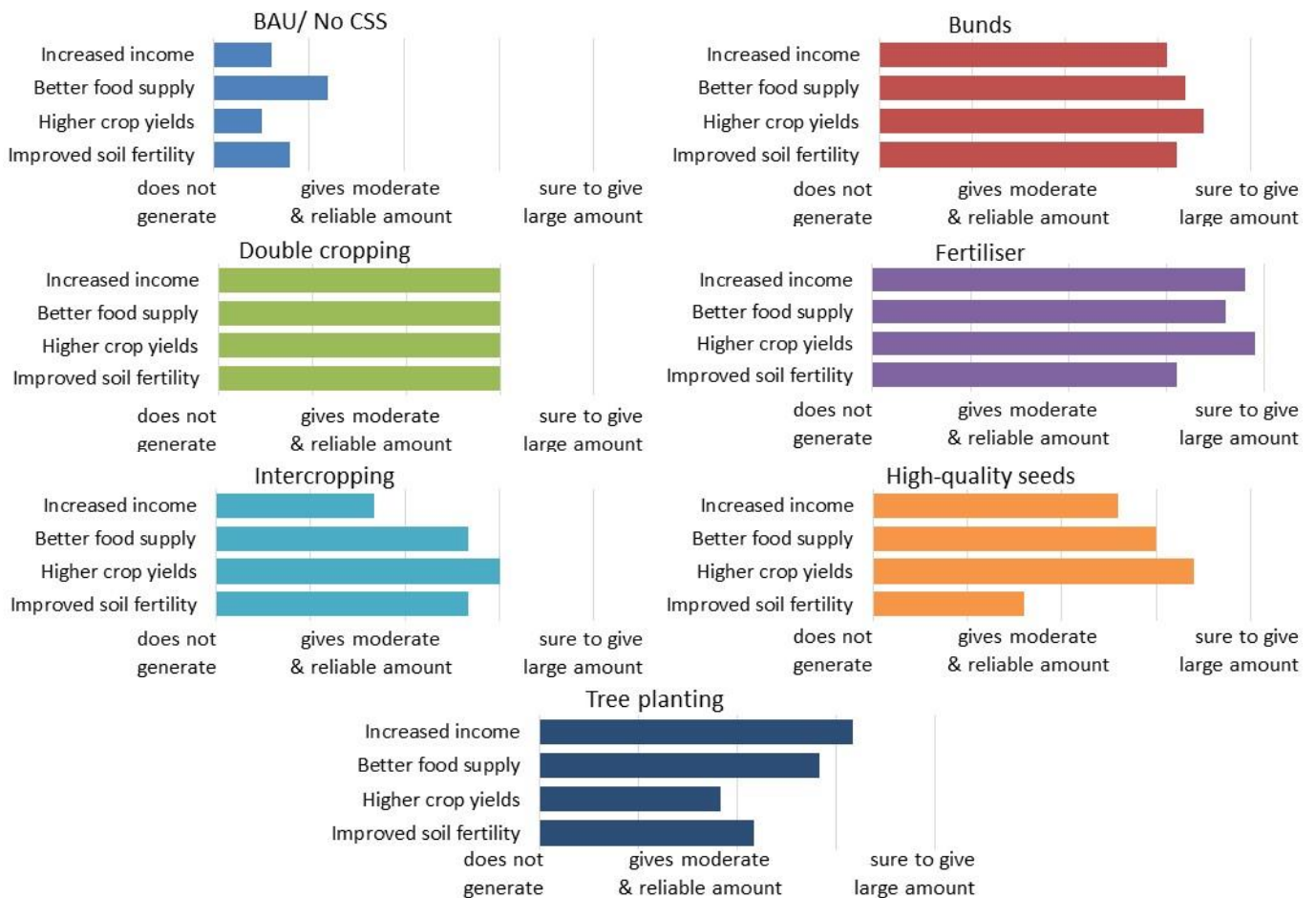
The BAU/no CSS option is perceived to generate substantially lower levels of benefits or positive outcomes (Figure 26, Figure 27). All of the other land management options are generally perceived to lead to fairly reliable and significant gains in income, food supply, crop yields and soil fertility. Fertiliser applications, in particular, are linked to higher and more certain improvements in crop yields, income and food supply. This perception of the all-encompassing benefit of fertiliser is a crucial factor influencing its use and adoption. Bunds, too, are also considered to show relatively good income, food, yield and soil fertility gains. They are seen as being a critical precondition for productive farmland. As one farmer emphasised “Without bunds, the land will disappear. If the land disappeared, what would I plough and get benefit?”

Figure 26: Ethiopia – achievement of land management benefits (by benefit category)



Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 27: Ethiopia – achievement of land management benefits (by land management practice)

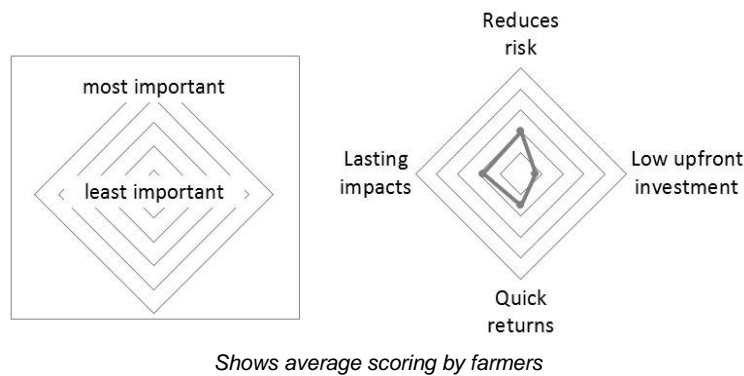


Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Advantages and positive attributes

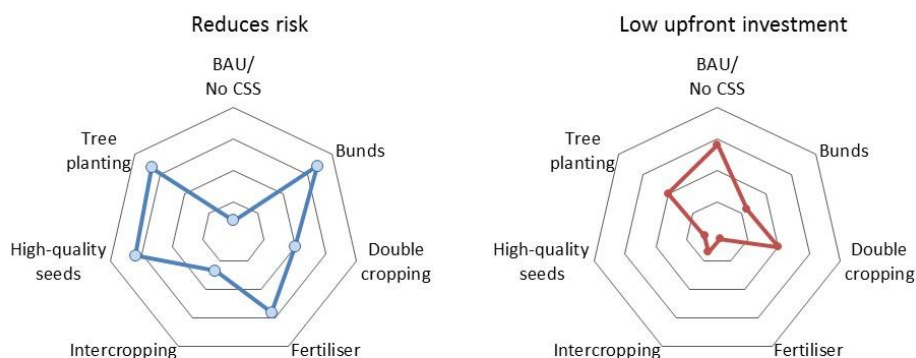
Farmers identified four categories of advantages and positive attributes as being of the greatest relevance when choosing between land management alternatives: the ability to reduce risk, generate quick returns, have a lasting impact and only require a low upfront investment. The least important one is generally perceived to be low upfront investment (Figure 28), although farmers' opinions were somewhat mixed as regards the relative importance of other land management advantages. As was the case with costs/inputs and benefits/outcomes, there is significant variation between different farmers' perceptions of land management advantages and positive attributes. These are largely tied to their varying needs, wants and livelihood circumstances. Thus poorer farmers were most concerned with lasting impact, linked to their need to overcome the deep-rooted constraints hindering crop production. In contrast, richer farmers laid more emphasis on risk reduction, while market-oriented farmers identified "gives quick return" and "small upfront investment" as the most important advantages.

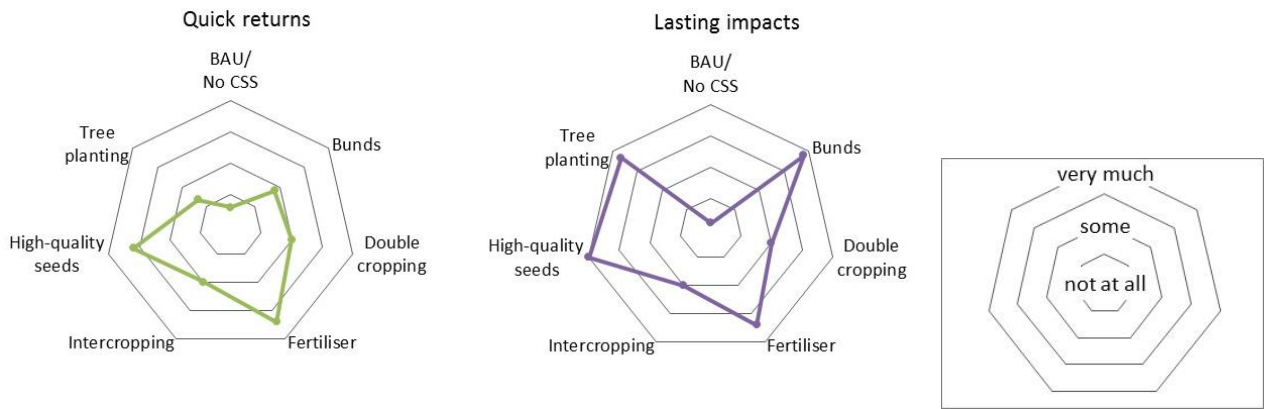
Figure 28: Ethiopia – relative importance of land management advantages



Different land management alternatives vary in the extent to which they manifest these advantages and positive attributes (Figure 29, Figure 30). Business as usual/CSS is perceived to have little or no advantage in all respects except for requiring a low upfront investment, where it outperforms all of the other land management alternatives. Tree planting, bunds, high quality seeds and (to a slightly lesser extent) fertiliser are ranked high as regards risk reduction and having lasting impacts, while fertiliser and high quality seeds are also seen as having a greater advantage in yielding quick returns. Double cropping is generally perceived to show a moderate advantage in all respects.

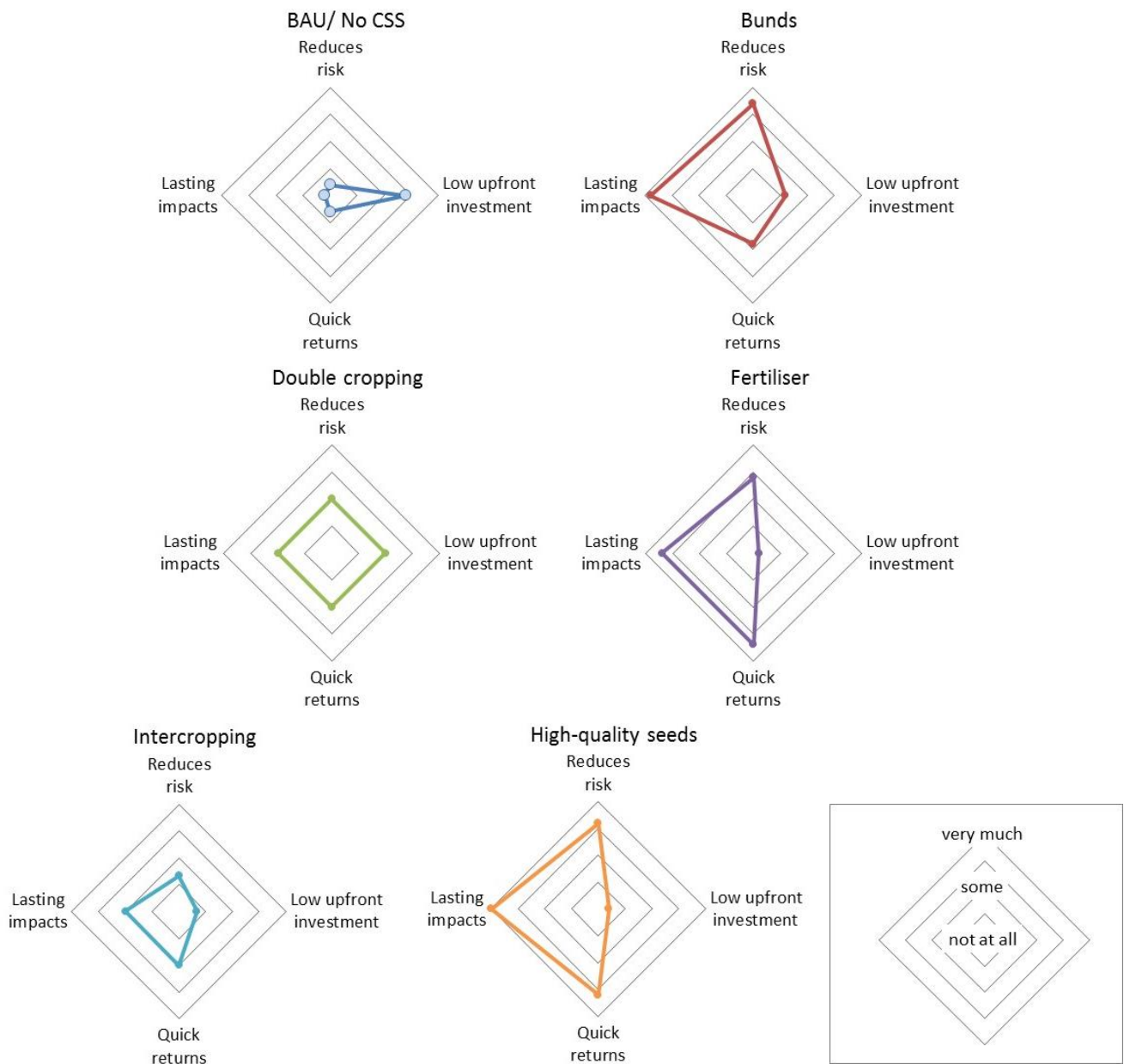
Figure 29: Ethiopia – extent of land management advantages (by advantage category)





Shows average attribution of extent to which advantage/positive attribute shown, from not at all to very much

Figure 30: Ethiopia – extent of land management advantages (by land management practice)

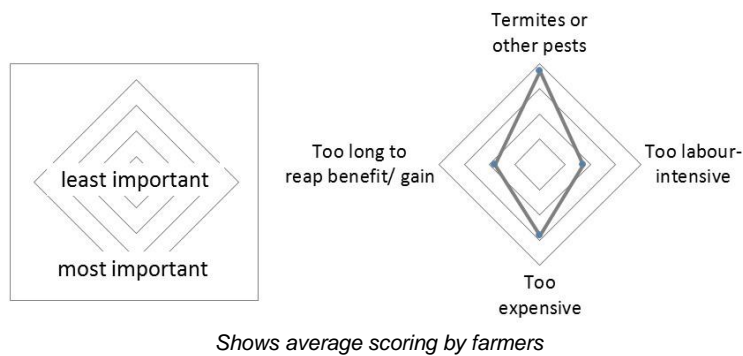


Shows average attribution of extent to which advantage/positive attribute shown, from not at all to very much

Disadvantages and negative attributes

Farmers identified four categories of potential disadvantages and negative attributes in relation to the choice of land management practices: their being too labour-intensive or expensive to implement, taking too long to reap any benefit or gain and bringing termites and other pests. Bringing termites and pests was generally flagged as the most important negative attribute, while intensive labour demands and slowness of generating returns were seen as less binding (Figure 31). These perceptions are closely linked to the constraints that farmers face on a day-to-day basis. Pests pose the most significant threat to crop production in the study sites, leading to very big losses in terms of harvest, as well as precious investments, including fertilizer and quality seeds.

Figure 31: Ethiopia – relative importance of land management disadvantages



There is only minor difference between different land management practice as regards being too labour intensive: all are considered to display some level of disadvantage (Figure 32, Figure 33). It is only BAU/no CSS and double cropping which are thought to run any risk of bringing termites or other pests, while BAU/no CSS and (especially) tree planting are linked to slow benefits or gains, and fertiliser and high-quality seeds are identified as being relatively disadvantageous in terms of expense.

Figure 32: Ethiopia – extent of land management disadvantages (by disadvantage category)

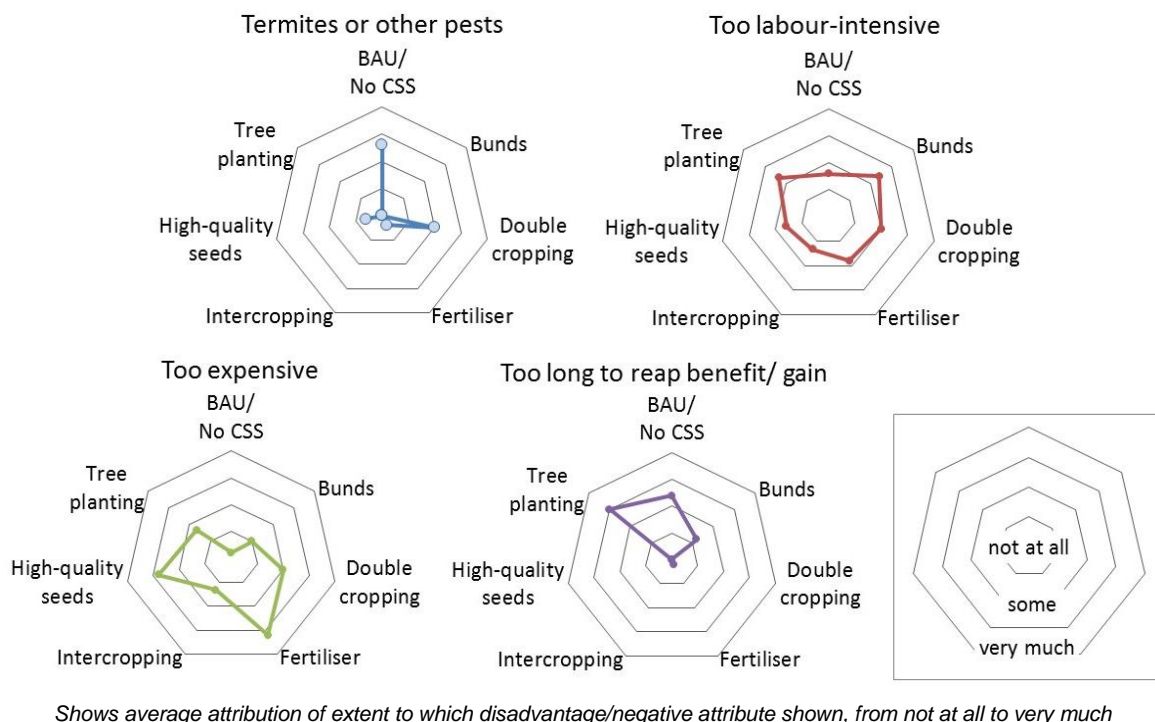
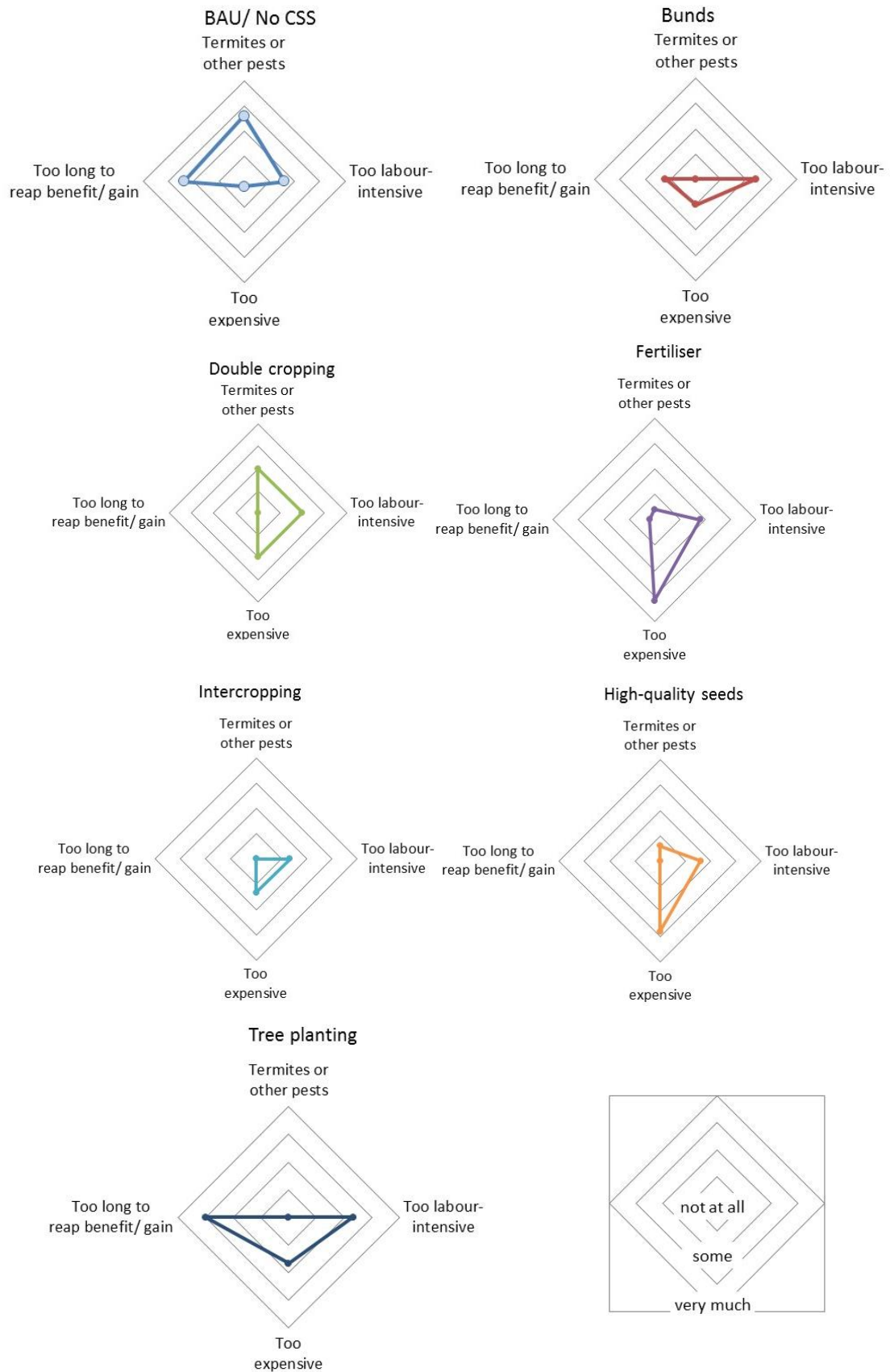


Figure 33: Ethiopia – extent of land management disadvantages (by land management practice)

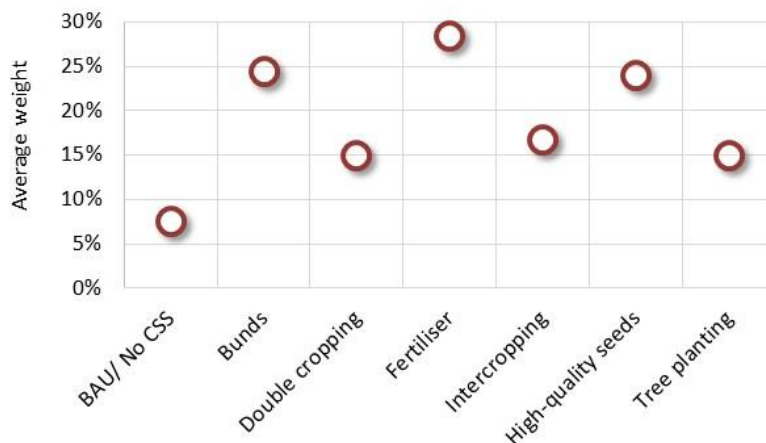


Shows average attribution of extent to which disadvantage/negative attribute shown, from not at all to very much

Overall land management preferences

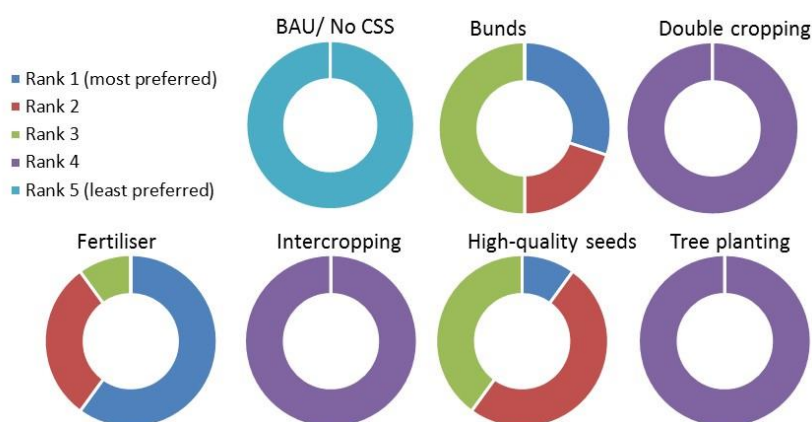
Business as usual is consistently ranked below all other land management practices as being the least preferred option (Figure 34, Figure 35). Fertiliser is generally favoured the most, followed by bunds and high quality seeds, with intercropping, double cropping and tree planting being rated lower – and at similar levels (rank four out of five) – by most farmers.

Figure 34: Ethiopia – overall preference for different land management alternatives



Shows average weight attributed according to overall preference relative to other land management practices. Note that total exceeds 100%, because interviews cover different combinations of land management practices.

Figure 35: Ethiopia – relative ranking of different land management alternatives



Shows percentage of respondents allocating different ranks to each land management practice.

It is clear that a variety of conditions that serve to encourage, discourage, hinder or facilitate particular land use practices (Table 4). Some of the key features or attributes that make a particular land management option workable for farmers include the ability to lead to tangible improvements in crop yields and soil fertility (which are, in turn, seen as being prerequisites to achieving other positive outcomes such as increased income and better food supply). Conversely, the risk of bringing termites or other pests was generally emphasised as among the most important negative attributes that would serve to make a land management practice less attractive or unworkable. Perhaps one of the most striking findings from the Ethiopia survey is, however, the insight it provides about the way in which farmers' perceptions and preferences differ, depending on their immediate circumstances. Just as people's livelihood needs and constraints vary, so do their aspirations as regards land management choices. These differences are particularly pronounced between different wealth categories, and for male and female farmers. The fact that poorer households lack many basic entitlements

(such as food, education and cash) also influences their ability to take up new land management approaches, and shapes the benefits or outcomes that they seek from them. In contrast, richer households tend to have a much greater choice of land management options open to them, because they have the means and ability to cover the costs of implementing them and are more flexible as to the types of benefits they seek.

Table 4: Ethiopia - summary of land management practices most and least preferred characteristics

	Most preferred characteristic(s)	Least preferred characteristic(s)
Bunds	Maintains soil and its fertility, protects land from floods, restores and maintains soil fertility to give good production, food and income, reduces risk, lasting impacts	High labour demand, blocks passage across land (for moving oxen), requires technical knowhow
Double cropping	Yields quick returns	High labour demand, expensive to implement, requires technical knowhow, risk of termites or other pests
Fertiliser	Improves crop yields, income and food supplies, gives quick results	Expensive to implement, requires technical knowhow
Intercropping	Improves crop yields, allows for two crops	None mentioned
High-quality seeds	Improves yield, reduces risk, lasting impacts, , gives quick results	Expensive to implement, risk of seeds being damaged, requires technical knowhow
Tree planting	Provides products for home use and sale, reduces risk, lasting impacts	Long time to reap benefits, cash us required to buy seedlings, Eucalyptus may dry upland

FINDINGS FROM INDIA

Introduction to the study site

Four interviews were carried out in May 2016 involving four men, spread across four villages and four districts (Asoli in Yavatmal District, Bhangadwadi in Ahmednagar District, Dhamangaon in Amaravati District and Shendwad in Dhule District). Household size in the survey villages ranges from five to six people and farm areas vary between 2.1 - 9.2 ha (one rainfed and the other three irrigated). All of the farmers keep livestock, and none are engaged in business or have household members in employment. Three farmers are engaged exclusively in cash crop production, while one grows crops for subsistence purposes only. The main cash crops grown are cotton, red gram, green gram, horse gram, moth beans, chick peas, soya beans, wheat, sorghum, fodder maize, onions and other vegetables. The main subsistence crops are rice, chick peas, finger millet, maize, groundnut, lentils and peas.

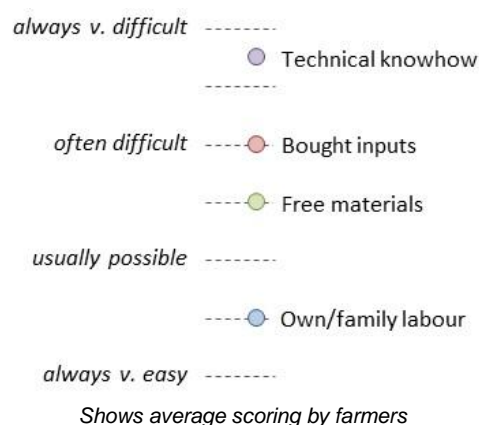
The following four land management practices were discussed with farmers (in addition to the BAU/no CSS baseline): bio-fertiliser, compost, manure and trees/bunds.

Perceptions of land management characteristics & attributes

Costs and input requirements

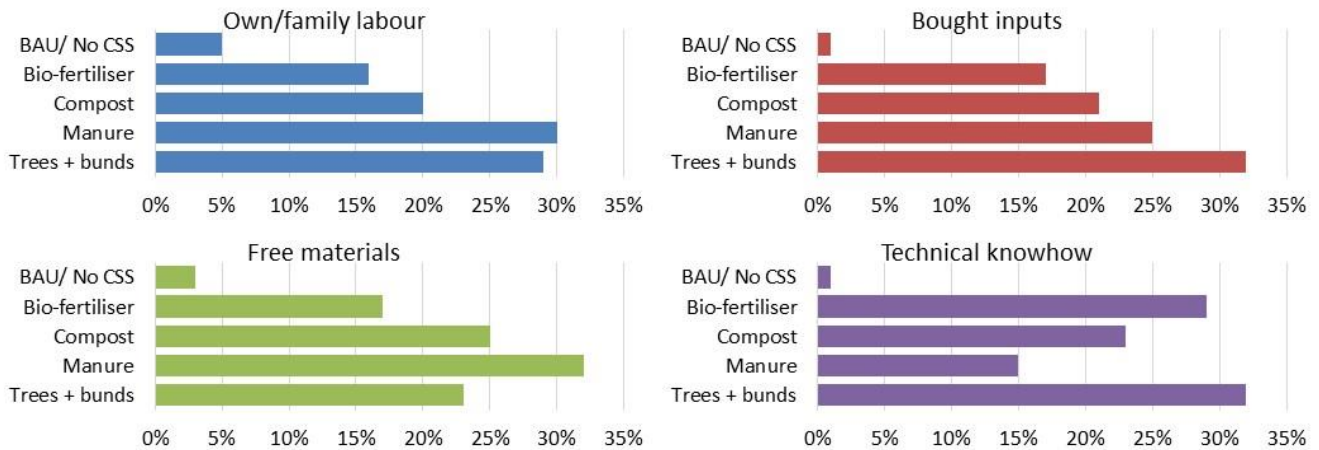
Four categories of costs or inputs were identified as having the most impact on farm decision-making and household livelihoods: own or family labour, bought inputs (including hired labour), free materials and technical knowhow. Whereas most farmers find own/family labour relatively easy to obtain at most times, free materials are considered to be less available and bought inputs are often difficult to afford due to cash shortages (Figure 36). Technical knowhow is considered to usually be very difficult, because information is not easily accessible, and extension officers are often not available.

Figure 36: India – relative difficulty in accessing or affording costs/inputs



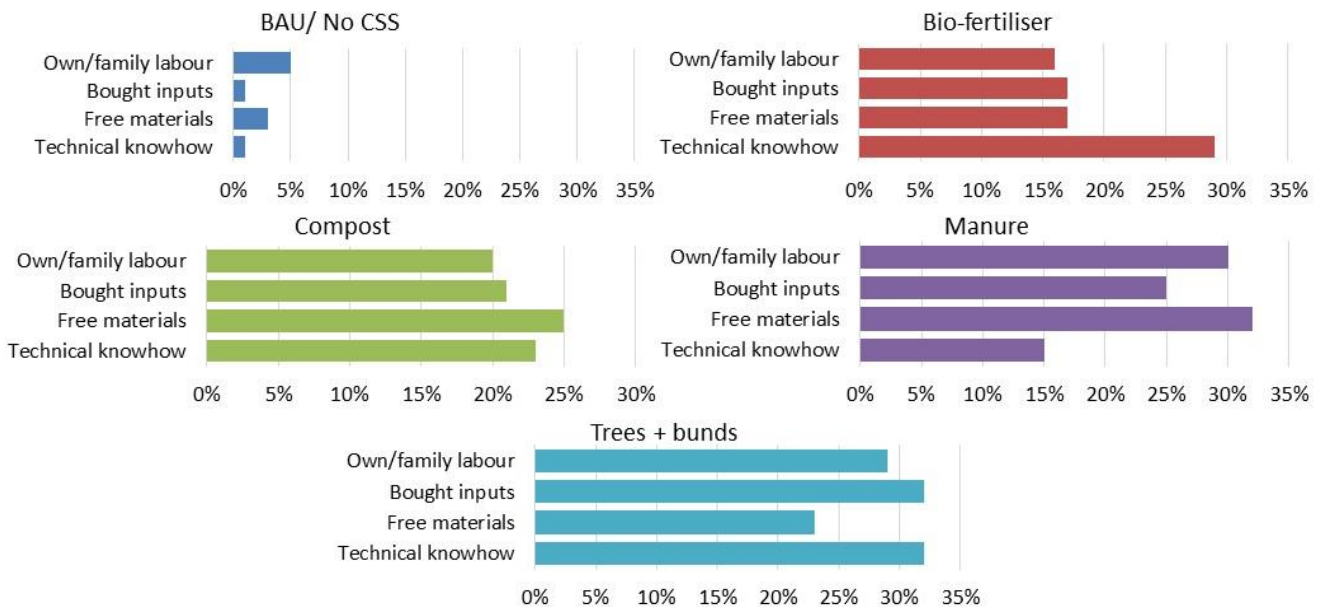
Farmers perceive that BAU/no CSS demands a much lower level of all inputs and spending than other land management practices (Figure 37, Figure 38). Trees and bunds are seen as requiring high levels of all inputs, and manure is also perceived to place relatively high demands on labour, bought inputs and free materials (although the technical knowhow needed to implement it is low as compared to other land management practices). In contrast, bio-fertiliser and – to a somewhat lesser extent – compost, although less demanding of other inputs, require a relatively high level of technical knowhow.

Figure 37: India – land management cost/input requirements (by cost/input category)



Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 38: India – land management cost/input requirements (by land management practice)

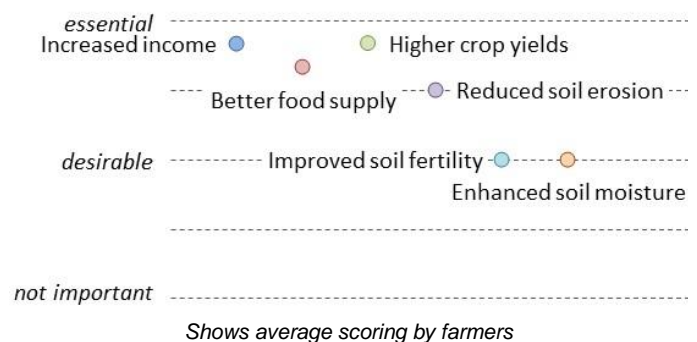


Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Benefits and desired outcomes

Six categories of benefits and desired outcomes were identified to be particularly relevant: increased income, better food supply, higher crop yields, improved soil fertility and enhanced soil moisture. All are considered to be important. Whereas improved soil fertility and moisture are perceived only as being desirable characteristics, reduced soil erosion is deemed to be very important, and higher crop yields, better food supply and increased income are commonly highlighted as being near essential outcomes to aim for (Figure 39).

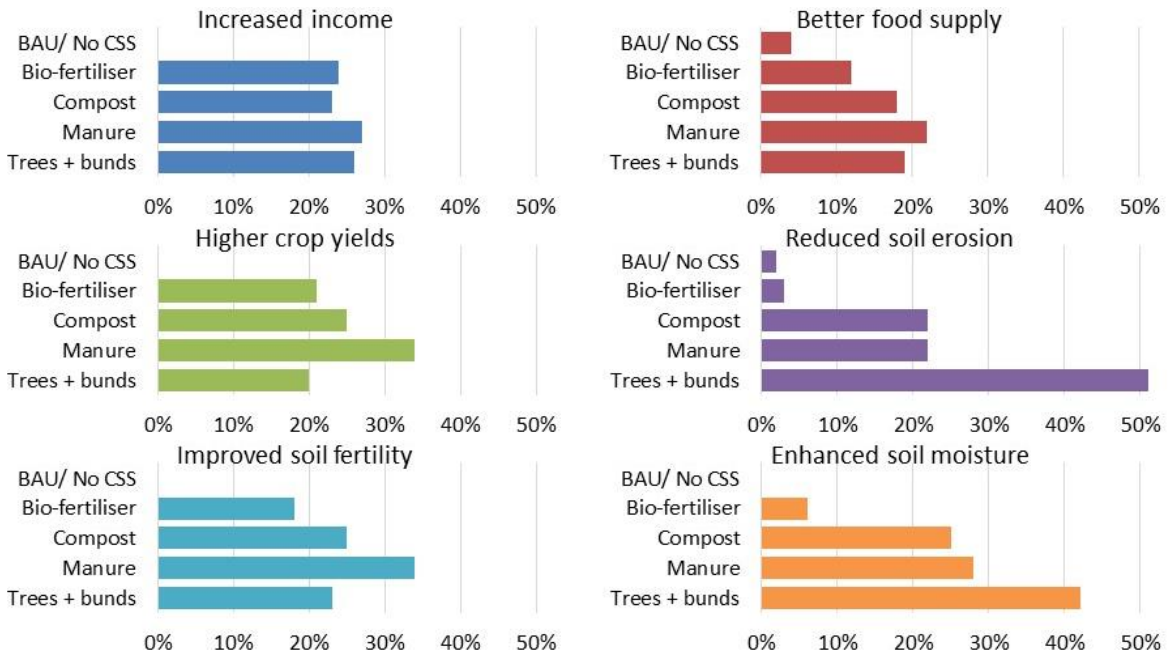
Figure 39: India – relative importance of land management benefits



Shows average scoring by farmers

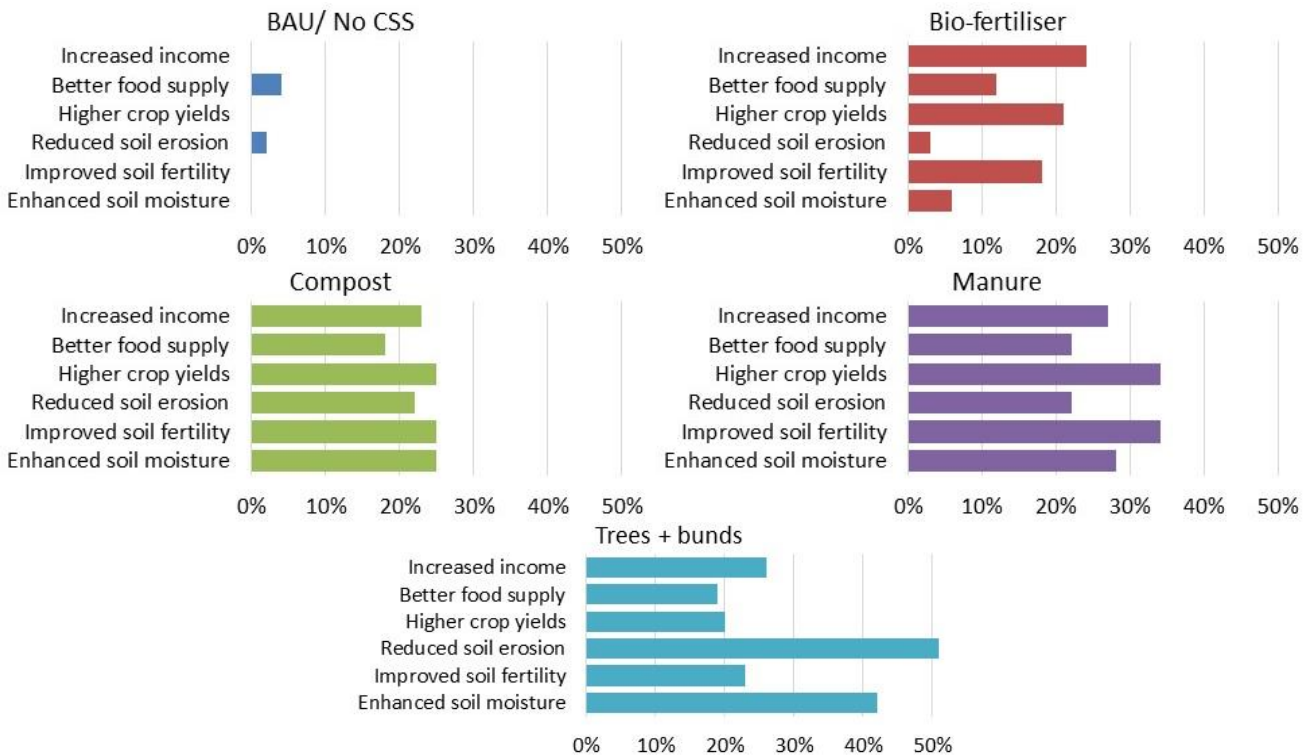
The BAU/no CSS option is perceived to generate zero or low levels of all benefits (Figure 40, Figure 41). Whereas the impact of the other land management options on increased income is similar, bio-fertiliser shows lower improvements in food supply, crop yields, soil erosion, fertility and moisture, while manure performs relatively well in terms of these indicators. The impact of trees/bunds on reduced soil erosion and enhanced soil moisture is particularly pronounced in comparison to other land management practices.

Figure 40: India – achievement of land management benefits (by benefit category)



Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 41: India – achievement of land management benefits (by land management practice)

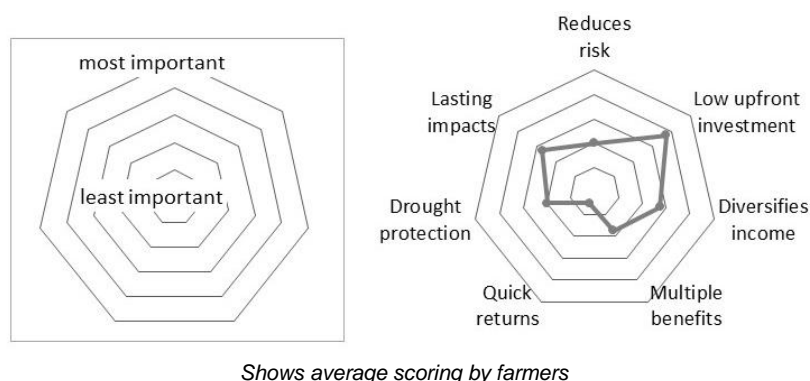


Shows average weight attributed according to achievement of benefit/outcome relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Advantages and positive attributes

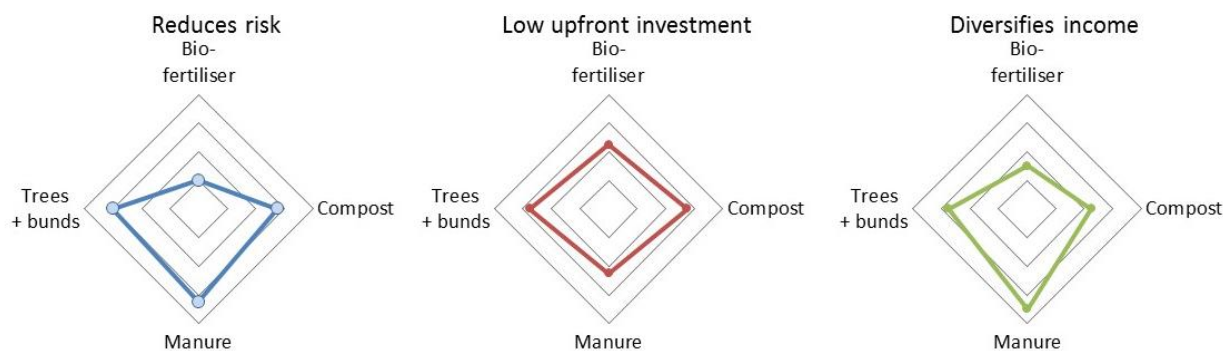
Farmers highlighted seven categories of land management advantages and positive attributes: the ability to diversify income, have a lasting impact, reduce risk, offer drought protection, generate multiple benefits, yield quick returns and only require a low upfront investment. Low upfront investment needs are considered to be of the greatest importance as a factor in land management decision-making, while risk reduction and – especially – the ability to generate quick returns are deemed to be of the least importance (Figure 42).

Figure 42: India – relative importance of land management advantages



The extent to which different land management practices display these advantages and positive attributes shows a similar pattern to their achievement of benefits and positive outcomes. Here, too, bio-fertiliser shows a relatively low achievement in most respects except for its effects on drought protection and ability to generate quick returns (Figure 43, Figure 44). Both manure and trees/bunds perform relatively well in all categories of advantage except for drought protection and, in the case of trees/bunds, quick returns. Compost is flagged as being particularly advantageous in terms of drought protection. The India survey did not include the BAU/no CSS alternative in the ranking of land management practices according to their advantages/positive attributes, so no information is available on this. It should also be noted that some respondents were not asked to rank the land management practices being discussed against the full set of advantages/positive attributes. However, even though some data are missing in relation to quick returns and drought protection, the fact that all respondents were assessing the same set of land management practices means that it is possible to draw conclusions from a reduced sample.

Figure 43: India – extent of land management advantages (by advantage category)



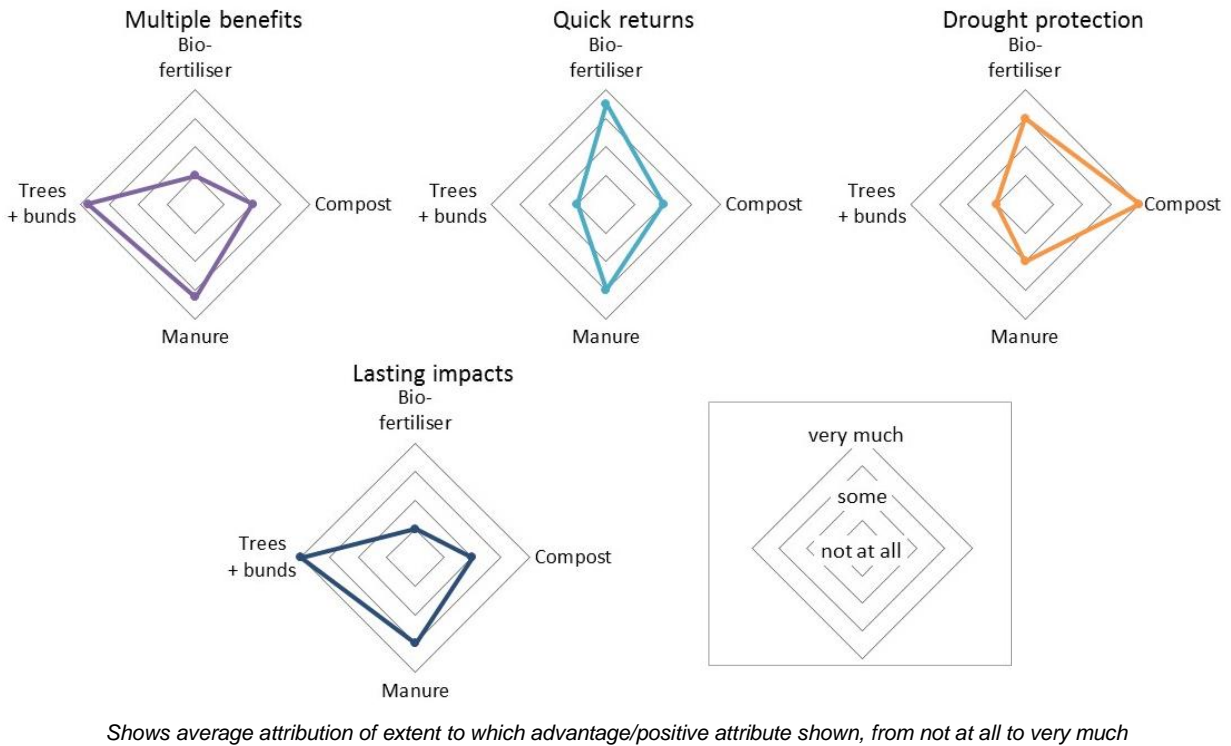
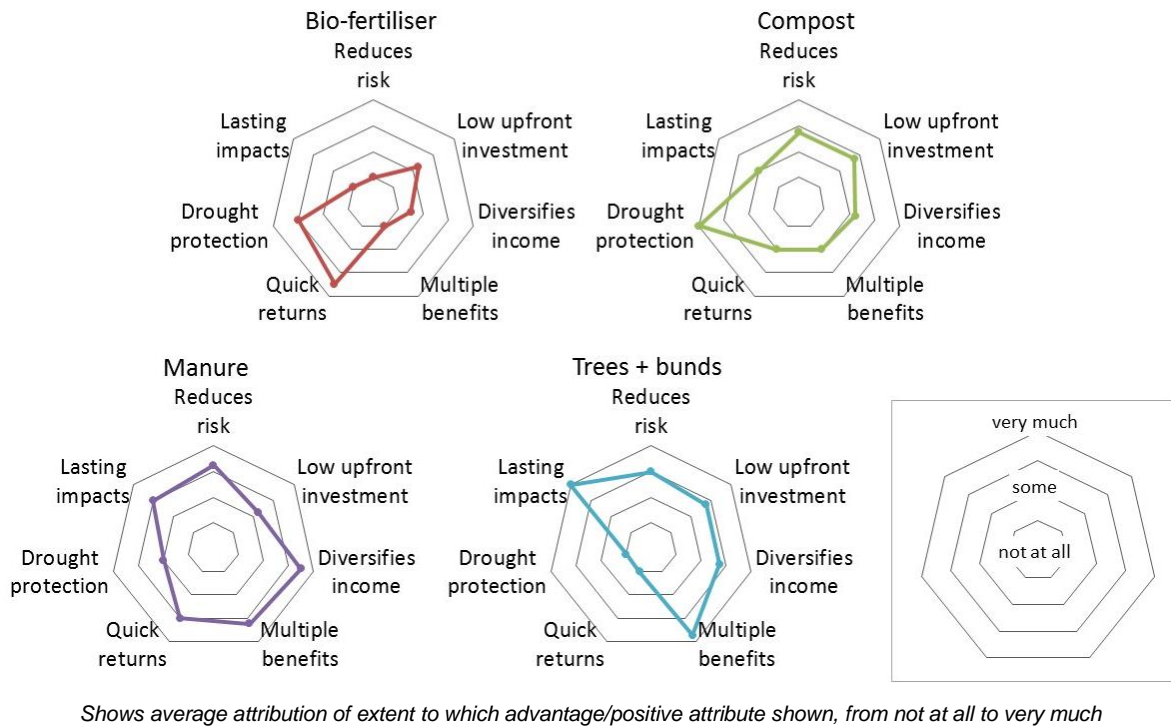


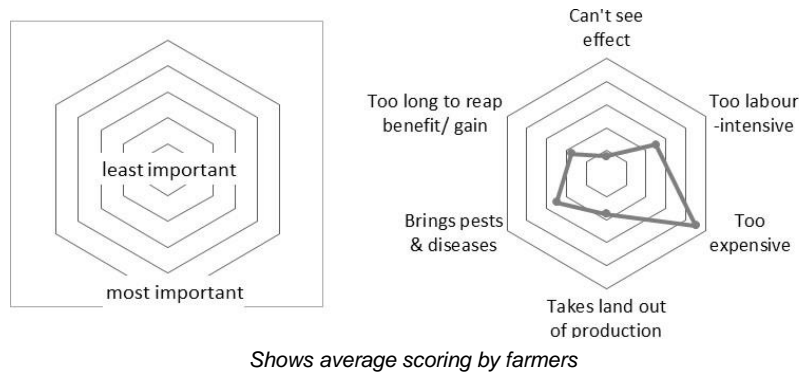
Figure 44: India – extent of land management advantages (by land management practice)



Disadvantages and negative attributes

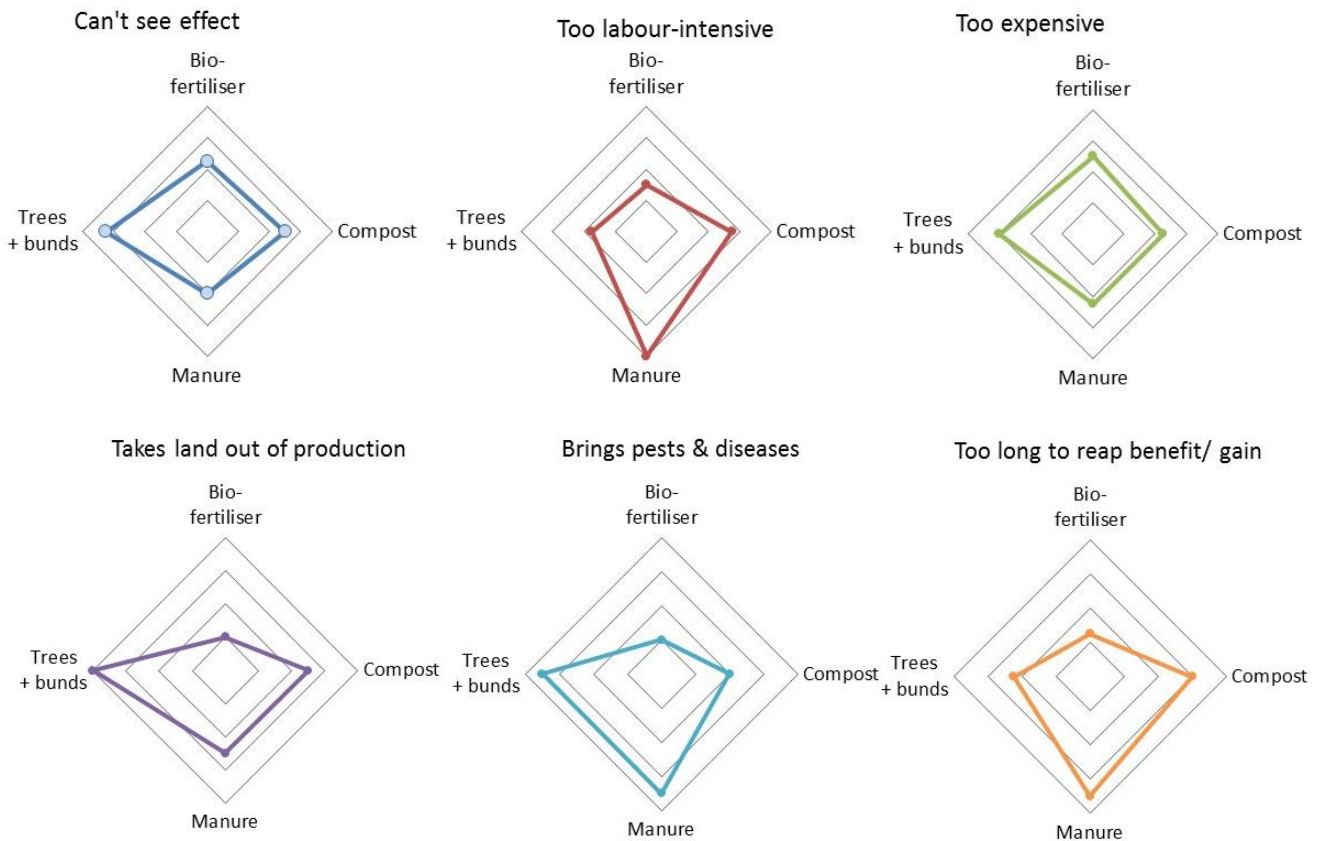
Farmers identified six categories of potential disadvantages and negative attributes in relation to the choice of land management practices: their being too labour-intensive or expensive to implement, taking too long to reap any benefit or gain, bringing pests and diseases, taking farmland out of production, and showing low evidence of any positive effect. Expense was generally flagged as the most binding constraint, while evidence of effects was deemed to be relatively unimportant (Figure 45).

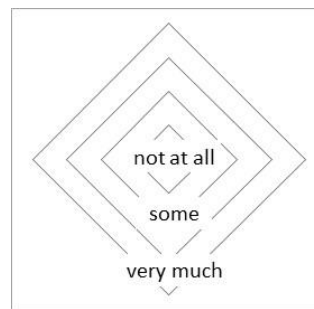
Figure 45: India – relative importance of land management disadvantages



There is only minor difference between different land management practice as regards expense and evidence of impact (Figure 46, Figure 47). However it is interesting to note that in most other cases bio-fertiliser is perceived to manifest relatively low levels of disadvantages, whereas manure and trees/bunds are thought to display fairly high disadvantages as compared to other land management practices in all respects except labour demands (for trees/bunds) and evidence of impact (for manure). As was the case for advantages, compost is generally ranked in the middle as regards displaying negative attributes. The India survey did not include the BAU/no CSS alternative in the ranking of land management practices according to their disadvantages/negative attributes, so no information is available on this. It should also be noted that some respondents were not asked to rank the land management practices being discussed against the full set of disadvantages/negative attributes. However, even though some data are missing in relation to bringing pests and disease, the fact that all respondents were assessing the same set of land management practices means that it is possible to draw conclusions from a reduced sample.

Figure 46: India – extent of land management disadvantages (by disadvantage category)





Shows average attribution of extent to which disadvantage/negative attribute shown, from not at all to very much

Figure 47: India – extent of land management disadvantages (by land management practice)



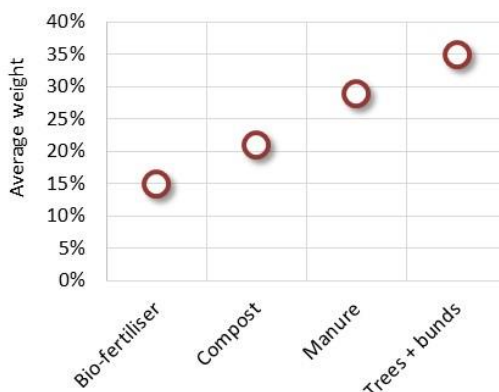
Shows average attribution of extent to which disadvantage/negative attribute shown, from not at all to very much

Overall land management preferences

There is a fairly clear pattern as regards farmers' overall preferences (Figure 48, Figure 49). Trees/bunds are the most preferred land management practice, followed by manure and compost, with bio-fertiliser as the last favoured technique (ranked bottom by all survey participants). The most popular techniques are stated

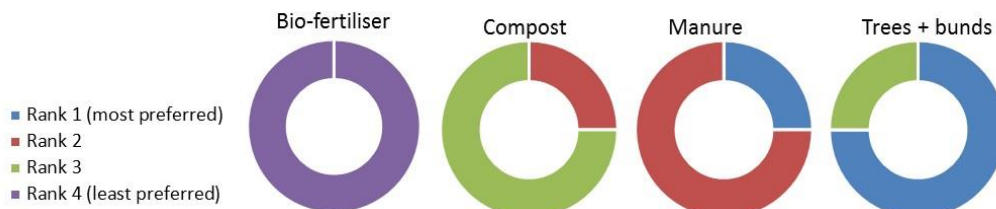
to be those which can yield provide multiple benefits. The India survey did not rank and weight land management practices relative to the BAU/no CSS alternative, so no information is available on this.

Figure 48: India – overall preference for different land management alternatives



Shows average weight attributed according to overall preference relative to other land management practices. Note that total exceeds 100%, because interviews cover different combinations of land management practices.

Figure 49: India – relative ranking of different land management alternatives



Shows percentage of respondents allocating different ranks to each land management practice.

Interesting findings emerge about the array of forces that drive farmers’ land use choices in India, and which make certain options more or less feasible to them (Table 5). While labour availability is not usually considered to be a binding constraint to investments in land management, technical knowhow is recognised to pose a major barrier to uptake. Many farmers do not have the knowledge that is required to implement new approaches successfully, and lack the means to access this information. Relative expense, too, is highlighted as one of the major concerns when choosing between different land management options and low upfront investment needs is identified as an important advantage and sought-after characteristic. A critical concern when selecting new land management approaches is to secure immediate benefits in terms of higher crop yields, better food supplies and increased income. In contrast, longer-term improvements in soil fertility and moisture, although desirable, are not seen as essential.

Table 5: India - summary of land management practices most and least preferred characteristics

	Most preferred characteristic(s)	Least preferred characteristic(s)
Bio-fertiliser	Easy to apply since it doesn't require much time, gives quick benefits, is not expensive, gives diversified income,	Requires more capital, requires technical knowhow, less pronounced impact on crop yields and associated income/food supply gains
Compost	Increased soil nutrition and soil moisture, does not require much capital	Requires technical knowhow, time consuming, high family labour requirement
Manure	Does not require much capital or cash inputs, increases soil moisture and fertility, enhances yields and food supply	High family labour demands (including transportation), time consuming and expensive to implement, can bring pests and disease, takes a long time to reap benefits
Trees + bunds	Has a lasting impact, offers protection to the land, does not require much capital, improves soil moisture and reduces soil erosion	Takes too much land out of production, time consuming, requires technical knowhow, high labour demand, expensive to implement, can bring pests and disease

FINDINGS FROM KENYA

Introduction to the study site

Seven interviews were carried out in July 2016 involving one man and six women, spread across four villages and two counties (Bituyu, Lugusi, Mukangu and Sinoko villages in Bungoma and Kakamega Counties). Household size in the survey villages ranges from five to ten people, cultivated areas vary between 0.6 – 4.2 ha (all rainfed), and all farmers interviewed keep livestock. The main crops grown are maize and beans. Most farmers use their production for both subsistence and sale purposes. Three of the surveyed households include members who are in employment, and just two (both women respondents) are engaged in business.

The following ten land management practices were discussed with farmers (in addition to the BAU/no CSS baseline): compost & manure, contour terraces, crop rotation, farmyard manure, grass strips, inorganic fertiliser, legume intercropping, mulching, Napier strips and residue incorporation.

Perceptions of land management characteristics & attributes

Costs and input requirements

Four categories of costs or inputs were identified for discussion: own or family labour, bought inputs (including hired labour), free materials and technical knowhow. Whereas most farmers find that free materials are almost always easy to obtain, it is perceived that own and family labour, technical knowhow and bought inputs are often difficult to access or afford (Figure 50).

BAU/no CSS is perceived to be much less demanding of costs and inputs than any of the other land management practices discussed (Figure 51, Figure 52). Compost and manure are seen as requiring particularly high levels of labour, bought inputs, free materials and technical knowhow, while grass strips and – to a slightly lesser extent – residue incorporation are generally seen to have relatively low cost/input requirements. Farmyard manure, contour terraces and legume intercropping are considered to be relatively labour-intensive, while compost/manure, inorganic fertiliser and legume intercropping all require higher levels of bought inputs.

Figure 50: Kenya – relative difficulty in accessing or affording costs/inputs

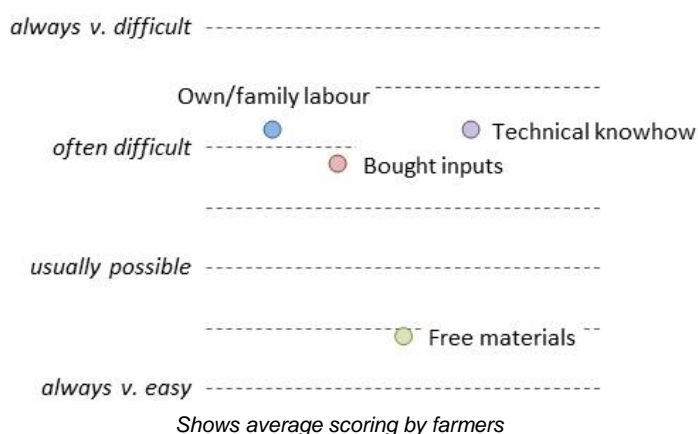
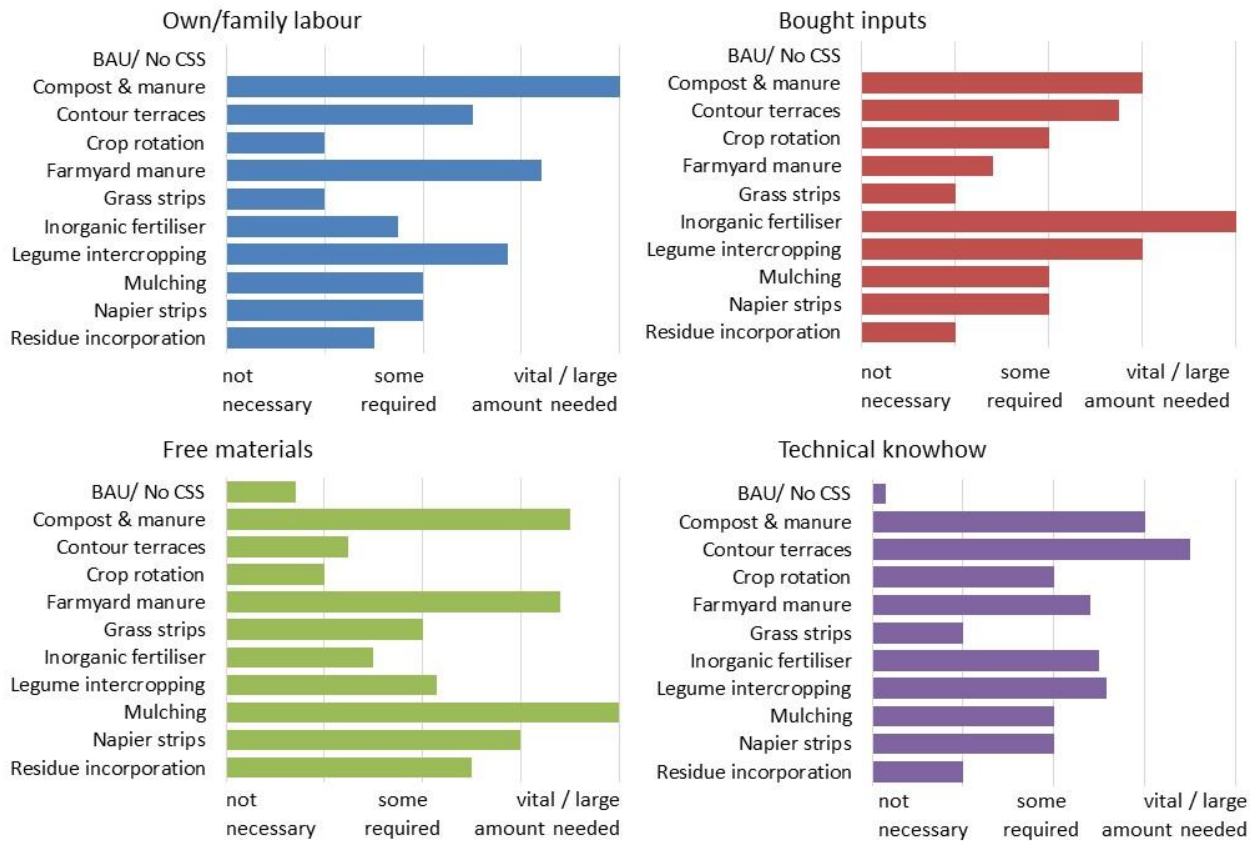
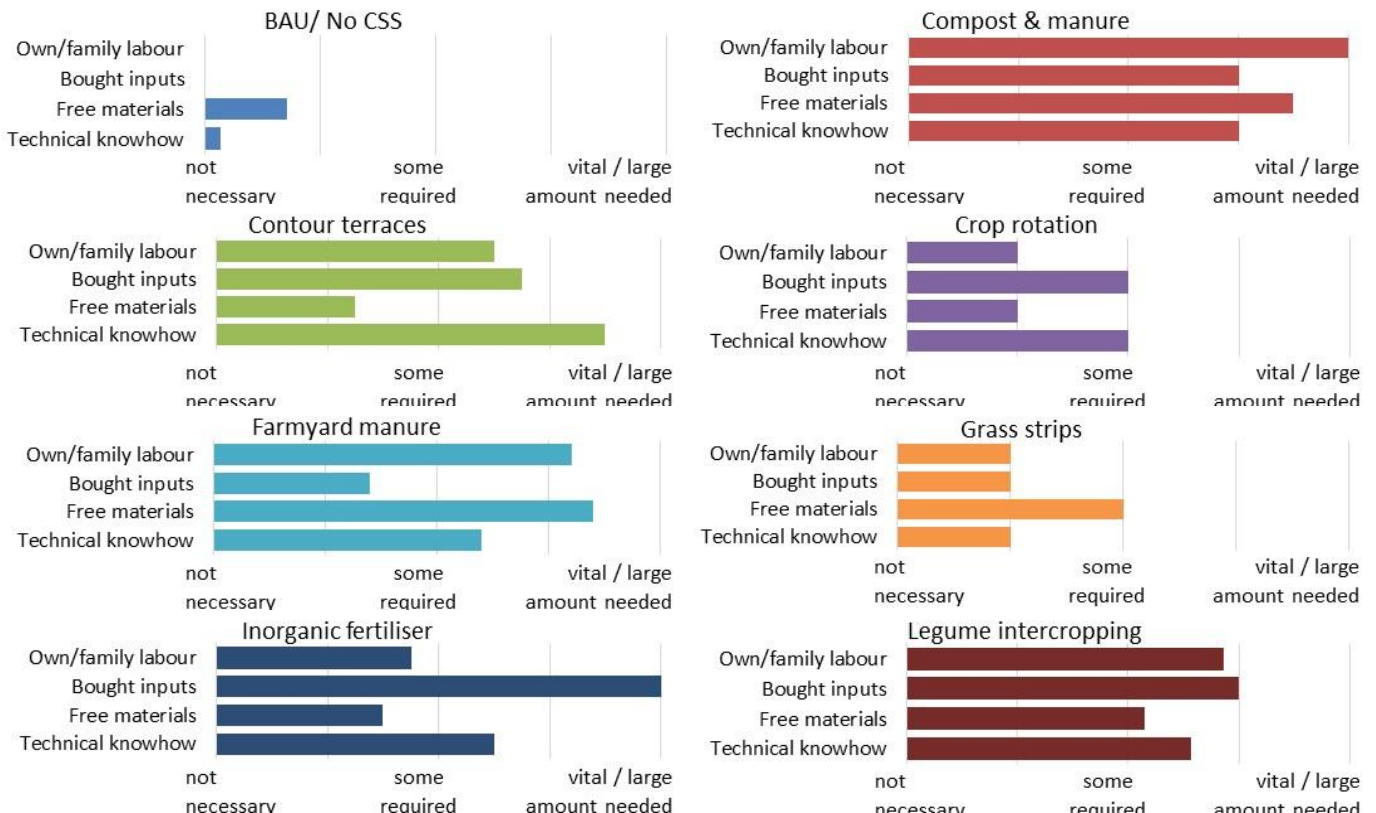


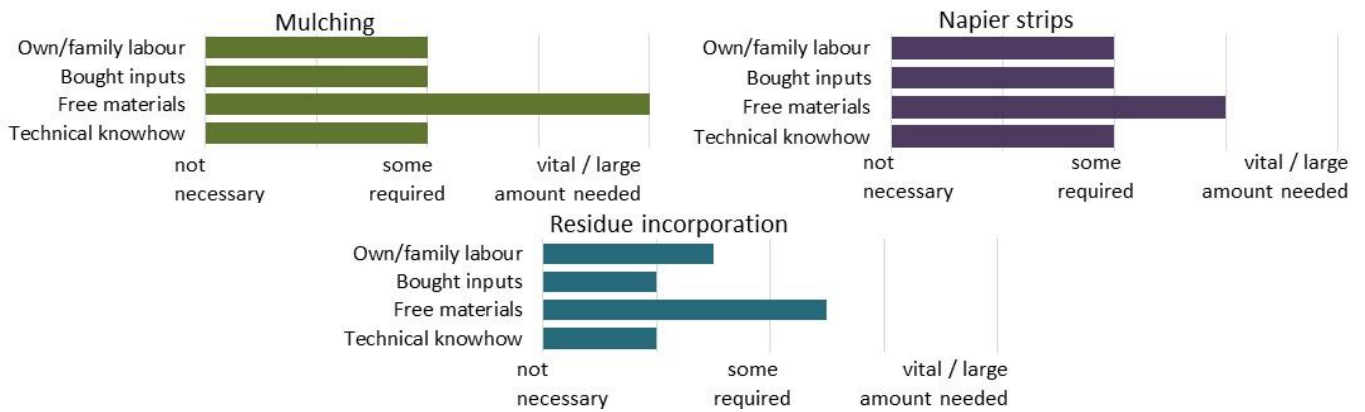
Figure 51: Kenya – land management cost/input requirements (by cost/input category)



Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Figure 52: Kenya – land management cost/input requirements (by land management practice)



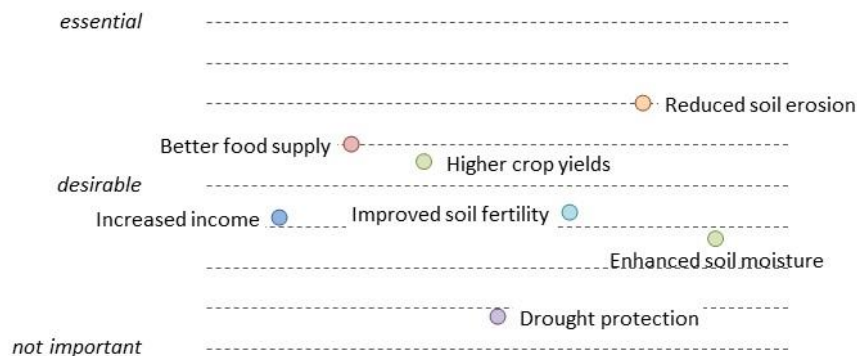


Shows average weight attributed according to requirement for cost/input relative to other land management practices. Note that averages cannot be summed to 100%, because interviews cover different combinations of land management practices.

Benefits and desired outcomes

Seven categories of benefits and desired outcomes were identified: increased income, better food supply, higher crop yields, reduced soil erosion, improved soil fertility, enhanced soil moisture and drought protection. While none are perceived to be essential characteristics in the choice between land

Figure 53: Kenya – relative importance of land management benefits



Shows average scoring by farmers

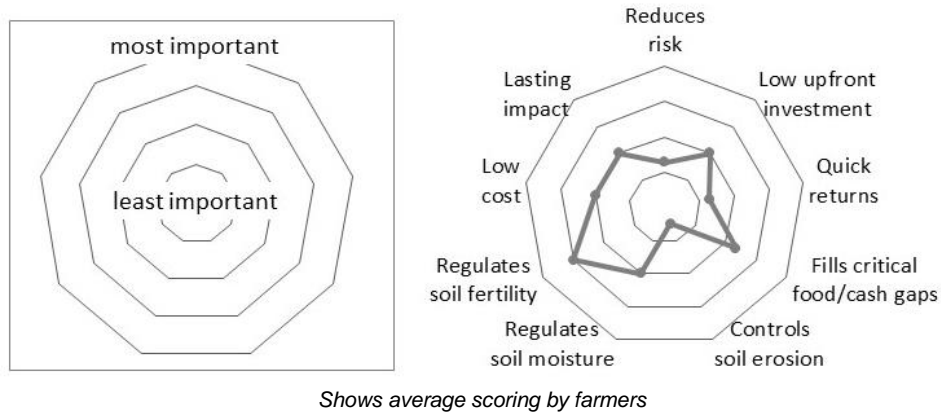
management practices, most are considered desirable, with reduced soil erosion and better food supply being accorded a slightly higher level of importance. It is only drought protection which is generally not considered to be particularly important (Figure 25).

It should be noted that, in the Kenya survey, respondents were not asked to score the land management practices being discussed against the full set of benefits/desired outcomes. Four of the seven specified categories were selectively omitted from some interviews. Because of the small sample size and very large number of land management practices discussed, this results in a very large number of blank entries. These gaps in the results mean that the data from this section of the survey cannot be used, as they cannot be aggregated or compared in any meaningful way.

Advantages and positive attributes

Farmers identified nine categories of advantages and positive attributes: the ability to reduce risk, generate quick returns, have a lasting impact, control soil erosion, regulate soil moisture and fertility, entail low costs, only require a low upfront investment and fill food and cash gaps at critical times of the year. Only soil fertility regulation and the ability to fill food and cash gaps at critical times of the year are considered to be of greater importance, and risk reduction and erosion control are deemed to be of relatively little significance as a factor in land management decision-making (Figure 54).

Figure 54: Kenya – relative importance of land management advantages

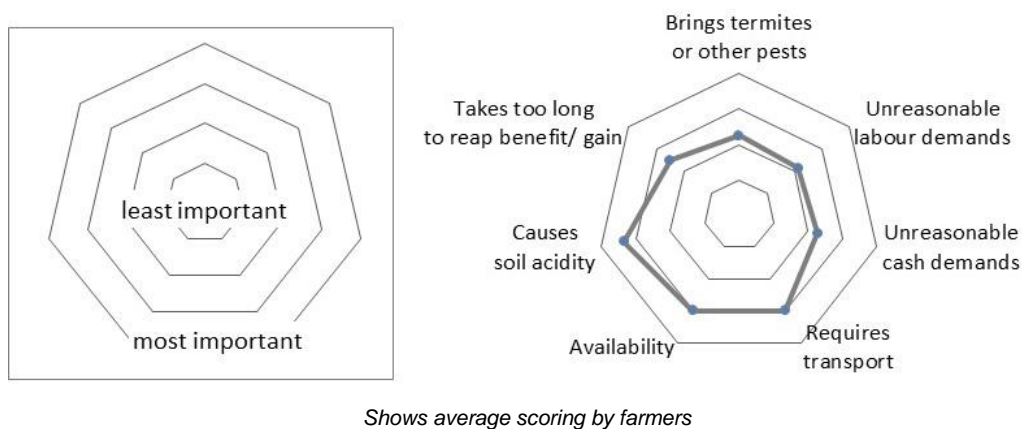


It should be noted that, in the Kenya survey, respondents were not asked to rank the land management practices being discussed against the full set of advantages/positive attributes. All of the nine specified categories were selectively omitted from some interviews. Because of the small sample size and very large number of land management practices discussed, this results in a very large number of blank entries. These gaps in the results mean that the data from this section of the survey cannot be used, as they cannot be aggregated or compared in any meaningful way. In addition, the BAU/no CSS alternative was omitted from the ranking exercise.

Disadvantages and negative attributes

Farmers identified four categories of potential disadvantages and negative attributes in relation to the choice of land management practices: their being too labour-intensive or expensive to implement, taking too long to reap any benefit or gain and bringing termites and other pests. There is little difference in scoring, although soil acidity, requirements for transport and availability were flagged as being of slightly greater importance (Figure 31).

Figure 55: Kenya – relative importance of land management disadvantages



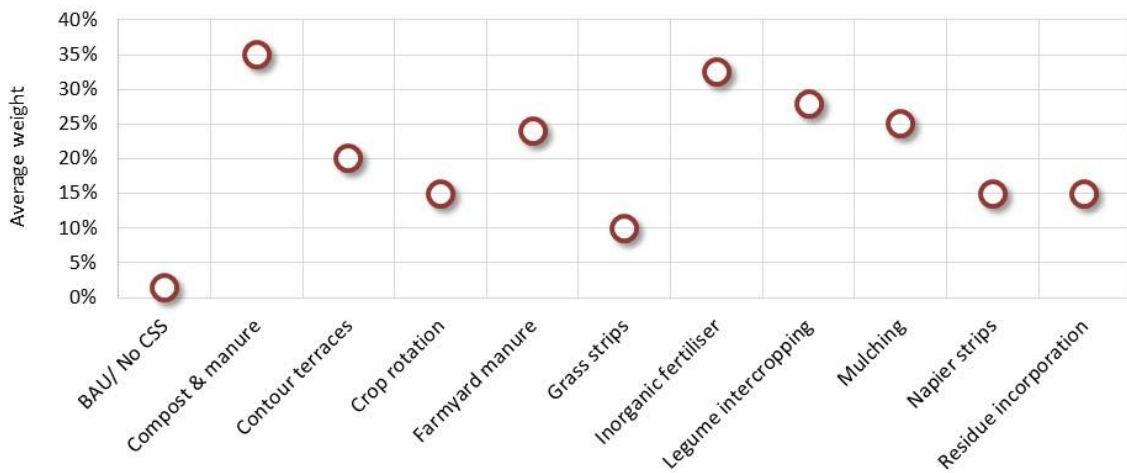
It should be noted that, in the Kenya survey, respondents were not asked to rank the land management practices being discussed against the full set of disadvantages/negative attributes. Five of the seven specified categories were selectively omitted from some interviews. Because of the small sample size and very large number of land management practices discussed, this results in a very large number of blank entries. These gaps in the results mean that the data from this section of the survey cannot be used, as they cannot be

aggregated or compared in any meaningful way. In addition, the BAU/no CSS alternative was omitted from the ranking exercise.

Overall land management preferences

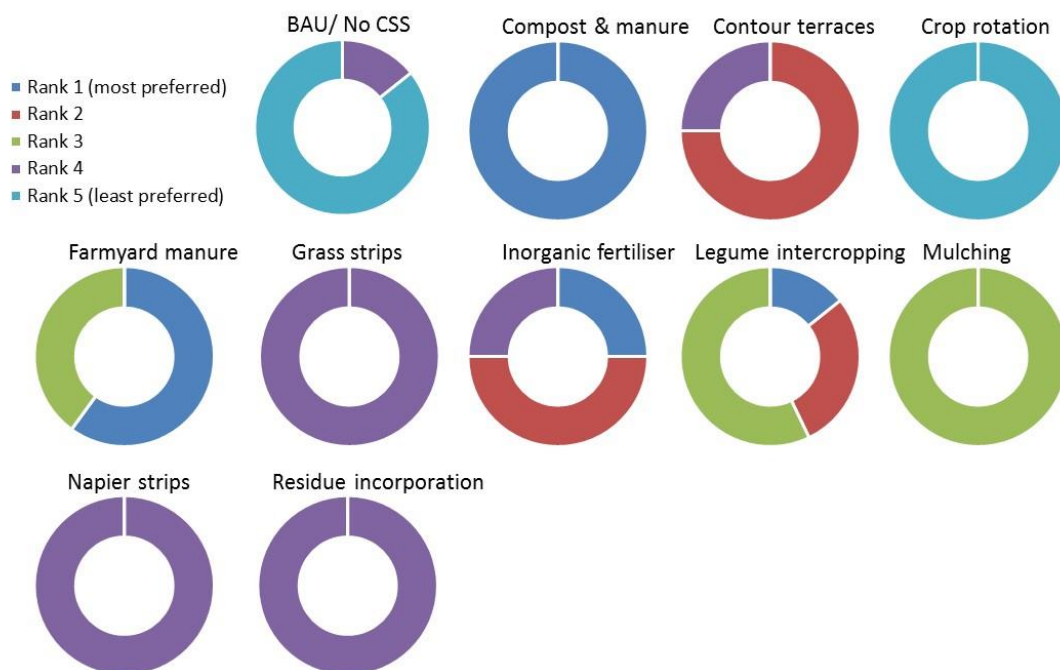
Business as usual is consistently ranked below all other land management practices as being the least preferred option (Figure 56, Figure 57). Compost and manure is consistently the most preferred (always ranked first above other techniques), with inorganic fertiliser and legume intercropping also emerging as relatively favoured techniques. Meanwhile, farmers show a relatively low preference for grass strips as compared to other land management options.

Figure 56: Kenya – overall preference for different land management alternatives



Shows average weight attributed according to overall preference relative to other land management practices. Note that total exceeds 100%, because interviews cover different combinations of land management practices.

Figure 57: Kenya – relative ranking of different land management alternatives



Shows percentage of respondents allocating different ranks to each land management practice.

The survey uncovers a number of important issues and concerns that shape and influence the way in which farmers perceive and choose between land use alternatives in Kenya (Table 6). Most farmers face difficulties in accessing labour, bought inputs and technical knowhow, meaning that any land management practice which places heavy demands in these areas is likely to be difficult to implement or sustain. Respondents emphasise the importance of soil fertility and food supply effects in shaping the relative viability of land management alternatives, particularly emphasising those techniques which can assist in evening out or overcoming food and cash shortages across the year.

Table 6: Kenya - summary of land management practices most and least preferred characteristics

	Most preferred characteristic(s)	Least preferred characteristic(s)
Compost & manure	Good yields, soil fertility	Labour intensive, requires large amount of rainfall, needs technical knowhow
Contour terraces	Controls soil erosion, reduces water passage which reduces mosquitoes	Labour intensive, demands cash
Crop rotation	-	-
Farmyard manure	Retains soil moisture, does not introduce chemicals into the environment, improves food supply	Can introduce pests and termites, leads to scorching of plants, labour intensive
Grass strips	Controls soil erosion, provides a source of fodder for animals	Draws down soil moisture, especially in dry seasons
Inorganic fertiliser	Provides a source of income, increases food production, improves soil health	Can lead to soil acidity, high cash needs
Legume intercropping	Provides multiple benefits (soil fertility, good yields, more harvests), gives quick gains, reduces risk, increases food supply	High cost, requires large amounts of manure and/or fertiliser, labour intensive
Mulching	Enhanced soil moisture, erosion control	Can bring termites, requires large amounts of labour
Napier strips	Reduces soil erosion	Stunts growth of main crop
Residue incorporation	Minimal labour demands, retains soil moisture and enhances soil fertility	Can introduce pests and termites

GENERAL CONCLUSIONS

Common themes regarding farmers' land management preferences and decision-making criteria

This study set out to investigate what farmers in Benin, Burkina Faso, Ethiopia, India and Kenya perceive as the main inputs, outcomes, barriers and enabling conditions that influence their uptake (or rejection) of different land management practices. It sought to identify the various costs, benefits, advantages and disadvantages that they seek (or strive to avoid) when making land management choices. While there remain key differences between (and within) the study sites, certain common findings emerge.

Two important themes, in particular, should be emphasised concerning farmers' economic perceptions, preferences and decision-making criteria as regards land management choices:

- One is the critical importance of taking account of farmers' constraints and limitations as concerns their ability to access cash, labour and technical knowhow. Even when a land management technique may be perceived to be of great interest and high potential benefit, many farmers are simply not in a position to allocate the extra items that are required to implement it. In all of the countries, high demand for bought inputs was frequently cited as posing the greatest barrier to investing in new land management measures, and considerations of expense were seen as a primary factor influencing farmers' preferences and choices between different techniques.
- Another insight that emerged across the different countries was the emphasis given to the multiplicity and additionality of potential benefits or desired outcomes. In most cases, farmers stated that they do not merely strive to achieve one outcome or maximise a single stream of benefits when they make land management choices. Rather, it is the array of values, and the interactions between them, that matter and shape their preferences. The most desirable and viable land management alternatives are seen to be those which not only increase the flow of physical products (for example cash, food and other items), but also enhance livelihood diversity and security (such as filling critical food and cash gaps over the course of the year), at the same time as helping to secure longer-term improvements in the production base (most importantly soil fertility and moisture).

Broader insights on the assessment and design of CSS measures

The study findings also serve to underline a number of important general points relating to the assessment and design of CSS measures – and to identifying CSS practices and portfolios which will be the most effective, viable and sustainable in terms of on-the-ground impact. These lessons extend beyond just the partner countries of Benin, Burkina Faso, Ethiopia, India and Kenya.

Traditionally, there has often been a tendency for agricultural research to focus on the farming 'improvements' and technical/technological 'fixes' that will deliver the greatest impacts in terms of physical measures such as crop yields, soil fertility or cash profitability. It is assumed that the ability to demonstrate these gains will automatically translate into measures that will benefit farmers the most, and that they will thus find attractive, viable and easy to take up and sustain.

The insights provided by farmers in the five countries however make it clear that these type of simple, one-dimensional measures of cash profitability or crop productivity do not serve as adequate indicators of farmers'

needs, aspirations or preferences as concerns the 'best' land management options. In reality, the situation is far more complex. The most preferred land management are not necessarily those that yield the highest production gains, generate the greatest income, or entail the lowest costs (the characteristics that would traditionally be deemed important when land management interventions are designed). Farmers employ a much more sophisticated series of metrics to determine the desirability and viability of different land management options, measure their desired effects, and weigh up their advantages and disadvantages. These do not just concern cash costs and benefits or physical inputs and outputs, but encompass a wide array of monetary and non-monetary factors (such as the type and diversity of benefits generated and costs incurred, their timing, certainty, risk and relative ease of delivery). Unless these broader needs and preferences are identified, and addressed in the land management 'solutions' that are presented to farmers, CSS measures are unlikely to be acceptable, effective or sustainable in practice.

The idea of farmers' preferences as being shaped by a complex array of economic conditions, circumstances, needs and aspirations also has implications for the design of both CSS portfolios and the policy interventions which accompany them. Many of the farmers that were interviewed in the surveys did not feel themselves to face an open choice about which land management option to pursue. They are not in a position to undertake measures that they prefer the most, consider to be most desirable in meeting their economic and livelihood needs, or perceive as having the greatest effect on soil protection and rehabilitation. Rather, they carry out those that they are able to accomplish, given their endowments, capacities and the resources available to them.

It is of critical importance to make efforts to pinpoint the ways in which farmers' economic circumstances hinder them from selecting their most preferred land management options, if they are to be enabled to unlock this potential – and to take up and sustain 'first best' CSS measures. This means identifying the gaps that exist between the land management options that farmers prefer and those that they are actually able to undertake. In many cases it is structural conditions (such as poor access to markets, unavailability of credit, lack of cash or pervasive poverty) that constrain farmer's willingness and ability to invest in CSS (or, conversely, encourage or even force them into situations which result in soil degradation). Without addressing farmers' underlying circumstances or addressing the barriers that these pose in terms of preventing particular land management choices, many of the CSS options that are recommended are likely to remain beyond their reach.