Selection of Sustainable Rural Agriculture Projects in South Africa: Case Studies in the LandCare Programme

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***Abstract*-The degradation of natural resources has a direct and significant impact on those living in rural areas. The resultant increasing pressure that is placed on the livelihoods of rural people leads to desperate and poor agricultural practices, which in turn cause further degradation of natural resources. The LandCare programme of the South African national government aims to address these problems by facilitating rural agricultural projects that are sustainable in the long-term. This paper summarises the development of a new set of project selection criteria for the evaluation of project proposals in order to compile an effective LandCare programme portfolio. The new project selection criteria were developed through a review of current literature, existing criteria applied in previously selected projects and interviews with key stakeholders during project site visits. These site visits were also used to determine criterion weights, which were calculated using the Analytical Hierarchy Process (AHP), a known decision-analysis technique. The established set of criteria was applied to three case studies in South Africa, through which an evaluation procedure is further demonstrated. Thereby a successful project portfolio can be ensured that is dedicated to all three components of sustainable development in rural areas.**

***Keywords*-Agriculture, Analytical Hierarchy Process, project management, resource management, rural, South Africa, sustainable development.**

I. Introduction

The agricultural sector has an important role to play, both directly and indirectly, in the socio-economic growth and development of South Africa. The general scarcity of natural and agricultural resources necessitates the implementation of sustainable agricultural management practices.

In order to achieve wider participation in agricultural support programmes and proactively involve all community members in the management of natural resources, the national LandCare programme was initiated in 1997. The overall objective of this programme is to optimise productivity and ensure sustainable use of natural resources; thereby achieving greater food security, job creation and a better quality of life for all [1]. The philosophy of the LandCare programme is based on the concept of "care for the land and the land will care for you" [1].

A. Development of the LandCare programme

South African LandCare projects are community-based projects that follow a Community/Public/Private Partnership (CPPP) model. For example, the National Department of Agriculture (NDA), a Provincial Department of Agriculture (PDA) and private sector stakeholders would form a partnership with a local community in order to collectively prepare specific project plans and proposals, and implement the selected and financially supported projects.

Local communities manage the projects and provide some of the project resources that may be needed. These resources usually consist of labour, materials or a small financial contribution. The PDAs provide assistance in the writing of project proposals, as well as onsite technical support for communities in order to ensure that the projects are executed according to specifications. Private sector involvement in such partnerships often translate into subcontractor roles for private sector stakeholders to provide specific products or services that may be required for a specific project. Where possible, private sector stakeholders based within or near the community in question are contracted so as to stimulate local economies.

B. Current project selection process

Project proposals received from local communities are evaluated by the relevant PDAs from where projects proposals are submitted to the NDA by provincial LandCare coordinators. Project sizes normally vary between 0.1 and 2 million South African Rands, or approximately 0.02 to 0.3 million US Dollars. Previously, the LandCare programme was funded from the South African poverty relief fund of the national government. However, as from the 2004/2005 financial year, it is funded from the NDA budget. The projects are evaluated according to selection criteria and only selected projects are funded by the NDA.

Local communities manage their own LandCare projects, but they do not always have the necessary technical or project management skills to ensure project success. Although the PDAs provide onsite support in this respect, limited capacity exists in PDAs in terms of the availability of staff to be on each project site daily. Thus, the project plan must be of a high standard (with appropriate information/technical transfer) to ensure that local communities can implement the project successfully with limited assistance from PDAs.

C. Current LandCare selection criteria

Social, environmental, economic and technical considerations are addressed in the current LandCare selection criteria. LandCare coordinators, officials from the LandCare secretariat and delegates from the Australian LandCare programme developed the selection criteria at a workshop in 2000. The current selection criteria are summarised in Table 1 [2]. The fifteen selection criteria (see Table 1) place large emphasis on social issues and the indicators that are provided

are largely qualitative or subjective. Since the LandCare programme is not solely associated with the poverty relief funding anymore, it may be appropriate to place more emphasis on issues pertaining to natural resource management. Furthermore, the selection criteria have no hierarchical structure to show performances on social, environment, economics and technical components separately. It is also rather difficult to measure the performances of proposed projects as no scales or methodologies are provided to assist decision-makers. Subsequently, the potential impacts of a proposed project cannot be determined as the criteria are only a reflection of conformity to a set of guidelines originally formulated for the LandCare programme.

TABLE 1
CURRENT LANDCARE SELECTION CRITERIA [2, 3]

Assessment criteria	Potential rating
Sustainable use and conservation of natural resources	**15**
Economic viability	**10**
Recognizes or addressing primary causes of natural resource decline	**10**
Community ownership, and community contribution	**10**
Appropriateness of approach and technology	**10**
Socially and political acceptable	**5**
Potential to improve household food security over long term	**5**
Potential degree of benefit to target groups and area	**5**
Short term and long term job creation potential	**5**
Potential for project spread	**5**
Ability of project owners to plan, manage and maintain project in long term	**5**
Development of skills and capacity within the community	**5**
Contribution to LandCare awareness and education	**5**
Management of risk	**3**
Representation and gender equity, gender sensitive impact	**2**

The current point structure of the criteria may cause potentially good projects to score very low during the selection process. Through the current assessment process, if a project does not contain all the elements of a criterion, the no-scoring principle counts against the project resulting in a low score, whilst the (positive) impacts of the project may potentially be significant in a specific community.

D. Objectives of the study

The current project success rate is testimony to poorly planned projects, with few projects completed on time, within the budget and of acceptable quality. Only a small number of projects are taken further after project closure, placing a big question mark on the sustainability of the LandCare programme.

The study, summarised in this paper, was subsequently undertaken to develop new selection criteria as well as an appropriate evaluation procedure in order to filter project proposals effectively and ensure sustainable project performances, and to compile the best possible LandCare programme portfolio.

The use of appropriate project selection criteria aims to identify proper projects that will be funded and implemented. These criteria also guide project planners as to what is required in a project plan. Although this is by no means a guarantee that projects will be successfully implemented, good project plans significantly improve the chances of project success.

II. PROPOSED CRITERIA AND PROCEDURE FOR LANDCARE PROJECT EVALUATION

A. Approach to compile a set of appropriate criteria

The set of effective criteria for the LandCare programme was compiled using a qualitative research approach. The research process was comprised of a critical analysis of existing criteria and indicators, and a number of one-on-one interviews. As the LandCare programme requires a holistic perspective of proposed projects, all elements of sustainable development had to be considered.

The critical analysis was performed bearing ongoing LandCare projects in mind. The criteria and indicators included in the analysis were [3]:

- The current LandCare criteria (see Table 1);
- Proposed Clean Development Mechanisms (CDM) project evaluation criteria [4, 5];
- The World Bank's indicators of land quality and sustainable land management [6];
- Criteria for assessing the sustainability performances of industries [7]; and
- Proposed methodologies to assess the sustainability of land use management practices in rural areas [8].

To complement the information obtained from the critical analysis, interviews were conducted with nine provincial LandCare coordinators. These individuals are responsible for the coordination of LandCare efforts in each province, which include the implementation of projects, facilitation with communities and support to the implemented projects. The interviews established the factors that are perceived by stakeholders actively involved in the LandCare programme as critical for project success. The outcomes of the critical analysis and interviews were consolidated and, together with the specific needs and goals of the LandCare programme, a draft set of selection criteria and indicators was formulated. This draft set was sent to the participants involved in the research study (see Section 3.2 below) for comment. After the comments were analysed the final set of selection criteria and indicators was formulated. The criteria are grouped into: social sustainability; economic sustainability; environmental sustainability; and technical feasibility. The purpose of grouping the selection criteria in this manner is to assist the team, which is responsible to evaluate project proposals, in determining the potential impacts that a project will have in a structured and logical manner. The hierarchical structured selection criteria and indicators, listed in Table 2 [3], incorporate all of the important or applicable aspects that are addressed by the published approaches. Further details on the classification that is used for each indicator are provided in elsewhere [3, 9]. The compiled criteria also support the vision, aims and goals of the LandCare programme [1].

B. Proposed procedure to evaluate LandCare projects

A scaling factor (-1 to +1) is assigned to each criterion, based on an introduced 'class' change in a community after project implementation. These 'classes' have been defined in detail elsewhere [3, 9]. Community members and the PDA should jointly determine the current baseline class, regarding the state of the criterion in the community. The community's needs regarding the criterion class are then identified through

a process of participation. Thereafter, the project's impact on the criterion is determined, i.e. how the project would affect the class of the criterion. A single class difference indicates a moderate change, while a class difference of two or more indicates a significant change. The conformance of the class change to the community needs is assessed on a similar scale.

TABLE 2
PROPOSED PROJECT SELECTION CRITERIA [3, 9]

Social sustainability	Economic sustainability	Environmental sustainability	Technical feasibility
Representation **Community participation** **Leadership** **Household food security** **Employment opportunities** **Skills development** **LandCare awareness and education**	**Return on investment** **Return on environment** **Community contribution** **Management level** **Profitability**	**Air resources** • Air quality • Noise **Water resources** • Quantity • Quality **Soil resources** • Soil loss • Soil condition **Plant resources** • Biodiversity of plant species • Plant production • Plant management **Animal resources** • Biodiversity of animal species • Animal production • Animal management **Waste management** • Waste generation • Waste disposal	**Project plan** • Work breakdown structure • Schedule • Budget layout • Quality management • Risk management • Plans and specifications **Appropriateness of technology** **Address prime causes**

By following this process both the project performance and conformity to community needs are evaluated. Some of these indicators require a subjective evaluation by project management expertise, specifically for determining effects and comparing these to a baseline. Other criteria such as representation, community participation, leadership and community contribution do not require baseline information as performances are directly measured. Technical sustainability indicators are either a go or a no-go decision for the entire project with respect to its projected sustainability. This component is subsequently not included in the sustainability evaluation procedure.

The evaluation of water quality, as part of the water resources criterion, is used as an example in order to demonstrate the procedure. The scaling factor for this criterion is provided in Table 3, whilst the class description is provided in Table 4. The class description [3, 9] is in accordance to water quality measurements and classification of fitness for use. In the example a site visit has established that the water quality of a nearby water source is only suitable for use on crops and is not fit for human or animal consumption. The community is therefore dependent on another water source that is more than 10 km away for drinking water. A project is proposed to rehabilitate the area around the nearby water source in order to establish a fully functional wetland. The baseline class regarding water quality for this proposed project will be class III. The community desperately needs potable water in close vicinity of their homes; therefore their needs classification is a class I. If the proposed project is implemented, the water source quality will change to class II. This is mainly due to the area not being fenced off and the animals and humans use the same water source.

TABLE 3
SCALE FACTOR TO EVALUATE WATER QUALITY [3, 9]

Scale factor	Description
1	Significant increase in water quality
0.5	Moderate increase in water quality
0	No change to baseline
-0.5	Moderate decrease in water quality
-1	Significant decrease in water quality

TABLE 4
CLASSIFICATION TO EVALUATE WATER QUALITY [3, 9]

Description	Class
Suitable for human consumption	**I**
Suitable for animal consumption	**II**
Suitable for use on crops and other plants, but has a negative impact on animals	**III**
Negative impact on plants	**IV**
Unsuitable water quality	**V**

The proposed project will bring about a moderate change (+0.5) in water quality. Project conformity to community needs will score –0.5 due to only supplying water suitable for animal consumption and not for human use. However, if the area is fenced off to keep animals out, the water quality will be suitable for human consumption. That will cause a significant change in water quality and will score +1 with regards to the project impact. The project will then also conform entirely to the community's needs, and a score of 0 will be assigned for needs addressed.

These indicators are subjective, but the evaluation and project selection process is consistent as only one committee evaluates all the project proposals. The evaluation committee may choose not to fund a project if the overall project performance and conformance to community needs are not deemed adequate. For such an overall evaluation weighting values for the different criteria and indicators are required.

III. THE ESTABLISHMENT OF WEIGHTING VALUES OF THE SELECTION CRITERIA AND INDICATORS

A. Methodology to establish the weighting values

Weighting factors for the selection criteria were primarily determined through the Analytical Hierarchy Process (AHP), which is a known multi-attribute weighting method for decision support [10, 11, 12]. The AHP has been used before for the purposes of weighing criteria and indicators for sustainable development in certain industry sectors [5, 13, 14] and for solving complex decision-making problems in various disciplines, e.g. public policy [15], strategic planning [16], viability determination [17], forecasting [18] and project management [19].

For each of the social, environmental and economic sustainability groups, the AHP model is based on a pair wise weighting approach [20], whereby the selection criteria of a group are compared to each other to establish the criterion contribution (priority vector) to the objectives, i.e. to maximise the sustainability performance of the LandCare programme. Each pairwise comparison in turn has to be rated with a 1 to 9 point scale, which is later translated into relative weights for each criterion using the matrix eigenvalue approach [21]. Although technical sustainability is one of the main criteria groups it was precluded from an AHP evaluation,

due to the fact that the criteria and indicators are only go or no-go decisions.

A questionnaire, listing all the pairwise comparisons, was distributed amongst participants of a workshop. The completed questionnaires with the rated pairwise comparisons, and subsequent weighting allocation, were later checked for consistency following the normal AHP decision-making procedure (Aguarón and Moreno-Jiménez, 2003). Metric mean values of the weighting values were then obtained for each criterion from the questionnaires that were proven to be consistent.

B. Choice of panel

LandCare coordinators and representatives from all nine provinces of South Africa, as well as members of the LandCare secretariat attended the workshop where the selection criteria were discussed. A total of 20 officials, all with extensive experience in the planning and implementation of LandCare projects, attended the workshop where each criterion was weighed in a hierarchical manner to establish its perceived importance. Each participant was provided with a form on which he/she had to evaluate all the pairwise comparisons.

C. Data analysis

After the data from the questionnaires were processed, the matrices were populated and the criteria weights established. All the consistency indexes of the comparisons were below 10% [3]. The lowest consistency index was 4.43% for the main environmental criteria, i.e. for air, water, soil, plant and animal-resources, as well as waste management. The highest consistency index was for the social comparisons with a value of 8.49%. All of the results were satisfactory and fell within the limits that have been proposed for the AHP method [10].

In the overall system analysis, where the main criteria groups were also compared, environmental sustainability was rated the highest, followed by social sustainability and then economic sustainability. The ratings were 58%, 23% and 19% respectively.

The detailed analysis [3] showed that water quality is the most important criterion overall followed by return on environment, soil condition and soil loss all having the same weight, while skills development is the fifth most important criterion. On the other end of the scale, noise was rated the least important criterion followed by representation, return on investment and waste generation. The detailed analysis therefore highlights that criteria pertaining to basic needs, from a natural resource availability perspective, are considered the most important where rural agriculture projects are undertaken.

The weighting values are documented elsewhere [3, 9].

IV. Case studies to demonstrate the evaluation procedure with the proposed criteria

Three case studies in two of the South African provinces were selected for evaluation [3, 9]:

- A water harvesting project (Koringkoppies) [2];
- A cattle project (Thuo-Boswa) [22]; and
- A crop production project (Lwatshatsimu) [23].

Although these cases differ significantly in their focus, they are representative of the majority of LandCare projects. Participants of the workshop, whereby weights were determined for the different selection criteria, together with delegates of the Australian LandCare programme selected a total of eight projects that are representative of the South African LandCare programme. From these projects, the three projects were chosen based on the significant amount of information that was available for each. Sufficient and relevant information were captured in the project plans of each project, thereby allowing for proper evaluation. Since all three case study projects have been completed, it was also possible to verify the results of the research on site.

A. Evaluation of the three projects

The data needed to populate the selection criteria spreadsheets for the Koringkoppies, Thuo-Boswa and Lwatshatsimu case studies were collected on site by means of interviews and observations. The needs analysis (see Section II above) may not be an accurate presentation of community expectations prior to project implementation, as none of the case study projects included proper needs analysis before project commencement. Comments from community members and LandCare coordinators obtained during on-site evaluations were used as reference points to rate the community needs. If the procedure for evaluating project proposals is implemented in future LandCare projects, no such problems will be encountered as the needs analysis process is an inseparable and essential part of the project planning process.

B. Case study results

The project performances, according to social, economic and environmental sustainability for the case studies, are summarised in Table 5. The table summarises the detailed evaluations that have been described elsewhere [3, 9].

TABLE 5
EVALUATION SUMMARY OF THE THREE CASE STUDIES [3, 9]

	Koringkoppies		Thuo-Boswa		Lwatshatsimu	
Component	**Project score**	**Needs score**	**Project score**	**Needs score**	**Project score**	**Needs score**
Social	0.16	-0.05	0.17	-0.03	0.19	0.02
Economics	0.10	-0.03	0.14	0.01	0.04	-0.01
Environment	0.32	-0.08	0.36	0.14	0.16	0.10
Project total	**0.58**	**-0.16**	**0.66**	**0.12**	**0.39**	**0.11**

The Thuo-Boswa LandCare project was found to have scored highest in terms of both project score (overall project impact) and needs score (conformity to community needs). The Koringkoppies project scored second highest in terms of project score, but scored negatively on the needs score. The Lwatshatsimu project scored the lowest with regards to project score, but achieved a positive needs score.

Considering all three case studies implies that the Thuo-Boswa project would have been the most favourable for approval of funding and implementation had this project selection criteria and procedure existed prior to project selection. Choosing the second most favourable project would have been more difficult as the Lwatshatsimu project scored

low on potential positive project impact, but exceeded all the community needs, while the Koringkoppies project had a much higher score in overall project impact, but did not comply with community needs in any of the system components (social, economic or environmental sustainability). Non-compliance to community needs could be a telltale of a poorly designed project. Although the Koringkoppies project had a significant positive impact, some doubt had since emerged about its long-term sustainability. In light of the project selection model developed in this study, it is therefore clear that the Lwatshatsimu project should have been rated above the Koringkoppies project.

The preference for the Lwatshatsimu project above the Koringkoppies project was confirmed during site visits, and are discussed in greater detail elsewhere [3, 9].

V. Conclusions

Agriculture has historically played an important part in the development of South Africa and will continue to do so in future, as it forms part of the foundations upon which economic growth, social development and environmental management are based. The LandCare movement aims to bring about change and improvement in agricultural practices and ultimately contribute to sustainable development.

Successful LandCare projects will improve local economic sustainability through more efficient management of farms and other agricultural resources, thereby addressing the high levels of poverty in rural areas. The structure of LandCare projects involves the creation of employment, transfer of skills and creation of entrepreneurial opportunities amongst other social development factors, thereby also contributing to social sustainability. In addition, the sustainable utilisation of natural resources in LandCare projects ensures long term environmental preservation through which the environmental aspect of sustainable development is addressed.

A successful project portfolio therefore consists of projects that are dedicated to all three components of sustainable development in rural areas. Sound selection criteria will ensure the correct assembly of a project portfolio. This study has illustrated that the proposed project selection criteria for LandCare projects allow the LandCare programme to make a meaningful contribution to sustainable development.

The research findings and their application to the case studies show that the developed selection criteria could be used to evaluate project proposals effectively. The incorporation of both overall project impact as well as conformity to community needs in the procedure facilitates more informed decisions.

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