Community Participation in Natural Resource Management Projects:

A Rational Institutional Choice? Some Evidence from Sand Dune Fixation in Mauritania

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Abstract: *Community Participation in Natural Resource Management projects has been a concept much debated in international development planning and policy-making. However, the debates tend to be based on undocumented postulates and implicitly normative statements on why, when, and how local communities should or should not be involved. Approaching the issue by using Institutional Rational Choice (IRC) theory could provide a more consistent basis for discussion. But here the problem seems to be the lack of empirical grounding of the theory.*

This article is an attempt to bring the discussions a step further at two levels. At the empirical level, it provides some quasi-experimental empirical results from the author's own research in the Islamic Republic of Mauritania, West Africa, in support of the theoretical hypothesis that community-based institutional arrangements are more cost-effective than centralized types of arrangement for sustainable provision and production of common pool goods and services.

At the methodological level, it suggests a methodological solution to some of the major challenges in making IRC-analysis operational in a quasi-experimental sense.

Key Words: community participation, natural resource management, institutional rational choice, Mauritania.

1. Introduction

Policy-makers and planners concerned with the promotion of economic and social development in developing countries have a long tradition of debating the role of institutional and organizational arrangements in achieving sustainable social progress and economic growth. How much state and how much market or civil society is still debatable, and so is the balancing of the criteria of choice between economic efficiency, social equity, and environmental sustainability (Watts & Peet 1993).

When discussing the merits and comparative efficiency of alternative procedures and institutional arrangements applied in planned development interventions, it is necessary to distinguish between institutionalized practices in two different domains. One concerns the

domain of practices followed during identification, design, and planning of the projects. The other is the domain concerning the practices and institutional arrangements through which the planned intervention is supposed to be produced or reproduced after the end of the external support. This article discusses institutional arrangements at the level of the latter domain.

What constitutes the most efficient institutional arrangements through which new development activities can be maintained quite obviously depends on the context and the type of development task we are talking about. Concerning rural infrastructure, governance, and the sustainable management of natural resources, a number of scholars have argued that in order to enhance the (often quite poor) performance and (lack of) sustainability of development policies and projects claim that such arrangements can be theoretically identified beforehand (see for ex. Oakerson (1986), Runge (1986), Ostrom and Ostrom (1977), Ostrom (1990, 1993), and Thomson (1992, 1994)[1]. Focus has particularly been placed on determining the optimal organizational arrangement for the sustainable use of common pool resources, as many natural resources have this economic nature.

The theoretical approach employed by these scholars is referred to as *institutional rational choice (IRC) theory*. This theory is a branch of *new institutional economics*, which builds on assumptions of rational, utility maximizing social actors and the idea that the institutions of society are created or maintained in order to reduce the transaction and information costs of exchange and production in the economy.

IRC analysis is task specific. However, applying this theoretical framework to real life tasks is not so simple. First, empirical data on information and transaction costs are hard to obtain. Very few activities in real life are priced in such a way that information and transformation costs can be distinguished from production costs. This has made it difficult to generate empirical studies to validate the theory in a positivist sense. Secondly, the IRC theory does not consider the institutional "room for manoeuvre" set by the physical and technological attributes of the provision and production processes, through which goods and services are produced. In order for an analysis to be of use in practical terms, there is a need to complement the IRC economic analysis with a technical analysis.

This article is an attempt to deal with these two challenges, although in reversed order. Firstly, I shall briefly present an attempt to integrate the economic and the technical aspects into a two-step methodological procedure by which to determine analytically the optimal institutional framework for the provision and production of goods and services. The procedure is applied on the specific task of establishment and maintenance of windbreaks and reforested woodlots for sand dune fixation in arid countries. I conclude that community participation can be theoretically identified as the main feature of a mixed set of „appropriate institutional arrangements" for sand dune fixation.

Second, the issue of empirical validation of the theory is addressed. A solution to the methodological problem of making operational the empirical measurement of information and transaction costs is proposed. Some results from the author's own empirical research on community participation and choice of organizational arrangements for sand dune fixation in Mauritania, West Africa, are discussed. The research was based on a quasi-experimental design comparing the relative importance of information and transaction costs generated in two cases of theoretically optimal institutional arrangements versus one case of theoretically non-optimal institutional arrangements. The empirical findings from Mauritania come out in support of the theoretical claim that a mixed set of institutional arrangements with a main feature of community-based organization is best suited for sand dune fixation activities.

1 Whether they can be put into practice is a different story. I shall return to this issue in my conclusion.

2. The case of sand dune fixation in Mauritania

The analysis presented here is an abbreviated version of a more elaborate work published as Part III in Lund (1998). It is based on data from a large Sand Dune Fixation Project in Mauritania, where I worked from 1984 to 1987. The project was funded by DANIDA[2]/ UNSO[3] and the UNDP[4], and implemented by the FAO[5]. The data collected concern the first two phases of the project. The first phase of the Sand Dune Fixation Project in Mauritania was entitled "Projet de Stabilisation et de Fixation des Dunes" (PSFD). It was implemented from 1983 to 1986 and covered 15 regular sites and 4 pilot sites in representative regions of the country. The second phase of the project was called „Projet de Lutte contre la Désertification et Mise en Valeur Agro-Sylvo-Pastorale" (PLEMVASP). It was implemented from 1987 to 1990 and covered 99 sites.

The first phase was mainly concerned with the development of locally adapted sand dune fixation techniques, or the so-called "curative" activities in different types of physical and socio-economic environments. Training of local technical staff and planning of the second phase were other important activities.

The second phase of the project, the PLEMSVASP, aimed at the consolidation of existing curative sites and the extension to the whole country of this kind of work. To this dimension was added the development of new models and techniques for environmentally sound exploitation of the natural resources, such as water harvesting techniques, anti-erosive measures, hay-making, etc.

A major concern of the project was the question of *institutionalization*, or how to create „local ownership" in order to make sure that activities would continue after the end of the project. Local ownership was both assumed and required by Danida, the main funding agency. But for reasons not entirely clear to the project staff, local ownership was very difficult to obtain.

One reason, of course, arose from the fact that ownership implied an engagement on the part of the local community in certain efforts or costs. The costs or contributions involved on the part of a local community engaging in sand dune fixation projects include:

- Stinting use of project-site range-land;
- labor, money investment and materials for mechanical dune stabilization (windbreaks) and reforestation;
- time spent on communication with forestry services and local administration;
- time spent on reaching community consensus, work organization, and planning activities;
- controlling access (guards, fences, herders);
- supporting risks of failure (cricket or „rongeur" attacks, plant disease, drought);
- opportunity costs when activities are in conflict with other income generating activities.

Some of the efforts can be managed at the individual or household level (as for example stinting the use of project-site range land). Others depend on collective action. The individual efforts are not economically feasible unless food-aid or salary incentives are offered. The activities may or may not be economically feasible at the community level. This depends on the value of the (productive) assets to be protected from sand encroachment[6]. But seen from a macro-economic or a political perspective, protection from sand encroachment may

2 Danish International Development Agency

3 United Nations Sudano-Sahelian Office

4 United Nations Development Programme

5 Food and Agricultural Organization of the United Nations

6 Cf. Visiting Scientists report (UNSO,1981). However, a cost-benefit study of sand dune fixation in the locality of Magtaa Lahjar concluded that these activities were economically feasible in the rural town of Magtaa Lahjar (cf. Helles and Jørgensen, 1989). Cf also Wright (1989) concerning the village of Hassey Thine.

still be considered by the government to be a necessary development activity, insofar as it constitutes a prerequisite for sedentary rural life.
Development wise, the big question therefore concerns the appropriate institutional arrangements for the most cost-effective implementation of these tasks and, particularly, the possibility of expansion/continuation of these activities on a larger scale. Seen from the project management's point of view, this challenge could be expressed as constituting a situation of principal-agent relationship, a classical problematic in economics. But given the desire to institutionalize sand dune fixation practices independently of the presence of a „project", the problem might be expressed in more general terms as a question of minimizing transaction and information costs.
At this point, the discussion about the role and merits of community participation became important for project implementation. In the debates over the most appropriate institutional arrangements, community participation was rejected by the project management and foresters of the technical staff as being inefficient and un-manageable, whereas it was advocated by the social scientists of the staff (including the author of this article) both as a political development ideal ("local democracy") as well as a more efficient management strategy than the centralized, top-down strategies. The latter part of the claim was based on the common-sense argument that local communities would be psychologically more committed if they had been associated in making decisions about engaging in these activities, their design and plans of implementation from the beginning.
Actual decisions on this were made based on trial-and-error. The first phase of the project was implemented in a way which was termed *en regie* in French. Expressed in the terms used by Ostrom, the PSFD opted for an institutional framework leaving the responsibility of both provision and production in the hands of the central project management and National Forest Services (Direction de la Protection de la Nature). A certain „deconcentration" was planned in the sense that there were locally fielded forestry agents organizing and supervising the work at each project site. They had a certain level of autonomy in the conduct of their daily work, but plans and decisions were mainly made by the international experts at project headquarters or by the central direction of the Forestry Services in the capital. Control over project resources was also entirely in the hands of the management of the project. It was thus basically a **centralized statal institutional arrangement**.
How did the project perform under this arrangement.?During the first phase, technical solutions were efficiently developed. However, at the same time, the project management experienced major difficulties in involving the local communities in the practical work and in achieving their acceptance to take over the responsibility of protecting their own villages from sand encroachment.
In response to this situation, the project management intensified efforts of dialogue with the populations to increase their participation. The task of making plant nurseries was subcontracted out to interested local individual producers, wherever possible. But basically, the top-down centralized management structure was maintained at the 15 sites officially operated during the first phase.
However, to accommodate donor expectations and pressure from the social scientists of the project, it was decided, in 1985, to experiment with a different approach in four villages where the local leaders had expressed their wish to be supported in fixing the sand dunes. Collaboration between the project and these local communities was established as *pilot sites,* where the institutional set-up was organized differently than at the regular sites. The project limited itself to the technical support given in elaborating technical proposals for sand dune fixation and training selected village people in some of the necessary techniques. All tasks of deciding, organizing and implementing the actual work of sand dune fixation were left to the local village committees (local governance and provision) and local user groups (implementation). The outcome was very encouraging. Three villages out of four managed to implement projects of their own on these terms.

In light of the successful experiments with a decentralized, participatory approach, it was decided to organize **the second phase** on a *contractual basis*. Contracts were made between the project and a local branch of a central government type organization, the *Structures d'Education des Masses,* who then proceeded to appoint a local project committee to be responsible for the daily activities of organizing and implementing the work. The contracts stipulated that the local contracting organization would be subsidized by the project/the Government according to the produced output. The local forestry services were confided the tasks of technical advice and supervision, as well as controlling technical results of the works and determining the corresponding amounts of subsidies to be released to the local committees. The local administrative authorities guaranteed the enforcement of the contracts. This phase yielded good results in terms of both physical outputs and ownership[7].

The main question discussed in the remainder of this article is whether the change of institutional arrangements from regular to pilot sites in Phase I, and from phase I to phase II yielded results which correspond to the predictions of IRC-theory? Does community participation in natural resource management tasks such as sand dune fixation reduce information and transaction costs? The approach adopted here starts out by an attempt to define in empirical terms what type of institutional arrangement would be considered as being „optimal" for sand dune fixation activities from a theoretical point of view. Based on this definition, the relation between the performance and information/transaction costs observed in three cases of applied optimal or non-optimal institutional arrangements respectively are compared. Finally, the empirically observed outcome is compared to the theoretically expected outcome.

3. Determining the optimal organizational arrangement for sand dune fixation

The analytical approach adopted in this article constitutes a simplified version of the frameworks used by three authors, namely Ostrom et al. (1993), Thomson (1992, 1994) and Uphoff (1986). It consists of a two-step analysis of sand dune fixation as an economic task. First, the „economic nature" of the goods and services produced when engaging in sand dune fixation are identified. This is done in order to provide the information from which a rational institutional choice can be made between private sector, common property sector, or public sector arrangements (or *regimes*). Secondly, this result is supplemented by an analysis of the organizational requirements stemming from the technical and physical attributes of the actual process of provision and production of this good. This step aims a rational institutional choice of organization with respect to scale and technical qualities.

Economic nature of the goods produces by sand dune fixation projects

Institutional rational choice theory assumes that there are patterns of incentives inherent in the **physical and economic attributes ("nature") of goods** and services and the technologies used to produce, control, or consume them. By "the **economic nature**" of the task is meant its character as being composed of either public goods, private goods, common pool goods or toll goods, a character which is determined by the given the "physical" or technological attributes that they have. The physical attributes play a role with respect to

7 In this phase, activities were diversified beyond the purely "curative" activities of sand dune fixation. Various new techniques of water and soil conservation, range management, reforestation, hay-making, etc. were introduced and experimented with. These were considered "preventive" activities. From an IRC-analytical point of view, however, these are physically different tasks. They are therefore considered as new tasks which according to the analytical framework, should be analyzed separately. I have therefore excluded these tasks from the analysis presented in this article.

the character of their supply and consumption (joint or separable) and the ease of exclusion of users or consumers (difficult or feasible).[8] Clean air is a typical public good, forests or range land are typical common pool resources, bridges, cinemas and highways examples of toll goods, and finally plenty of products like machinery, agricultural products, etc. are examples of private goods. The issue of incentives for producing or protecting goods presents itself differently in each of these cases, and IRC-theory then postulates the existence of a corresponding optimal choice between private, public, or common property regimes as incentives structures for the most efficient production of these goods.
It is a classical assumption of economic theory that private goods are more efficiently provided, produced and exchanged under free market conditions, whereas public goods and services are more efficiently delivered through public sector arrangements, although such arrangements still suffer from inefficiencies due to the existence of „unwilling riders" (Schmid 1987). There has been much debate about the optimal organizational arrangement for common pool goods, to which category many natural resources belong: is it private, public, or common property regimes which is most appropriate?
The studies undertaken by Ostrom et al. (1993) and Thomson (1994) suggest that common property sector arrangements in the form of **self-governing, polycentric local institutions** would provide the optimal institutional arrangements for such common pool goods or public goods as natural resources and rural infrastructure. Does this hold for sand dune fixation? To answer this, we must begin by specifying what kind of goods and services are produced by sand dune fixation activities, and determining what their economic natures are.

The economic character of sand dune fixation
The principal benefits produced by sand dune fixation are the following ones:

(a) **protection from sand encroachment** of the target site (thus permitting continued production or use of rural infrastructure), and

(b) **pasture and tree products**.

Due to the socio-economic context and applied state policies (the latter being institutional arrangements, which can be considered as given conditions), sand dune fixation activities in Mauritania also constitute a means for a local community to:

(c) gain direct **access to state-subsidized employment opportunities** or direct monetary state-subsidies on the basis on local management performance; and to government services and favors, such as food-aid, other development projects, higher administrative status, social infrastructure (schools, water supply, health clinics); and more generally to:

(d) establish a **"spacio-economic address"** as a community officially recognized by the state, with :

(e) a legally recognized right of collective **ownership** to the project site.

An analysis of the economic attributes of the five mentioned types of goods and services produced by sand dune fixation activities give the following results, summarized in **Table 1**, below.

8 Cf. Thomson (1992:9) and Ostrom and Ostrom (1977: 12)

Table 1: Nature of goods and services produced through sand dune fixation

Goods or services concerned	Nature of the goods or services
(1) Protection from sand encroachment	Public good
(2) Pasture and tree products	Common pool or private good, depending on costs of exclusion
(3) Access to government services	Common pool or private good, depending on costs of exclusion
(4) Recognition of the community by the state	Public or private, depending on the unit of analysis
(5) Legal ownership of the project site	Public or private, depending on the unit of analysis

(1) **Protection from sand encroachment** is a typical **public good** to the communities and individuals living in or moving through the target area, although it is not equally important to everybody and public management solutions thus may give rise to the problem of the „unwilling rider". People living close to the invading sand dunes, people having houses or individual productive assets like agricultural parcels or palm trees, have more interest in protection than people living in (mobile) tents and/or gaining their livelihoods from herding or petty trading.

(2) **Access to pasture and tree products** are **common pool resources** with a potential for becoming **private goods** if the costs of exclusion (of other users) can be reduced sufficiently.

(3) **Access to government services** is not a direct product of the sand dune fixation activities as such. However, since sand dune fixation is part of a public development investment program, engaging in sand dune fixation activities also implies external economies to the local community in terms of government subsidies, access to food aid, higher priorities in the allocation of health or water facilities, employment etc.

Strictly speaking, „access to government favors" — as well as „official recognition" and „legal ownership" discussed under 4) and 5) below — analytically cannot be seen as a part of the goods produced. It is not an inherent quality of sand dune fixation installations to yield such „goods", but rather, they constitute incentives, which are part of a larger system of institutional arrangements. My argument is that we are justified in treating these incentives analytically as goods, as long as they can be considered as given, contextual conditions (i.e. no change in the national policies). To the extent that this is what local communities are trying to obtain (and field data showed it often was), it becomes relevant to assess what would be the appropriate **local**, **intra-community arrangement** that would make this possible. It is only in this very special (but not uncommon) context where such access, recognition, or ownership are in some respect "earned" by the investing social actor that it might make some sense to do so.

Accepting this assumption, access to government favors becomes access to **common pool goods** (e.g. a fixed amount of job opportunities of food aid) or **public goods** (e.g. a health clinic with sufficient capacity), depending on the type of services. The scale of all three aspects is limited to the physical space of a local community (see below).

(4) The **acquisition of official recognition of the community by the state** is basically a **symbolic good,** which confers political power onto the leaders of the community. As

an economic good, this good has the character of a **public good** from the point of view of the members of the individual, undivided community with a recognized, legitimate leadership, but tends to take the character of a **private good** when considered at the level of inter-community competition for this status.

(5) **Legal ownership of the land** is also a contextual outcome which has a symbolic nature. The economic analysis of this symbolic good is identical to the one made on obtaining official recognition of the community by the state. In so far as it can be considered an economic good, it has the character of a **public good** from the point of view of the members of the individual, cohesive community under a recognized, undisputed, and legitimate leadership. It takes on the character of a **private good** if it is considered at the level of inter-community competition for this entitlement.

At this point in the analysis, we can conclude that sand dune fixation, to the extent that is valued in terms of **protection from sand encroachment,** theoretically would be better assured **by public sector arrangements.** In contrast, the production of some of the secondary goods would be better assured through some kind of **common property sector** or by **private sector arrangements.**
This already poses a challenge in practical terms on the overall level. However, the composite nature of sand dune fixation provision and production process would make the analysis too imprecise without considering the economic nature of the goods produced during the eight sub-processes necessary to obtain the final result.

1. Making the decision to commence works (provision)
2. Organization and application of rules (governance)
3. Technical elaboration of plans and solutions
4. Setting up wind-breaks (management and work)
5. Producing plant seedlings (management and work)
6. Planting-out the seedling on the dunes (management and work)
7. Protecting the seedlings and eventually the trees (management and work)
8. Exploiting the trees (management and work)

The aggregate picture becomes quite complex[9]. As was explained above, producing a stabilizing effect on the sand dune (by setting up wind-breaks) is producing a public good. Theoretically, this calls for local public sector management arrangements. But many of the sub-processes are producing goods of a private character. Producing plant seedlings ready for planting, for example, is producing a private good: Consumption of seedlings is separable; it is easy to exclude non-payers from consumption; it also easily divisible; and seedlings are renewable and seasonal with a time of production of only approximately three months. They could therefore be possible elements for sub-contracts with private sector agents, which through additional analysis (see below) can be specified as being individuals, teams/ enterprises or membership organizations. The optimal institutional arrangements for sand dune fixation are thus clearly a complex „package“ of combinations of the public, common property and private sector arrangements.
Let us turn now to the institutional implications of the technical dimension of the sand dune fixation production process.

Physical and technical attributes
In order to identify the organizational implications which follow from the technical nature of sand dune fixation activities, I have analyzed the technology of sand dune fixation

9 A detailed analysis of this can be seen in Lund (1998, part III, 3).

according to a framework inspired by Uphoff (1986) who defines an organization as a „structure of recognized and accepted roles" (Uphoff 1986: 8). His point is that every single institutional solution („organizational mode") to the management of natural resources or other areas of activity must be considered in the light of the specific context and specific management goals (Uphoff 1986: 23).
Through an impressive empirical effort of studying the performance of local organizations as intermediaries in development, Esman & Uphoff (1984) and Uphoff (1986) have been able to assess typical strengths and weaknesses of different types of local organizations. Uphoff (1986) distinguishes between six categories of local organizations and makes a number of generalizations about the comparative advantages with respect to efficiently dealing with major categories of practical issues common encountered when undertaking various development tasks, including natural resource management.

- Local Administration. Bureaucratic institutions (public sector arrangement)
- Local government organizations. Political institutions (public sector)
- Local membership organizations. Local organizations based on membership control (common property arrangement).
- Cooperatives. Local organizations based on membership control (common property arrangement).
- Local service organizations. Local organizations based on membership control (common property arrangement).
- Private Business. Profit oriented institutions (private sector arrangement.

Thus, for example, for activities that involve social conflict such as land tenure rights or access to other resources, local government organizations are appropriate, whereas local membership organizations are not.
Uphoff has not specifically investigated LOs with respect to sand dune fixation. But he has investigated social forestry, where he concludes that **local** government organizations seem to be the most appropriate institutions under the condition that **adequate resources and authority has been devolved to them**. This is because forests have multiple uses and multiple users with a corresponding great potential for user conflicts. It is also explained by the fact that investment in the resource are medium or long term investments.
There is no grand theory systematically referred to in the explanations of these correlations in Uphoff's book. His model, therefore, mainly rests on the quality of the common sense or practical reasoning about functionality, stemming from thorough knowledge of the production process and context. In this article, I have no better suggestion. But taking the model as it is, it can be used to examine the task of sand dune fixation installations and its various sub-processes with respect to the relevance or non-relevance of each issue category.
In Mauritania, specific technical solutions to desert encroachment were designed according to local conditions. Sand dune fixation during the period observed in the 80´s was a development task, which required certain skills and know-how which were not generally present in Mauritanian villages. But as such, sand dune fixation is not a highly complex or technically complicated task to perform. Technically, the adequate training of village level sand dune fixation specialists is feasible within the time-horizon of a normal project. According to the methods developed in Mauritania, the windbreaks are fabricated locally and set up manually. The seedlings are also produced in local plant nurseries. This makes necessary the availability of occasional brief inputs from competent technical staff for the initial elaboration of possible technical solutions. Some demonstrations on how to set up windbreaks, cut the necessary material or make a plant nursery are also tasks to be provided by the local technical services. Apart from this, the necessary "time and place information" mostly concerns the management of local work teams, a task, which is clearly best performed by local organizations, although it requires some new forms of organization of work

teams which must be developed and learned at the village level.
The overall picture emerging from this analysis points towards a division of roles between local government institutions (such as community councils), local user groups, service groups or cooperatives, and individual producers.
As an additional step, Uphoff (1986) suggests to look at interactions between resource and user characteristics with regards to the given development task. He proposes to structure the assessment around four concepts: boundedness of the resource and the user groups, the character of the distribution of costs and benefits, other characteristics of the resource and characteristics of the users. Sand dune fixation is a bounded good with a bounded user group (the local village people being protected) except for villages located near highways. This calls for a local organizational set-up. Similar analyses can be made for the other concepts. The character of the distribution of costs and benefits calls for a local governance institution, and so on. All these aspects are considered in more detail in Lund (1998).

Conclusion: the appropriate institutional arrangement for sand dune fixation

The final step consists in integrating the two analyses. The organizational implications of the physical and technical characteristics of **the production process** call **for local level management**. Integrating the physical and economic attributes of sand dune fixation activities point to the suggestion that the optimal institutional arrangement would be a combination of **private (market) management** of plant nurseries, protection, and exploitation; **communal management** by local user groups or other community organizations for the production of sand dune fixation installations, and **state (public) management** by some form of **(local) government units** with respect to the provision aspects, complemented by **local technical services** for technical assistance and control. This is summarized in **table 2** below.

Table 2: Overview of theoretically identified set of optimal institutional arrangements for sand dune fixation (sdf) production and exploitation.

Sdf Provision and governance	Technical Support	Sdf prod. wind-breaks	Sdf prod. nurseries	Sdf prod. planting	Sdf prod. protection	Sdf prod. exploitation
Local Gvt. or Legitimate Community council	Centralized gvt. management	Communal management by local user groups	private management	Communal management by local user groups	private management	private management

The concluded optimal institutional arrangement is thus a set of arrangements for each major sub-component of the total process of provision and production of sand dune fixation infrastructure. This set contains both decentralized communal management arrangements, local private management arrangements, and centralized publicly managed elements.

4. Is IRC-theory valid?

We can now proceed to the second major question raised in this article: can the validity of IRC-theory be grounded empirically? Does the application of a mixed community based institutional arrangement as concluded in the previous section generate lower information and transaction costs than for example centralized arrangements?

In order for us to answer, the different sets of institutional arrangements actually applied at the Sand Dune Fixation Project during its different phases can be categorized according to whether they represent cases of theoretically speaking non-optimal or optimal institutional arrangements respectively. As was described in the presentation of the Sand Dune Fixation Project, institutional arrangements actually applied during the two phases were such that we may conclude that the observed cases can be considered theoretical samples of respectively (a) a centralized governmental ("non-appropriate"); and (b) decentralized, local government / local user group ("appropriate") institutional arrangement for sand dune fixation. The analysis is summarized in **Table 3** below (for more detail, cf. Lund (1998), Part III, 4).

Table 3: Overview of applied institutional arrangements for sand dune fixation (by sub-activity) observed in field data. Shaded cells are those corresponding to the theoretically indicated optimal arrangements.

	S.d.f. provision and finance	**Sdf prod. wind-breaks**	**Sdf prod. nurseries**	**Sdf prod. planting**	**Sdf prod. protection**	**Sdf. prod. exploita-tion**
Central-ized gvt. manage-ment	Phase I 15 sites	Phase I 15 sites	Phase I 15 sites	Phase I 15 sites	Phase I 15 sites	
Local Gvt. or commu-nity council	Phase II 99 sites Phase I 4 pilot villages			Phase II 99 sites		
Commu-nal ma-nagement by local user groups		Phase II 99 sites Phase I 4 pilot villages	Phase II many sites* Phase I 4 pilot villages	Phase I 4 pilot villages	Phase II ?? sites* Phase I 4 pilot villages	Phase II ?? sites*
private manage-ment			Phase II some sites*		Phase II ?? sites*	Phase II ?? sites*

* The project has been reported to have left the nursery-tasks with local individuals in certain cases, already in Phase I, but the source reports do not specify in how many sites this was tested, and thus how many sites remained with a user-group organization. This does not seriously influence the argument, as local user group management arrangements and private management arrangements in the Mauritanian context were quite similar in many respects. Local user group management would often in practice imply a few selected individuals from the user group who had an interest in plant nurseries and took this responsibility upon themselves. Individual producers, in a similar manner, would often have been approved by the local user groups or local authorities, before the project decided to work with them. (Source: From Lund 1998

The available data, therefore, can be viewed as representing a quasi-experimental situation where different institutional arrangements have been applied to the same task, with other contextual factors of influence being constant[10]. There is thus an opportunity to „run" three „experiments", so to speak, and compare theoretically expected outcome (performance in terms of information and transaction costs) with empirically observed outcome. Theoretically, we would expect the latter to perform better than the former, as shown in **Table 4.**

Table 4: Institutional arrangements for sand dune fixation: Quasi-Experimental design used.

Cases	Theoretical status of the applied inst. arr. (independent variable)	expected relative performance (dependent variable)
case 1: 15 Regular sites Phase I : Centralized, public arrangements	non-optimal	higher transaction and information costs
case 2: mixed, mainly community based arrangements, Pilot sites, Phase I	optimal	lower transaction and information costs
case 3: Mixed , mainly community based arrangements : Phase II	optimal	lower transaction and information costs

The outcome in terms of observed transaction and information costs for each of these quasi-experiments would have the analytical value as single experiments in a series of experiments on this particular type of development task in a Mauritanian context. They would not alone represent a validation or rejection of the theoretical hypothesis.

5. How to measure transaction and information costs?

A major methodological challenge inherent in this exercise lies in how to separate transformation costs from information and transaction costs.

Information costs are costs associated with efforts of producing or getting access to information necessary to start up and implement the process, such as getting information about

10 The validity of this claim may of course be critized. For example, during the period from 1984 to 1988, the national political context in Mauritania actually changed in favour of more openness towards community participation and local democracy. Also one might argue that there was a practical "learning process" going on during project implementation which would in itself influence transaction and information costs downwards.

local physical conditions, local opinions about the phenomenon, sharing information about possible technical solutions, where to find appropriate materials, etc.
Transaction costs are costs associate with agreeing amongst the involved parties to undertake the activities, establishment of contractual arrangements, of monitoring performance and the use (or abuse) of project inputs, etc.
As it is often the case with other development tasks, empirical measurement of information and transaction costs associated with the production and maintenance of sand dune fixation infrastructures has posed a technical problem, insofar as available data from the case project consisted in regular project documents, such as progress reports, field trip reports, technical reports, and evaluation reports. Resources allocated to project activities are accounted for according to standard procedures following the plan of operation and budget lines stipulated in the original Project Document. In these procedures, there is no distinction made between transaction costs and transformation costs. Consequently, transaction costs were not systematically and explicitly recorded in money-terms. In the present case, however, such absolute measures are not even necessary in order to make the argument, anyway. It suffices to search for significant **relative** differences. This is why I have chosen the **frequency of reported information and transaction costs and their apparent significance to the project management** as the unit of measurement[11].
The taxonomy used is taken from Ostrom (1993). Ostrom employs four major categories: needs for coordination and consensus; imperfect information; need of governance and control; and measures to prevent opportunistic behavior such as free riding or rent seeking. I have gone through the different types of activities undertaken the studied project and singled out those, which corresponds to these major cost categories. Thus for example, reported efforts aiming at dealing with lack of commitment by local staff or community members, or with suspiciously low productivity of labor, are counted under the category "need for coordination and consensus". Efforts to establish punitive measures against trespassing animals are classified under the category of "need of governance and control", and so on (see Lund, 1998).
The **score system used** is extremely simple. To measure performance in terms of information and transaction costs, I have merely registered the importance of any indicated activities belonging to the categories of transaction costs as they have been reported in the reports[12]. I have then assigned a **transaction/information cost score on an ordinal scale,** ranging from 0 (this type of information/transaction cost not reported) to 3 (this type of information/transaction costs being both frequent and considered a major problem by the project staff). The justification of a given score can be assessed by anybody who takes the time to

11 It is important to note that this method of operationalization has shifted the question of transaction costs from a global view to a management point of view. The empirical „evidence" produced by this exercise thus only takes into consideration the relative variations of information and transaction costs placed on the project management. This is not to say, that such costs have necessarily been shifted from the project management to the village communities, it is just to say that this article does not give any empirical evidence on the information and transaction costs borne by these communities.

12 The institutional performance analysis which I have made is based on criteria of performance conceived by the project staff and the project formulating agencies. The relevance or desirability of sand dune fixation activities is not really questioned at this point. However, the performance criteria are no absolute standards. They are elements of the process of project implementation themselves. Their reliability as indicators of transaction and information costs can always be questioned. The best way to permit others to assess their relevance and reliability, in my view, is by giving the detail and the context (see Lund 1998, Part V).

go through the project documents and reports[13], but should also appear from the description of the planning and implementation process in Lund (1998, Part V). Where no data are available, I have indicated this by the letters N.A. ("Not Available").

6. Field observations

The transaction costs observed in the three cases are shown in **Table 5.** They show a relatively small decline in information costs from case 1 to case 2 and 3. The striking difference is the decline in strategic costs (transaction costs related to efforts of minimizing opportunistic behaviour) from case 1 to case 2 and 3.

Table 5: Comparison between the 15 centrally managed sites of the PSFD, the 3 successful pilot sites, and the 99 curative sites of the PLEMVASP 1987-1990 with respect to the reported frequency of different categories of information and transaction costs.

Category of source of information and transaction costs	PSFD	3 pilot sites	PLEM-VASP
1. Need for coordination and consensus	3	1	2-3
2. Imperfect information	2	2-3	2-3
3. Need of governance and control	3	2-3	2
4. Opportunism			
4.1 Rent seeking (by forestry agents)	3	N.A.	3
Rent seeking (by village committees)	3	1	0
4.2 Free Riding (by forestry agents)	0	N.A.	0
Free Riding (by village committees)	2	0	0
4.3 Over-prizing (by forestry agents)	3	N.A.	3
Over-prizing (by village committees)	3	1	1
4.4 Corruption (by forestry agents)	2	N.A.	2
Corruption (by village committees)	3	0	0
4.5 Moral hazard (by forestry agents)	2	N.A.	2
Moral hazard (by village committees)	3	0	0
4.6 Shirking (by forestry agents)	2-3	N.A.	2-3
Shirking (by village committees)	3	0	0
4.7 Adverse selection (by forestry agents)	N.A.	N.A.	N.A.
Adverse selection (by village committees)	0	1	1

13 The collection of empirical data was based on an investigation of available project reports, as listed in Lund (1998). These records have been made to account for project performance officially. They do not, of course, provide sufficient sources for making a 100% account of transaction and information costs. But they do account for some of them, and there is no reason to believe that the proportion of transaction costs accounted for should change significantly from one phase of the project to the other. We're dealing with the same type of activities, implemented by the same organizations and even reported by the same chief technical advisor. To this base, I have added my own personal experience from having worked at the project from 1984-1987 and having visited the project on several occasions in 1987, 1988, 1989, and 1994. My own observations at the time were not consciously directed at distinguishing and observing transaction costs specifically. They were concerned with reporting and understanding practical problems of implementation. Thus, as the project documents, my observations were concerned with performance. Nevertheless, the quality of these two sources of information in my view constitutes a sufficiently reliable basis for making comparisons about the relative levels of transaction costs between different phases.

Score system used:
3 Major problem
2 Frequent problem
1 Rare problem
0 Problem not reported
N.A. Not applicable (relevant) or not available (no data)

If we compare this outcome to the theoretically expected differences, we may conclude that field observations showed a correspondence between the cases having applied theoretically defined optimal institutional arrangements and the cases having the lower transaction costs.

Table 6: Overview of the observed relative level of information and transaction costs under differing institutional arrangements for sand dune fixation installations

Sand dune fixation	Phase I Regular sites	Phase I Pilot sites	Phase II
Institutional Arrangement	**Non-optimal: Centralized State Management**	**Optimal : Local Communal, Non-subsidized Contractual Management**	**Optimal: Local Communal Subsidized Contractual Management**
Performance	**Higher transaction costs**	**Lower transaction costs**	**Lower transaction costs**

The table shows the relatively lower transaction costs associated with the cases of the local communal, contractual arrangements which were identified as being the appropriate arrangements for the provision and production of sand dune fixation installations. My data thus support the IRC theories developed by Oakerson, Ostrom and Thomson. The higher score of the 2nd Phase compared to the pilot sites is mainly due to the fact that the opportunistic behavior of the forestry agents remained approximately the same from Phase I to Phase II, whereas this source of transaction costs did not exist in the pilot sites. Thus, my data gives support to the hypothesis that **community participation reduces information and transaction costs associated with sand dune fixation projects.**

7. Conclusion and discussion

The exercise presented in this article has given support to the idea that IRC-theories can be useful for policy-makers who want to assess alternative options of institutional arrangements to be made in support of given policies or projects. IRC-analysis has the advantage of proposing coherent explanations to the question of **what institutional arrangements can be expected to be "appropriate"** for the provision of an incentives structure leading the social actors to adopt targeted behavior. It provides stable ground under the feet for policy discussions on when to adopt community participation strategies. But at the same time, this choice of theory has implications with regards to the rationales for applying

participatory approaches to development as well as with respect to the specific, operational meaning assigned to the term (White 1996). When choosing an IRC-approach, it is analytically implied that we are concerned with participation in an instrumental way from the policy-makers' point of view. It implies researching hypotheses concerning community participation as a means to efficient achievement of policy goals, performance, or „project success". In addition, it implies assuming that community members act as utility maximizing individuals. Indeed, it is an act of „depoliticizing development", as White (1996) has pointed out. It is important to distinguish this economic efficiency rationale from other more political rationales commonly referred to in discussions about participation. Community participation seen as part of empowerment strategies in favor of marginalized population groups is a highly relevant policy-issue which raises many challenges for back-ground research, too. But it requires different conceptual systems to explore (Lund 1990). The IRC theories do not pretend to be analyzing community participation as a political goal in itself, as an ideal of what kind of society we want, and how it could be promoted.

This points towards the limitations of new institutional economics and institutional rational choice theories. They are powerful in devising appropriate institutional arrangements for given tasks, assuming there are no political conflicts over this. But often, such conflicts exist. Here, new institutional economics and IRC-theory have a major weakness. They are not very powerful in terms of accounting for the dynamics of the political dimension of people's investment strategies, although this dimension is just as much a part of peoples practices as are the economic ones.

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