Use of direct incentives and profitability of Soil and Water Conservation in Eastern and Southern Africa.

Preliminary analysis of WOCAT data.

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Summary

The World Overview of Conservation Approaches and Technologies (WOCAT) has collected information on Soil and Water Conservation (SWC) approaches and technologies in 15 Eastern and Southern African countries. A total of 38 different approaches covering over 50 technologies served as a basis for this analysis. The purpose of the paper is to present WOCAT results for Eastern and Southern Africa relating to the use of incentives in SWC and the profitability of SWC.

Although 80% of the projects investigated by WOCAT used some kind of incentive, these incentives did not represent an important part of the budget in most of the projects analyzed. Most WOCAT contributing SWC specialists did not perceive the use of incentives as a major problem in sustainable adoption of SWC.

An indicative benefit –cost analysis was carried out using investment and maintenance costs as well as change in production value within the first 10 years. The data are based on the respondents' perceptions and estimation, as well as on project data. The results should be considered as preliminary, and indicating orders of magnitude only. The median of the establishment costs is US$ 150 per ha (ranging from below US$ 20 to over US$ 1000 per ha). Most maintenance costs were between US$10 and 50. 34% of all technologies had benefit-cost ratios below 1 (benefit is smaller than investment and maintenance costs); 13% had benefit-cost ratios between 1 and 2; 24% had a benefit-cost ratio of more than 2; and 29 % of the respondents provided insufficient data. Whether projects promote technologies that are profitable to farmers or not, they tend to use incentives in a similar way. In general, SWC specialists had considerable difficulties providing information on all the costs and benefits of SWC. This reflects weak monitoring systems and indicates a need for further investigation into the economics of SWC.

1. Introduction

The World Overview of Conservation Approaches and Technologies (WOCAT) collected data on Soil and Water Conservation (SWC) approaches and technologies in 15 Eastern and Southern African countries in1995. A total of 38 different approaches covering over 50 technologies served as a basis for this analysis (see Table 1). These data are part of the global activities of the WOCAT programme, which aims to collect, analyze and disseminate promising and successful examples of SWC approaches and technologies (see Box).

Incentives are frequently used instruments in SWC projects and their role in adoption/ non-adoption of technologies is keenly debated. The question of incentives is therefore obviously an important topic in discussions of SWC approaches. The purpose of the present paper is to present WOCAT results for Eastern and Southern Africa relating to the use of *direct* incentives in SWC and the profitability of SWC. This paper provides an overview of current practices regarding incentives, and

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shows both the extent to which incentives are used and the problems involved. We also link incentives to the profitability of SWC technologies and analyze the costs and benefits to the individual farmer. We ask whether the benefits of SWC technologies outweigh the cost of their establishment and maintenance, and in which situations the use of incentives appears to be justified. Finally, we discuss the significance of these findings for on-going and future SWC projects and programmes.

Experiences with SWC were collected from SWC specialists in Eastern and Southern Africa through the use of questionnaires. These specialists, who are experienced in the implementation of SWC in projects or within Government, Non-Governmental Organizations or within research organizations, provided the information during regional workshops. The results represent their personal, professional assessment of the SWC activities based on data where available, and estimations where not. It should be noted that the data analyzed are based on the first edition (1995) of the WOCAT questionnaire on SWC Technologies and Approaches. This questionnaire has been improved in the meantime to facilitate the collection of more precise data. Furthermore, the data have so far only undergone preliminary quality control. However, they do provide a unique opportunity for a comparative analysis of SWC based on a common framework for evaluation.

What is WOCAT?

The World Overview of Conservation Approaches and Technologies (WOCAT) is a world-wide programme
- launched in 1992 by the World Association of Soil and Water Conservation (WASWC)
- organized under a consortium of international institutions
- coordinated by a Management Board

What does WOCAT do?

The goal of WOCAT is to contribute to sustainable use of soil and water through
- collection
- analysis
- presentation
- dissemination of soil and water conservation (SWC) technologies and approaches world-wide

How does WOCAT operate?

WOCAT
- uses a standardized framework for the evaluation of SWC, which includes questionnaires and a database system
- supports regional and national institutions
- assists in organizing regional and national SWC workshops
- creates openly accessible databases
- analyzes and exchanges collected information
- produces and disseminates outputs

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2. Analysis of the use of direct incentives

2.1 Data available regarding direct incentives

We follow a definition which distinguishes between *direct* and *indirect* incentives(IFAD, 1996; Enters, 1998). *Indirect* incentives – for example pricing policies, taxes, subsidies etc – are aimed at improving the economic environment, as well as influencing land tenure, decentralisation of decision making, development of markets and so forth. *Direct* incentives on the other hand are more specific and are generally designed for particular purposes at the project and programme level (Enters, 1998). Direct incentives are typically targeted at individuals or groups of potential 'beneficiaries'.

The WOCAT questionnaires collect data on direct incentives in the following categories:

- Compensation for labour (food-for-work, cash-for-work, rewards with other incentives)
- Support with equipment (e.g. tractors, graders, help in construction, provided free of charge, at subsidized cost, or at full charge)
- Other inputs provided (seeds, seedlings, fertilizer, biocides, community infrastructure, hand tools)
- Credit

In this study, the term incentive therefore refers to this type of *direct* incentives.

2.2. Results

Thirtyeight approaches to the implementation of SWC (see Table 1) were investigated through WOCAT by means of questionnaires completed by SWC specialists with first-hand knowledge of the project analyzed (who we shall refer to here as "WOCAT contributors"). The extent to which incentives are used is summarized below.

Extent of use

- About 20% of all projects used no incentive at all (Figure 1)
- About 50% of all projects compensated farmers for labour (Figure 1), of which more than one third used Food-For-Work
- Farmers were supported with equipment in about 50% of the cases
- Other inputs were provided in more than 60% of the cases: seedlings, hand tools and seeds were the inputs most frequently provided (Figure 2)
- Credit was used in only 5% of the cases (two projects)
- Incentives accounted on average for about 4% of the total project budget (minimum 0%, maximum 83 %; see Figure 3)

Compensation for labour and support with equipment are the most frequently used incentives, although a range of other incentives is very often used. On average, however, incentives do not account for a great proportion of the budget, so our concern is not primarily with the absolute cost of this instrument.

Respondents' perception of the impacts of incentives

About 70% of the WOCAT contributors (Figure 4) perceived the potential long-term negative impact of incentives to be *low or non-existent*. The reason most frequently given was that the incentives were relatively insignificant in terms of value and that it was made clear from the beginning that these incentives would be phased out with the end of the project (see Table 2). Some

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of the contributors gave explanatory answers that shed light on the way that incentives are believed to work. Two example illustrate a common viewpoint : *"The community expects small-scale incentives in terms of hand tools"* and, *"Farmers would expect more social infrastructure in exchange for more SWC activities to be implemented on their land, therefore without such incentives no actions would be taken"*. Incentives are often believed to be harmless in the long term, but projects need incentives to influence farmers' behaviour in the short term. On the other hand, a critical analyst might add that these kinds of expectations by farmers endanger the prospects for replication beyond the projects' boundaries and time horizon. It can be concluded, however, that most WOCAT contributors have quite a positive view of the use of incentives in the projects evaluated[1].

However, a significant minority believes that incentives do have a moderate or very negative influence in the long term. The reasons given include the fear of creating dependency, disturbing the relation of farmers with extension officers when incentives are withdrawn, as well as the difficulty in approaching other farmers when funds for incentives are lacking.

The questionnaire also asked whether incentives had changed during the project's lifetime. 45 % of respondents said that incentives had indeed changed over time. In most cases the incentives tended to be reduced. The following reasons were mentioned: financial constraints, fear of creating dependency, and reduced sustainability.

In another question, the WOCAT contributors were asked whether errors had been committed in the course of the project. 66% of respondents agreed that errors were committed. However, errors related to the use of incentives were mentioned only once. The most common were errors related to land tenure, gender and participation.

2.3 Preliminary conclusion regarding the use of incentives

Although 80% of the Southern and Eastern African projects investigated by WOCAT use some kind of incentive, these incentives do not represent an important part of the budget in most of the projects analyzed. The majority of WOCAT contributors do not perceive the use of incentives as a major problem in implementation of successful SWC. They believe that incentives are being used in their projects in a way that does not represent an impediment to the sustainability of interventions. However, they indicated that there may be problems: the most frequently mentioned problem was the danger of creating dependency. A close look at the responses shows that there were some doubts about whether the results achieved with incentives would be sustainable over the long term and replicable beyond the projects' boundaries.

It is important to take two points into consideration when discussing these results:

- WOCAT mainly reviews promising or successful results: therefore it does not constitute an analysis of the use of incentives in *average* SWC projects
- It is the perception of the SWC specialists that is being analyzed. The reality behind these perceptions may be still more complex.

However, these results give some indication of current practices. They can be used as a basis for a more informed discussion on the problems and as a benchmark for further analysis .

[1] NB: the question was phrased in a way that asked for the *negative* impacts. This will be changed in next edition of questionnaire, since it would be useful to check also for positive experiences.

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3. *Preliminary benefit-cost analysis*

3.1. Data and methodology

The WOCAT questionnaire collects the following information, which can be used for a simple benefit-cost analysis (all data per hectare):

- Investment costs and investment period
- Maintenance costs
- Initial production value without SWC
- Change (increase or decrease) of production value after ten years without SWC (in %)
- Change (increase or decrease) of production value within the first few years (with SWC)
- Change (increase or decrease) of production value within 10 years (with SWC).

It is important to be clear that the data presented are based on an "expert" estimation by the WOCAT contributors. In many cases, the respondents did not have economic studies available that would provide the necessary data. Therefore this analysis is based on the perception of the respondents regarding production increases and costs involved. The data generally are to be considered as estimates. A scenario of production change over 10 years, based on the above data, was calculated for each individual case. This scenario shows the benefits and costs of the SWC technologies to the individual land user. It allowed calculation of the discounted net present costs and benefits[2] of the SWC technology as well as Benefit-Cost Ratios and Net Present Value as an indicator of profitability[3]. More precise information will be collected through the revised questionnaire.

The analysis is based on market values of the goods produced and the costs of inputs, as provided by WOCAT contributors. Cost for labour includes hired and also family labour. This type of analysis is often called financial analysis and aims at measuring costs and benefits of an investment as seen from the farmer's point of view. Since the data provided by WOCAT also includes non-cash costs and benefits (production for home consumption and family labour for instance), we use in this paper the general term "benefit/cost analysis"[4]. The purpose of this analysis is to determine whether or not the proposed investment is attractive to the farmer, including also non-financial costs and benefits. We also use the term "profitability from the farmer's point of view" to describe this "financial " attractiveness to farmers.
Off-farm costs and benefits of the SWC technologies are not included in this analysis. We do therefore not provide, due to lack of data, an analysis of the cost and benefits from the point of view of society as a whole. Such an analysis would be called economic, or social, analysis. The results of our analysis have to be seen as indicative, providing orders of magnitude only.

[2] The methodology requires that future costs and benefits be discounted, i.e. benefits and costs accruing in the distant future are valued less than benefits and costs that arise today. For a description of methodologies and examples of benefit-cost analyis as applied to agriculture, see Gittinger (1982) and FAO (1986)
[3] See Gittinger (1982) for an explantion of these indicators
[4] FAO (1986)

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3.2. Results of cost/benefit analysis

Investment and maintenance costs

The median establishment cost is US $ 150per ha (Figure 5). The establishment costs vary greatly from below 20 to over US $ 1000 per ha. In a number of cases information on this topic was not available; these cases were subsequently excluded. For maintenance costs, the median of the responses was US $ 20 per ha per year, with the majority costing between US$10 and US $ 50 per ha per year (Figure 5).

Benefits of SWC

The benefits of SWC measures consist of the productivity gains (for instance through water or soil conservation) minus the productivity gains which would also occur without SWC. Contributors indicated that productivity increased as a result of SWC between zero and over 200% (Figure 6).

It is interesting to note that even without SWC, a slight increase in productivity on average (in current prices) is expected (a median of US $ 15 per ha). This indicates that on average the contributors did not base their predictions on a "catastrophic" scenario which foresaw a rapidly decreasing state of the resources. The current production values of the land, on which the technology was applied are presented in Figure 5.

Indicators of profitability

The benefit-cost ratio (BCR) is presented (Table 3) as one relevant indicator of profitability from the farmers' point of view. The benefit-cost ratio basically compares the benefits and the costs of an investment in soil and water conservation. The BCR is a rather straightforward and very important indicator in analyzing the motivation for the land user created by the profitability of SWC. If the benefit-cost ratio is above 1, then the benefits of an investment are greater than the cost, and the investment is profitable. Such SWC measures should therefore be attractive to the individual land user. Additionally the Net Present Value of the SWC measures was calculated, which gives an indication of the magnitude of the expected benefits.

The results of the *benefit-cost* analysis (at an annual discount rate of 15%) may be summarized as follows (Figure 7and Table 4.):

- 34% of all technologies had benefit-cost ratios below 1. This means that calculated over a period of 10 years, the (discounted) benefits are smaller than the investment and maintenance costs: from the point of view of the farmer, the benefits are less than the costs involved.
- 37% had benefit-cost ratios above 1, of which
- 24% had a benefit-cost ratio greater than 2.
- 29% of the respondents provided insufficient data.

The sensitivity analysis shows that the results are not very sensitive to the choice of the discount rate. This is because the technologies are very different regarding the pattern of costs and benefits. Some of the highly profitable technologies have almost no cost involved, a high discount rate therefore results in little change to the BCR.

A majority of the SWC technologies, about which sufficient data were available, have positive BCRs. Based on this analysis, these technologies ought to be attractive to farmers. This finding is consistent with the perception of the majority of WOCAT contributors, who said that rapid

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economic benefits are a very important condition for success (70% said that this factor had a great influence). A substantial number of projects had benefits that were greater than the costs by a factor of more than two. It is astonishing, though, that almost one third of the projects (31%) did not have enough data for even this rough analysis of costs and benefits.

Another intriguing point is why projects which do not seem to be attractive to the farmer were considered promising. This aspect would merit further investigation. There are many possible explanations: for example other benefits may not have been revealed in the questionnaire; data may be inaccurate; or there may be other, reasons, such as the provision of incentives at such a level that these in themselves motivated farmers to participate.

Profitability and use of incentives by projects

An attempt to link the use of incentives with the profitability of the technologies promoted by the projects did not provide conclusive results. All projects, regardless of whether they promote technologies that are profitable to farmers or not, use incentives to a similar extent. A certain trend to use more incentives in approaches that are less profitable to farmers may be visible. In order to better understand this link, a more in-depth analysis would be needed. A case-study approach, exploiting more fully the WOCAT-data available for the different projects, would allow us to gain more insight into this question.

4. Discussion

From a developmental point of view, the use of direct incentives is sometimes considered to be associated with a top-down or paternalistic approach (Bunch, 1982). But, as we see from the data collected under WOCAT, many projects that embrace participatory approaches also use incentives. However, from the existing literature on this subject, generally a growing disenchantment regarding the benefits of the use of direct incentives in projects becomes apparent[5]. How the use of incentives relates to the overall project approach will not be explored further in this paper[6]. However, we will discuss the implications of this analysis from an economic point of view.

If the technology promoted is not profitable from the farmer's point of view, it is highly doubtful that the use of direct incentives will lead to sustained adoption of a technology in the long term. The technology will almost certainly be abandoned as soon as the project is phased out, and no replication beyond the boundaries and the lifetime of the project can be expected.

However, there are certain circumstances where the use of incentives may be justified when the technology promoted is not profitable in itself to the land user. These include possible off-site benefits that accrue to the society at large as a result of measures on individual's fields; the need for subsidies to help finance high initial investment in cases where the maintenance of the measure itself will be viable; and the need for initial infusion of resources into poverty-stricken areas. There may sometimes indeed be good arguments for the use of direct incentives in order to create off-site benefits. In this case probably it would be better to regard such incentives as "payments for environmental services". The challenge would be to make such kind of transfer payments permanent, which in most cases is not feasible under the prevailing conditions in developing countries (Douglas, 1994). Mixing humanitarian objectives with natural resource conservation does

[5] Douglas (1994), Hudson (1991), Kerr John M., Sanghi N.K., Sriramappa G. (1996). IFAD (1996). Meijerink (1997).

[6] For an excellent description of problems related to use of incentives in watershed projects see Kerr J.M., Sanghi N. K. and Sriramappa G. (1996)

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not appear to be a promising solution, and the experiences have often been disappointing (IFAD, 1996).

If the promoted SWC measure is profitable from the farmer's point of view, then one might ask whether the incentives are needed at all, since the benefits created by the measure should serve as an motivation. However in this case, there are some also arguments to support the use of incentives. First, incentives may be helpful to bridge a period of investment, during which costs arise for the farmer but benefits are not yet realized. Secondly, due to risk-aversion by farmers caused by the limited resources with which they have to live, even a positive BC ratio may not be enough to motivate them to adopt innovations. In fact, some practitioners advocate that a BC ratio of at least two or three is needed to make a risk worthwhile to a peasant farmer. Thirdly, the incentive may have the positive effect of speeding up the diffusion of a technology that would otherwise be spreading more slowly. However, experiences documented elsewhere regarding direct incentives do not support these arguments: in most cases cited a non-sustained, temporary adoption has resulted[7]. The majority of contributors also state that rapid economic benefits are a very important condition for success. Most probably this factor is much more important than the use of incentives in terms of achieving genuine, durable adoption.

To conclude this brief discussion, it appears that analysis of the profitability of the SWC measures alone does not help to solve the problem of whether the use of incentives in projects is an appropriate measure to take. However, analysis of the profitability of SWC measures will promote understanding of the reasons why farmers may adopt a certain measure, and help define more clearly the purpose and rationale of using incentives.

This analysis is inevitably limited by only preliminary information being currently available in the WOCAT database regarding the use of incentives and the benefits and costs of technologies promoted by projects. Furthermore, more data would need to be analyzed regarding different types of land uses, land tenure regimes and the role of indirect incentives created by the policy framework. Nevertheless, several interesting issues have already emerged on the basis of the data available.

Methodological problems and limitations

The study is based on material provided by WOCAT contributors. Despite the effort of WOCAT to provide a common framework for analysis, there is still scope for individual interpretation of questions and subjective bias. Many of the respondents were, or had been directly involved in the projects under evaluation by WOCAT. It is also very difficult to give proven definitive answers on the impact SWC on future trends in yields and production. Furthermore, some of the questionnaires were not filled out completely or may still contain some inconsistencies, since the quality control has not been finalized yet.
The analysis has also shown that in order to explain some of the results quoted, one has to go back to the rest of the data under each approach and find reasons which may be explicable in terms of the area's characteristics, the overall project approach, the target groups involved and the results achieved.

Therefore, to look more deeply into the question of *why* projects use incentives would require more of a holistic, case-study type approach. Such a cross-cutting analysis as the present one, is limited by the amount of data that can be handled and the heterogeneity of the cases. While this analysis helps to provide some answers, it also raises many more. These could be addressed through further

[7] Douglas (1994), Hudson (1991), Kerr John M., Sanghi N.K., Sriramappa G. (1996). IFAD (1996).

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analyses of the WOCAT database. Making full and effective use of the WOCAT data will always mean having access to the complete data sets, and then selecting individual cases, or certain sets that are of interest and learning from an analysis of these. This access to data has been provided now in making the data available on CD-ROM.

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5. Conclusions

The following *general conclusions* can be made:

- Almost half of the projects surveyed in the WOCAT exercise in Southern and Eastern Africa(where sufficient data was available)have promoted profitable technologies from the farmer's point of view. This is undoubtedly one of the reasons for the success of these projects.
- The profitablity from the point of view of the farmer may *itself be* considered as a strong motivation and incentive for the land user to adopt SWC, and therefore extra material incentives may not be necessary (or desirable) in such cases. The importance of quick economic returns was emphasized by the majority of respondants.
- The relation between the use of incentives by the project and the profitability of the technologies that are propagated is not clear. Incentives appear to be used regardless of whether the technologies promoted are profitable to farmers or not, although a certain trend towards using more incentives in less profitable approaches is apparent. However, more projects need to be analyzed to draw firm conclusions.
- A significant percentage of the SWC technologies can be considered not profitable from the farmer's point of view .In these cases incentives may be causing damage by making such systems artificially attractive to land users – although when off-farm benefits are fully taken into consideration this might change the picture in some cases
- In order to fully understand and analyze the decisions of the farming household, other types of analyses (e.g. farm budgets, household budgets and strategies, analysis of the farming system and communities) would be needed.
- In general, the SWC specialists who contributed the information had considerable difficulties in providing data on costs and benefits of SWC. This reflects weak monitoring systems and indicates the need for further investigations into the economics of SWC. However, collecting data regarding incentives and projects budgets will always remain sensitive.

The following concluding lessons can be drawn for the *WOCAT program*:

- There is an apparent contradiction between the view of the WOCAT contributors that economic benefits are important, and the lack of sufficient data to support this point. One of the experiences during the data collection of WOCAT was, that contributors have acknowledged this lack of information and were motivated to start filling this gap.
- The new edition of the WOCAT questionnaires will collect more data, and in a more concise form, on these issues.
- WOCAT could develop a system for feedback on this or subsequent analyses. This would promote an interactive networking activity.
- Much more WOCAT data awaits analysis. In addition to cross-sectional analysis, WOCAT data provides the opportunity to further investigate individual cases and groups of SWC experiences.
- It has been demonstrated here that WOCAT data can be effectively used for investigating current practices in SWC. This current analytical exercise has helped WOCAT to reflect on the methodology of doing this.

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Name of WOCAT contributing specialist	Country	Name of Approach	Name of Technology	Type of Technolgies	Main landuse system
Lungu	Botswana	Drought Relief Programme Approach.	Micro Wind-Breaks.	mixed (structural + vegetativ)	Grazing land.
Nkayingwa	Botswana	Group Approach.	Livestock Watering.	structural	
Ramontsho	Botswana	Catchment Approach	Contour bunding	structural	Cropland/subsistence farming.
Tesfamariam	Eritrea	(Dam Construction). NGO-FFW-Participatory Approach.	Hill Side Terracing.	structural	Cultivated land, grazing land, irrigation land.
Danano Dale	Ethiopia	Food For Work (FFW).	Soil Bund. Stone Bund. Area closure. Hill side terracing. 1)	structural	Cultivated land.
Humi	Ethiopia	Social Infrastructure for Soil Conservation.	Graded Fanya-juu teracing.	mixed (structural + vegetativ)	Cropland cereal & pulses cultivation.
Kebede	Ethiopia	Individual Farmer Approach.	Soil and Stone Bunds.	structural	Crop cultivation of mainly cereals sometimes mixed with cash crops and trees.
Million Alemayehu	Ethiopia	Local Level Participatory Planning Approach (LLPPA).	Stone Bunds - Traditional Ditches 1)	structural	cropland, mixed, tree and shrub.
Mburu	Kenya	Catchment Approach.	Terraces / Cut-off Drains.	structural	Cropland, grazing.
Mutunga	Kenya	Catchment Approach. ASAL areas Enkorika-Kajiadu District.	Fanya-juu teracing.	mixed (structural + vegetativ)	Cropping and grazing.
Mwarasomba	Kenya	Food for Work.	Fanya-juu teracing, Retention Ditch, Cutoff Drain. 1)	mixed (structural + vegetativ)	Privately owned.
Mosenene	Lesotho	Machobane Farming System.	Machobane Farming System.	agronomic	Arable annual cropping.
Ts'asanyane	Lesotho	Production through ConservationI.	Terracing.	structural	Cropping and grazing.
Mulenga	Malawi	Catchment Conservation Approach.	Contour Hedge Vetiver - Systematic Interplanting - Contour Ridging 1)	agronomic	Maize production.
Munthali	Malawi	Conservation Campaigns Approach.	Contour Ridging.	structural	Crop land - rainfed cultivation.
Mwakalagho	Malawi	Integrating Conservation into Farming Systems.	Contour Hedge Row (Vetiver).	agronomic	Maize interplanted with beans.
Marques	Mozambique	Spontaneous Farmer to Farmer Transfer of Indigenous Technology	Broad Earth Ridges with incorporation of organic matter and short fallow.	structural	Rainfed annual crops
Engels	Namibia	Water Resources and Contour Ploughing Planning	W.R.C.P.	structural	Maize production
	South Africa	Old Motor Tyres on Contour.	Experimental	structural	Communal grazing.
Spies	South Africa	Conservation Tillage Planter.		mixed (agronomic + vegetativ)	
Dabaloub	Sudan	Traditional System with Government Assistance.	Teras System	structural	Traditional water harvesting system with assistance of the government.
Omer	Sudan	Collaborative Gvt/NGO Adaptive Research.	Microcatchment - Mekki A. Omer / SOS-Sahael.	mixed (structural + vegetativ)	Microcatchment Water Harvesting
Magongo	Swaziland	Community Mobilization.	Tree planting.	vegetativ	Grazing land
Masuku	Swaziland	Government Driven Approach.	May be used in a number of technologies.	mixed (structural + vegetativ)	Sugar cane irrigation.
Shongwe	Swaziland	Grass Strips Cultural Practice.		structural	
Zuke	Swaziland	Government Extension Approach.	Tree Planting.	vegetativ	Grazing.
Kajias	Tanzania	Catchment User Group Approach.	Fanya-juu teracing + Cut-off infiltration ditch.	mixed (structural + vegetativ)	Maize farming in hilly and/or plain land.
Mkwizu	Tanzania	SCAPA Approach.	1) Agroforestry. 2) Fanya Chini and Grass Strips. 1)	mixed (structural + vegetativ)	Annual cropping (maize mixed with beans).
Muenzel	Tanzania	Catchment Approach.	Fanya-juu teracing.	mixed (structural + vegetativ)	Rainfed cultivation of maize and beans.
Tarimo	Tanzania	Individual Approach.	The Matengo Pit System.	mixed (structural + agronomic)	Crop lands on mountain/hill steep slopes.
Nambuya	Uganda	Multidisciplinary Approach.$	Trashline, Ridging, Contour planting. 1)	mixed (structural + agronomic)	Crop land (maize & beans).
Nyakuni	Uganda	Group Approach.	Water Retention Trenches.	structural	Banana production.
Malesu	Zambia	Holistic Village/Catchment Approach.	Level Earth Bund	structural	Agro-silvo pastoralism.
Phiri	Zambia	Ad-Hoc-Approach.	Level Bunds	structural	Crop land.
Sishekanu	Zambia	Village Extension Conservation Approach	Soil fertility improvement (farm yard/compost manure	agronomic	cropland mixed
Chuma	Zimbabwe	Participatory Technology Development.	No Till Tied Ridges	structural	Subsistence Crop Production.
Murwira	Zimbabwe	Facilitation Approach.	Infiltration Pits	structural	Mixed farming (subsistence).(Crop farming + livestock farming).
Nyagumbo	Zimbabwe	Conventional Traditional Top Down Extension Approach.	Contour Ridge Technique	structural	Maize production.

1) either a combination or selection of the listed technologies

Table 1: Basic characteristics of SWC measures

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Influence in terms of long-term negative future impact	Quotation
Low	*"Incentives include tools which many farmers can afford."* *"Low because it is made clear in the beginning that incentives are only initial and will be phased out in the long term."* *"There was only provision of tools and seedlings (grass splits) only and this incentive was not significant enough to bring long term negative impacts."* *"The incentives are insignificant and in future can be met by the farmers themselves (incentives are hand tools, fruit/fodder tree seeds)."* *"The community expect small scale incentives in terms of hand tools."* *"Farmers would expect more social infrastructure in exchange of more SWC activities to implement on their land, therefore without such incentives no actions would be taken."* *"Some people might consider the Food-For-Work given during the construction phase should continue after the project was phased out."* *"Anticipated to have promoted dependency on resource poor farmers. "*
Moderate	*"Creates dependency on project or implementor."* *"To neglect even their own land for Food For Work mentality."* *"The people will believe that the incentives are necessary to carrying out the practise. Any failure to provide may lead to poor relationship between the extension staff and the land users."*
Great	*"Farmers must learn to bear the full cost of the SWC technology."* *"If no money is available to cover all affected areas, such communities may be difficult to approach for any other government facilitated activity."*

Table 2: Examples of responses about possible long-term negative impacts of incentives

Name of Approach 1)	Country	Prod. Value	Prod. value inc/dec. in 10 years (%) without SWC	Prod. Value after few years (% increase/decrease) with SWC	Prod. Value after 10 years (% increase/decrease) with SWC	Initial investment costs (US$/ha)	Net Present Value at 15% Discount Rate	C/B Ratio at 5 %	C/B Ratio at 15 %	C/B Ratio at 25 %	food-for-work 3)	paid in cash 3)	other incentives 3)
Drought Relief Programme Approach.	Botswana	80	10	10	10	n.a.	n.a.	n.a.	n.a.	n.a.		1	2
Group Approach.	Botswana	n.a.	10	10	10	5000	n.a.	n.a.	n.a.	n.a.		1	
Catchment Approach	Botswana	80	10	10	10	500	- 319	0.1	0.0	0.0		1	2
(Dam Construction). NGO-FFW-Participatory Approach.	Eritrea	150	-30	10	10	500	- 369	0.4	0.3	0.2	1		2
Food For Work (FFW).	Ethiopia	225	-20	10	20	200	- 681	0.3	0.2	0.2	1		2
Social Infrastructure for Soil Conservation.	Ethiopia	220	-15	0	15	200	- 132	0.7	0.5	0.3			1
Individual Farmer Approach.	Ethiopia	243	-5	5	20	158.6	- 140	0.6	0.5	0.4			1
Local Level Participatory Planning Approach (LLPPA).	Ethiopia	350	-30	-10	10	650	- 617	0.3	0.2	0.1			2
Catchment Approach.	Kenya	750	20	20	30	140	192	2.2	1.9	1.7		2	2
Catchment Approach. ASAL areas Enkorika-Kajiadu District.	Kenya	135	10	20	40	135	- 3	1.5	1.0	0.7			2
Food for Work.	Kenya	1000	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1		
Machobane Farming System.	Lesotho	90	-20	500	500	645	- 896	0.8	0.7	0.6			
Production through Conservationl.	Lesotho	150	-10	20	30	287	- 26	1.2	0.9	0.7			1
Catchment Conservation Approach.	Malawi	150	70	150	275	20	950	93.7	71.9	58.5	2		2
Conservation Campaigns Approach.	Malawi	80	25	40	60	n.a.	n.a.	n.a.	n.a.	n.a.			2
Integrating Conservation into Farming Systems.	Malawi	140	10	50	60	50	16	1.2	1.1	0.9			1
Spontaneous Farmer to Fa	Mozambique	80	30	20	30	negl.	25	undef. 2)	undef.	undef.			
Water Resources and Contour Ploughing Planning	Namibia	440	60	30	60	100	44	1.6	1.4	1.2			
Old Motor Tyres on Contour.	South Africa	80	-20	20	60	750	- 476	0.3	0.2	0.2		1	2
Conservation Tillage Planter.	South Africa	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			
Traditional System with Government Assistance.	Sudan	600	50	30	80	n.a.	n.a.	n.a.	n.a.	n.a.		2	1
Collaborative Gvt/NGO Adaptive Research.	Sudan	130	30	225	350	34	1'300	28.4	23.4	19.9	3		2
Community Mobilization.	Swaziland	150	30	10	30	200	- 381	0.0	0.0	0.0	1		2
Government Driven Approach.	Swaziland	1200	20	40	20	negl.	1'153	290.4	222.0	178.3			1
Grass Strips Cultural Practice.	Swaziland	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			
Government Extension Approach.	Swaziland	22	50	50	50	84.8	- 147	0.1	0.1	0.1			2
Catchment User Group Approach.	Tanzania	80	-20	50	80	146	56	1.5	1.3	1.2			2
SCAPA Approach.	Tanzania	150	-25	25	30	92	94	2.1	1.6	1.3			2
Catchment Approach.	Tanzania	150	-30	100	200	510	- 62	1.2	0.9	0.8	2	3	2
Individual Approach.	Tanzania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		2	2
Multidisciplinary Approach.$	Uganda	170	40	100	150	30	585	8.7	7.4	6.4		2	2
Group Approach.	Uganda	750	250	200	300	140	2'900	12.9	11.9	10.9			2
Holistic Village/Catchment Approach.	Zambia	120	-50	20	60	20	242	6.2	5.4	4.7			2
Ad-Hoc-Approach.	Zambia	80	-20	10	50	n.a.	n.a.	n.a.	n.a.	n.a.			
Village Extension Conservation Approach	Zambia	80	-20	60	70	5	234	21.3	19.7	18.3			2
Participatory Technology Development.	Zimbabwe	466	-20	20	30	n.a.	n.a.	n.a.	n.a.	n.a.			2
Facilitation Approach.	Zimbabwe	150	40	50	100	23	260	14.5	12.1	10.3			
Conventional Traditional Top Down Extension Approach.	Zimbabwe	350	0	20	20	n.a.	n.a.	n.a.	n.a.	n.a.			.

Notes: 1) for the corresponding technologies see table 1

2) undef.; (undefined): respondent assumed the cost to be "negligible"

3) Incentives: 1 : most important, 2 secondary importance

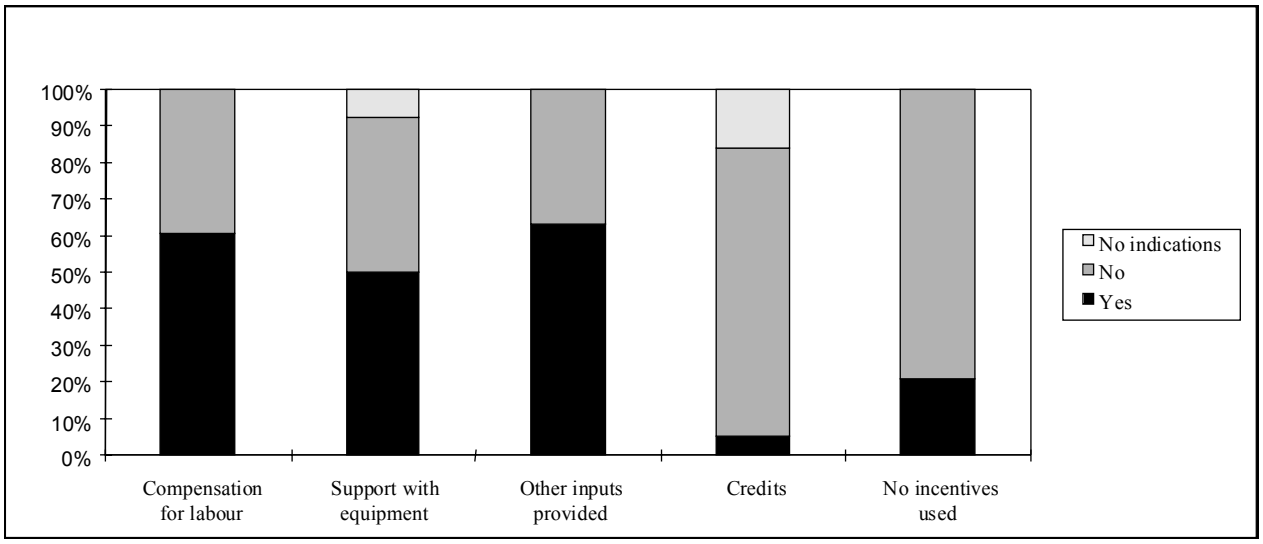
Table 3: Economic data of SWC measures

Giger M., Liniger H.P., Critchley W., 1999: Use of incentives and profitability of Soil and Water Conservation (SWC). In: Sanders D. et al. 1999: Incentives in soil conservation, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Benefit/Cost Ratios	At 5% discount rate (number of cases)	At 15% discount rate (number of cases and % of total)		At 25 % Discount rate (number of cases)
< 1	10	13	34%	14
1-2	6	5	13%	4
2	11	9	24%	9
Insufficient data	11	11	29%	11

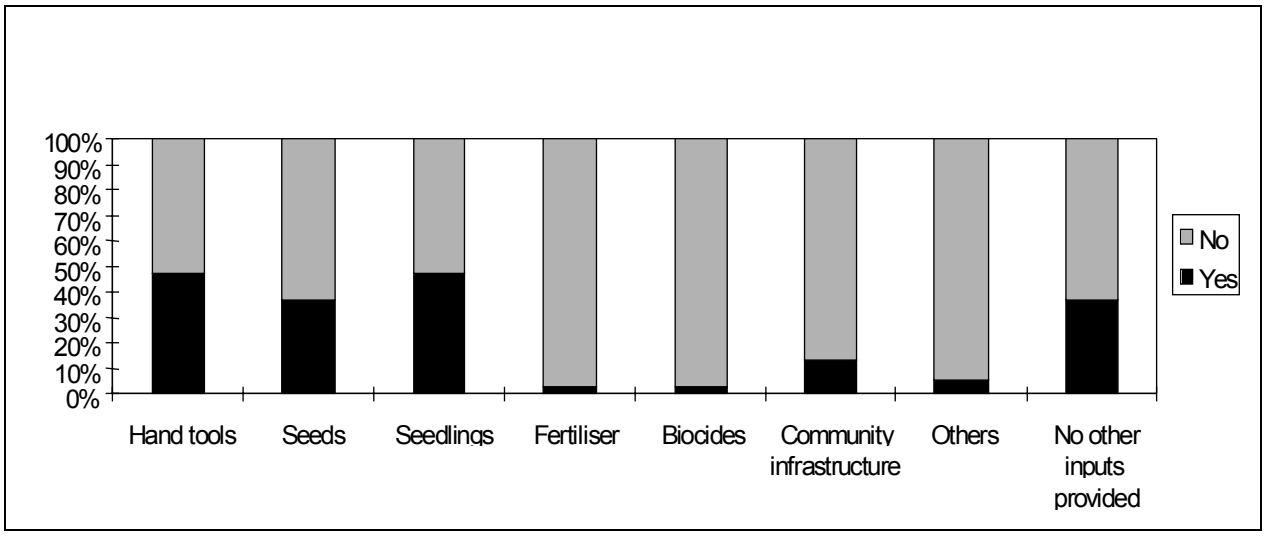
Table 4: Summary Table of Benefit – Cost Ratios and Sensitivity Analysis

Giger M., Liniger H.P., Critchley W., 1999: Use of incentives and profitability of Soil and Water Conservation (SWC). In: Sanders D. et al. 1999: Incentives in soil conservation, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.



WOCAT-database

Figure 1: Use of incentives in SWC in Eastern & Southern Africa



WOCAT-database

Figure 2: Other inputs provided for SWC in Eastern & Southern Africa (excluding compensation for labour and support wtih equipment).

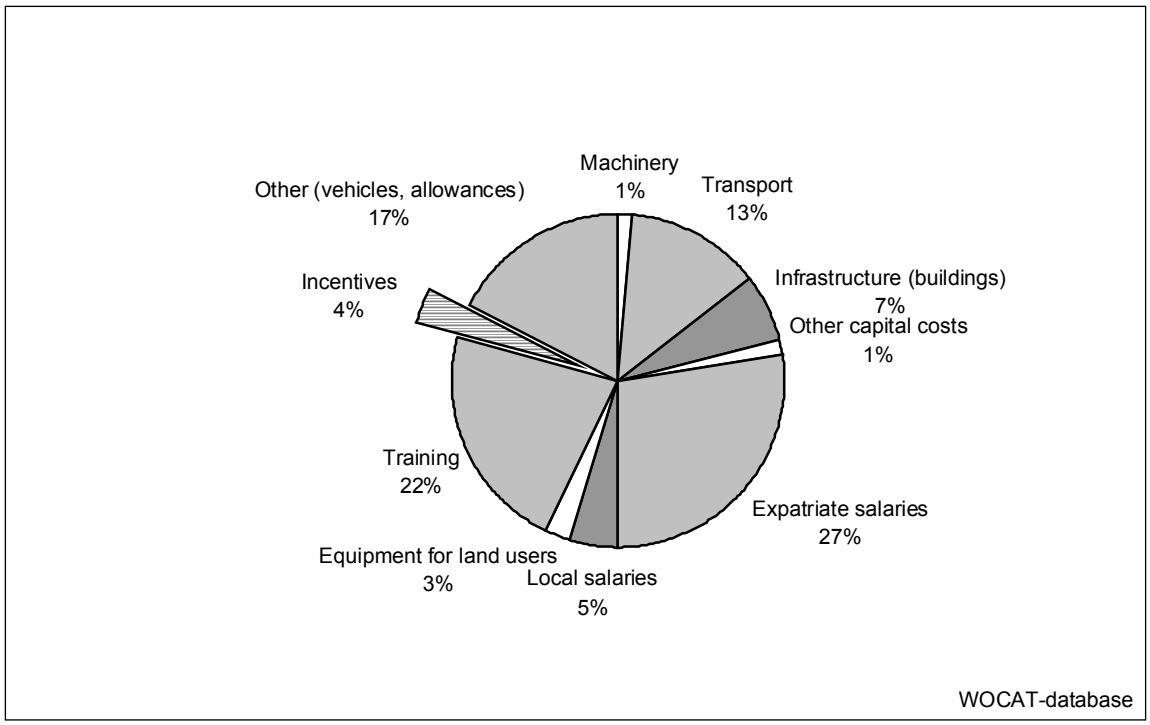


Figure 3: Breakdown of average SWC project budgets in Eastern & Southern Africa

Giger M., Liniger H.P., Critchley W., 1999: Use of incentives and profitability of Soil and Water Conservation (SWC). In: Sanders D. et al. 1999: Incentives in soil conservation, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

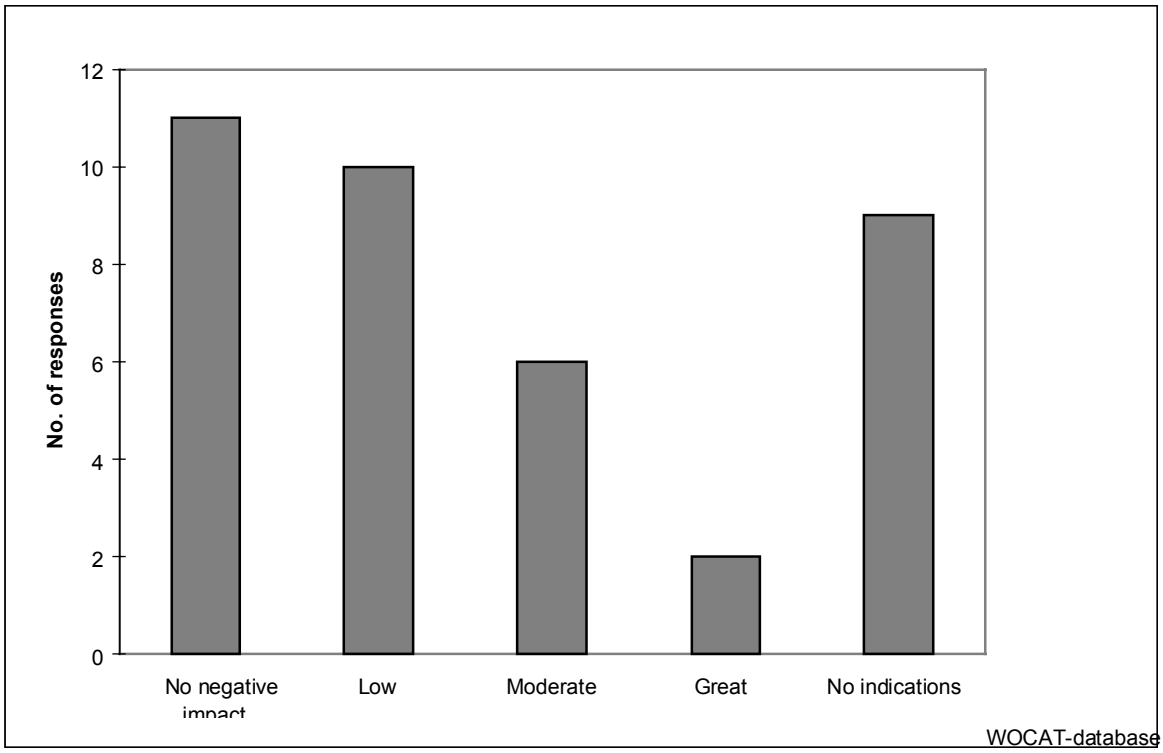


Figure 4: Influence of incentives in terms of long-term negative impact

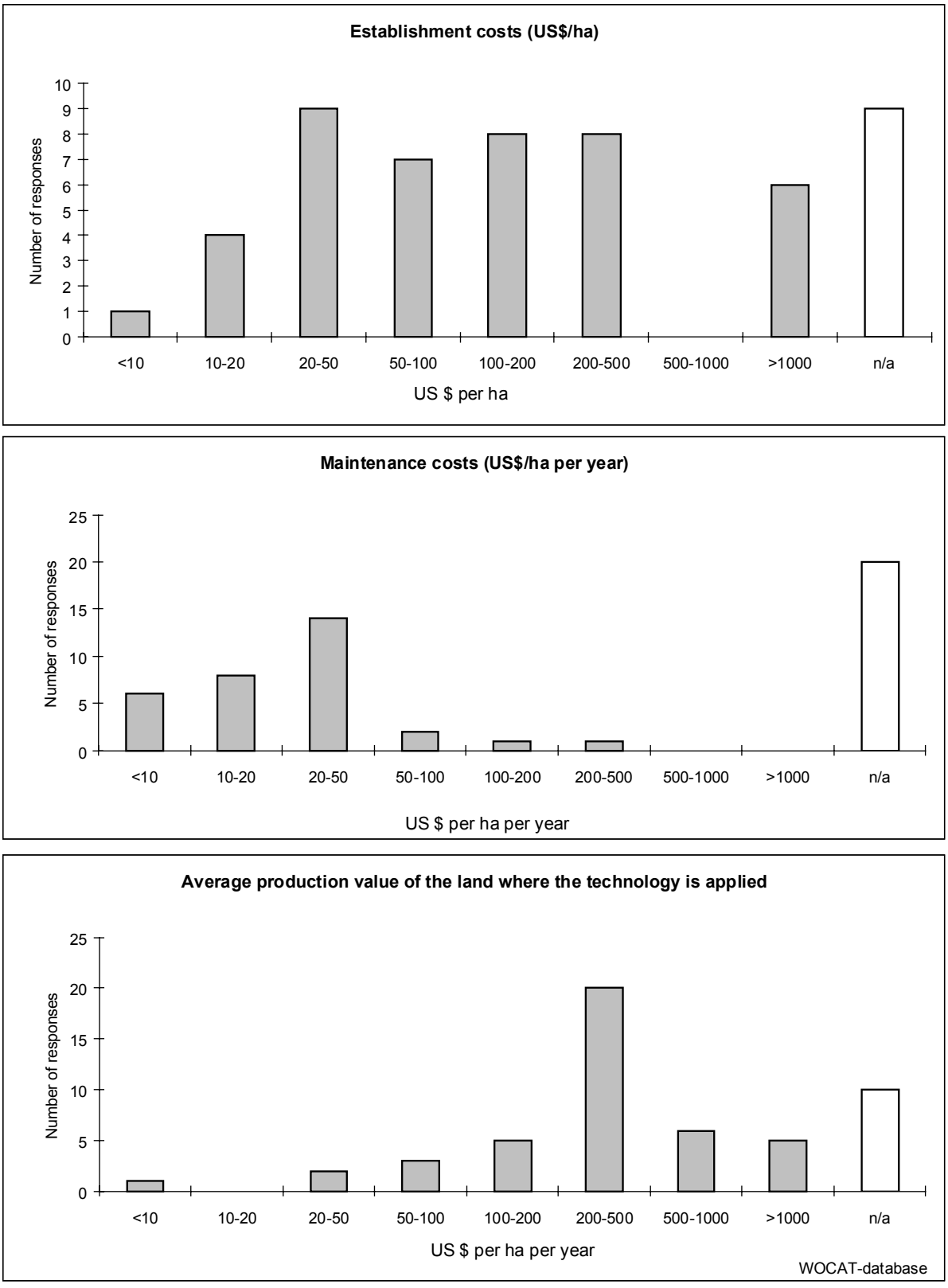


Figure 5: Establishment and maintenance costs of SWC technologies and average production value of land where SWC technologies are applied in Eastern and Southern Africa.

Giger M., Liniger H.P., Critchley W., 1999: Use of incentives and profitability of Soil and Water Conservation (SWC). In: Sanders D. et al. 1999: Incentives in soil conservation, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

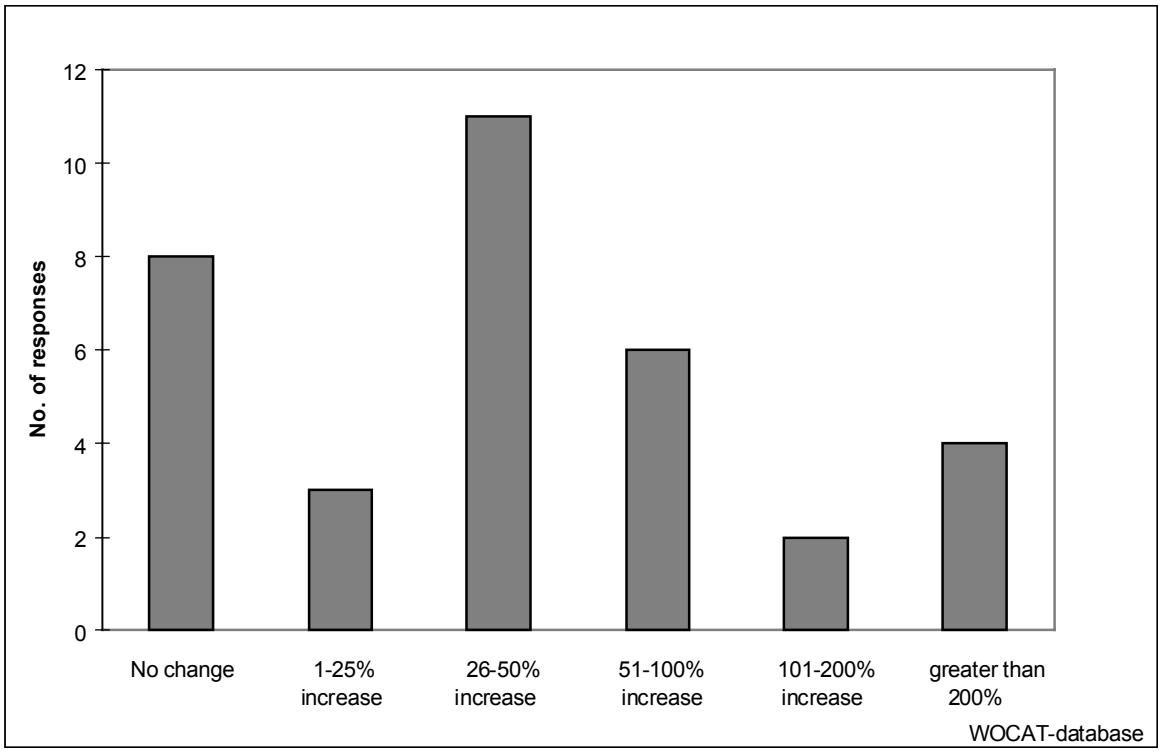


Figure 6: Increase of production within 10 years with SWC in Eastern & Southern Africa compared to a hypothetical situation without SWC.

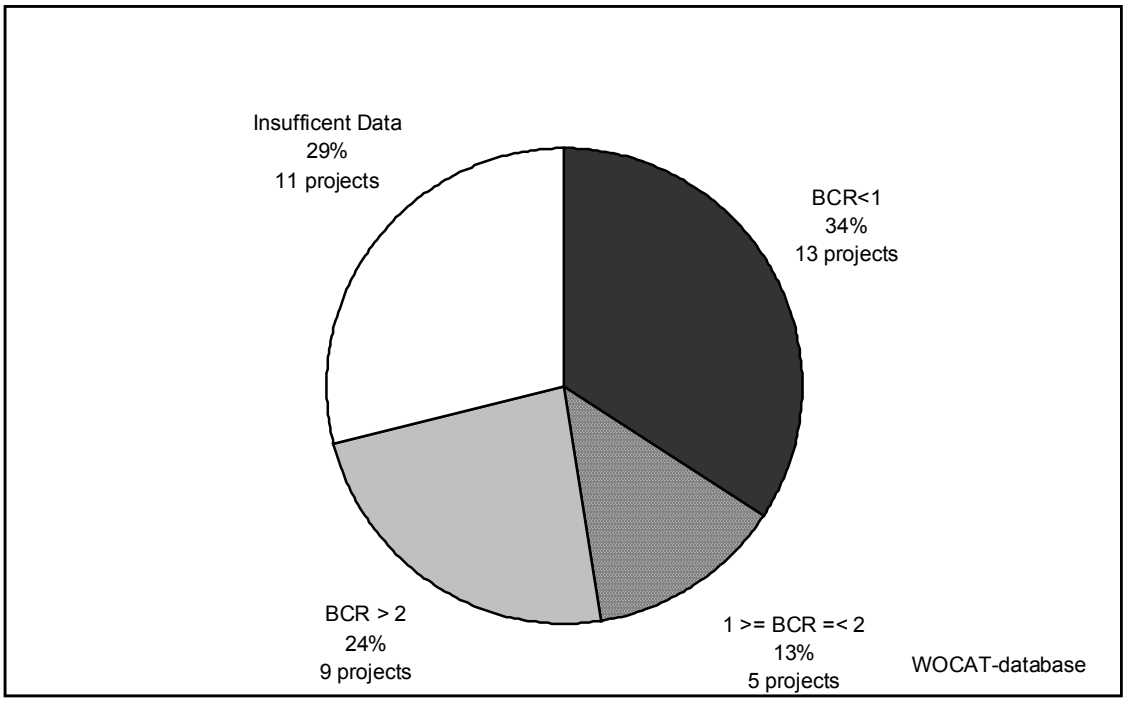


Figure 7: Benefit-Cost-Ratio (BCR) for 38 SWC projects in Eastern & Southern Africa (at 15% discount rate)