The scope for improvement

Stephen Sandford[1], Frank Anderson[2] and Addis Anteneh[1]

[1]*Economists, Livestock Policy Unit, ILCA, Ethiopia*

[2]*Agricultural Economist and Team Leader, Highlands Programme, ILCA, Ethiopia*

Introduction

This paper takes as its starting point that in the cycle of pastoral systems research (PSR) the existing system has been adequately investigated, described, and analysed and that the constraints on the further development of the existing system have been identified. The next stage in the cycle is to identify the scope for improvement.

Identifying the scope for improvement may imply different things. To some people in some situations, there seems to be almost no scope for improvement. Although the present system is one of low productivity, it seems that nothing can be done to improve it except at a cost which is far in excess of potential benefits. In such circumstances identifying a possible improvement is a most challenging task and enormous effort is spent in designing and redesigning research and development work in order to try to reduce costs and increase benefits.

To other people in other situations there seems to be a wide range of improvements, each of which offers promise. Identifying the scope for improvement then appears to be more a case of selecting from among the many alternatives those options which offer the greatest promise. In such cases the main task is estimating the likely consequences of alternatives.

Although this paper is relevant to both sets of circumstances, it has a number of different alternatives primarily in mind. In both cases decisions in principle are made on possibilities for improvement and the ideas about the improvements are refined to the point where they can be the subject of on-farm/range, on-research station,

component research, or the subject of further study of some other appropriate kind. This paper is concerned with the social and economic aspects of the identification and assessment of improvements.

In particular situations potential improvements are likely to induce some combination of changes in technology (technological change) and in organisations, institutions, or in other economic, administrative or social conditions (hereinafter collectively termed "social change"). One extreme example, involving no change in technology but substantial social change, would be the expropriation of individually-owned and managed water points (on communally grazed land) and the substitution of group-ownership and management by an elected committee of pastoralists. Such a change could lead to improvement both in overall productivity, through the establishment of a mechanism to control the number of livestock permitted to graze an area of land, and in the equity of distribution (*between* members of a pastoral society) of access to water and so to grazing. At the other extreme there may be a potential for substantial changes in technology, e.g. by the introduction of an effective vaccination against contagious bovine pleuropneumonia conferring immunity for life, which will require no direct social change but which can be applied through, for example, existing arrangements for anti-rinderpest vaccinations.

Most potential improvements will require some combination of substantial amounts of both new technology and social change. Both the technological and the social changes required will usually be of two sorts; firstly the *direct* intended change, which is a fundamental part of the improvement, and secondly the *indirect* changes, often unintended, unforseen and, sometimes, unwanted, which are brought about by the direct changes. Direct technological changes may lead to indirect social (as well as technological) changes, and *vice versa*. The indirect changes may be as important, in both their costs and benefits, as the direct.

Tasks in identifying the scope for improvement

This paper will discuss the tasks to be done principally from the point of view of ILCA. However other organisations carrying out PSR are faced with essentially the same obligations and constraints and so, with minor amendments, what is written here about ILCA is applicable to other organisations.

In order to fulfill its mandate, ILCA needs not only to identify *potential* improvements but also to make some assessment of ILCA's mandate states that it should seek to increase livestock production and to improve the quality of life in sub-Saharan tropical Africa. In assessing potential improvements it needs to look at their likely impact in terms of these two criteria. It also, in order to prevent resources being wasted on research whose results are not implemented, needs to assess the *chances of adoption* of potential improvements. Partly this is a matter of looking at the *objectives* of the other parties involved in development, e.g. of the host government or of the pastoralists of the area concerned, to see whether what seem to be improvements in terms of ILCA's criteria will also seem to these other parties to be improvements that they should encourage rather than frustrate. Partly it is a question of assessing whether, with the best will in the world, the parties and institutions concerned are capable of introducing the improvements within a reasonable period of time. Finally ILCA needs to ensure that at least some of the improvements that it develops will bear fruit rapidly. Host governments, pastoralists and donors will all need early reassurance of the capacity of PSR to yield useful results if their initial enthusiasm and support is not to wane. Some improvements are not only important but also, because of their very nature, have very long pay-off periods. They need to be complemented by others which even if not inherently so important can serve to sustain interest.

There are, then, four things to be done: to identify potential improvements, to assess the probable impact of each, to assess the probability that an improvement will be adopted and to estimate how rapidly an improvement will bear fruit. It is convenient for analytical purposes to classify them as separate activities

although in practice they will often be carried out more or less simultaneously and by a single person, sometimes through a series of iterations that modify initial ideas into something more appropriate and feasible.

In some cases the next step in the development of improvements lies with ILCA (or other organisations carrying out PSR) alone, e.g. where a new technology has to be devised or adapted for a specific location and where ILCA can itself carry out the necessary technical component research. In other cases some specific social change, which can only be brought about by someone else, normally a part of the host government, is required, either on its own or as a necessary concomitant to an ILCA derived change in technology. Even where someone else must take the next step ILCA needs to assess the likely impact and chances of adoption of the improvement, and the probable rapidity of its fruition so as to provide that someone with adequate information on which to base their own decision. In some cases what is required is research by someone else; in other cases further research will not be useful and what is needed is the implementation of development forthwith.

Identifying potential improvements

If, for example, an initial analysis of the system indicates that marketing is a constraint then this signposts the need for an improvement in marketing. "Identifying a potential improvement" is the process of looking at the critical stage or steps in the marketing process and tentatively selecting things which could be done, in the way for example that Bekure, Evangelou and Chabari (1982) have identified supply of credit, weighing and grading, and sale by auction, as potential improvements in livestock marketing in Kajiado, Kenya.

Assessing the impact of potential improvements

The assessment of impact of an improvement merits some further consideration. Essentially this is a *predictive* activity, or an attempt to forecast something which may follow on from research; it is not

monitoring or evaluating something which is already taking place. Assessment of impact has so far been described in terms of the likely direct and derived technological and social changes which will be associated with an improvement, but at this stage it is necessary to go further and evaluate the changes according to ILCA's criteria, i.e. in terms of their consequences on production and on the quality of life. ILCA will not be interested, of course, in improvements which simply maximize output regardless of cost. ILCA's mandate to increase output implies the rider "at reasonable cost". On the other hand at this stage in the PSR cycle *precise* prediction of costs of improvements in relation to benefits is impossible. The same is true of other kinds of impacts. Since research has not yet taken place the quantity of the potential benefits (yields) is not yet known and the volume of costs (inputs) is equally obscure. Moreover, since the improvement is still some way off in time from introduction to pastoralists, the relative prices of outputs and inputs will probably be subject to considerable changes, but ones which are largely unpredictable in direction or size. Analyses of various degrees of sophistication and complexity can, and should, be done to explore the combinations of yields, inputs, prices and other factors which give rise to impacts which are on balance favourable or unfavourable. These should permit an assessment of the probable long-term average overall impact. Another element in the assessment of the increased production is the extent to which increases in average (over different sites or different periods) production is matched by increased risk (variation).

ILCA's mandate also requires it to improve the "quality of life" - an expression which is in some ILCA documents rephrased as "standard of living", although in common usage there are important differences between the way the terms are used. The latter usually implies much more emphasis on material welfare, particularly on the consumption of goods and services, whereas the former embraces not only material welfare (clean air, low infant mortality) but also satisfaction of a less material kind, e.g. harmonious social relations.

In practical terms, ILCA can assess the probable impact of potential improvements on the quality of life in a number of important ways. The impact on the natural environment is one of these; a second is to assess to what extent the potential improvements proposed will benefit all sections of the community, i.e. all kinds of households - "kinds" in terms, for example, of wealth and power, occupation or ethnicity. Certain kinds of both technological and social changes, even if their benefits are not *intended* to be restricted to particular socio-economic classes, are in *practice* more likely to benefit or be adopted by some classes and this may positively injure others. ILCA, both out of a proper concern for social equity, and from a need to avoid the resentment against itself which will arise if it is thought to favour only certain groups, should aim to avoid developing improvements which are likely to benefit only certain ethnic groups in an ethnically mixed region, or the strong at the expense of the weak. Thus, as far as is practicable, ILCA should develop a package of improvements at least some of which should offer benefit to every kind of household. An early assessment is required of the likely impact on relative welfare of different groups, since once research has been sucessfully carried out it will not be possible to suppress its results even if their impact is inequitable. A third important respect in which the impact of a potential improvement on the quality of life can be assessed is in terms of the way it affects the distribution of benefits and burdens *within* households - in particular its effect on the nutrition of children and on the work pattern of women. There are, of course, a number of other aspects to the quality of life which may be relevant to particular potential improvements, but those mentioned here deserve consideration in respect of every improvement.

Assessing the chances of adoption of potential improvements

ILCA needs not only to assess the probable impact of improvements *if* adopted, but also to assess the chances of desirable improvements being adopted. It is not a sufficient condition for an improvement to be adopted that it has desirable impacts in terms of output and quality of life. There may be difficulties involved, for example

difficulties in the procurement and distribution of high technology inputs, which are unlikely to be solved even if ILCA convinces everyone concerned about the urgency of their solution. Social constraints, in the form of traditional institutions and value systems, have often been cited as causes of the failure to adopt new technological improvements. The possibility of such social constraints can not be denied, possibly in the form of fundamental divergencies in values between, for example, ILCA and a progressive government on the one hand and a traditionally-oriented pastoral society on the other. But in many cases in the past where agricultural researchers and extension personnel have blamed such social factors, the real problem has subsequently been found to be that the researchers were advocating unprofitable technology or had failed to grasp the full complexity, e.g. in respect of risk, of their clients' decision-making process.

Assessing the rapidity of fruition

As already noted, ILCA needs to include in its package of improvements some which will yield early evidence of the usefulness of PSR, even if these are of only modest importance. Otherwise there is a danger that essential support by other parties, i.e. host governments, pastoralists and donors, will be withdrawn prematurely from more important improvements which can be developed and yield results only over a longer term. The early development and introduction of some improvements, even if only modest ones, can help to sustain interest and support while the more long-term, and possibly more important, improvements are still being worked on.

Who should identify the scope for improvement?

The techniques for assessing the impact, probability of adoption, and speed of fruition of potential improvements are overviewed in a later section. This section examines who should do the identification and assessment. A "natural" solution appears to be that as far as improvements implying primarily technological change are concerned the first task of identifying the *potential* improvements should be by the *natural* scientist in that specialist field (e.g. soil science,

forage agronomy, genetics) most concerned, and that in the subsequent task of predicting the indirect changes and the impact on production and the quality of life, *social* scientists (including economists) should also play a substantial part. The implication of this approach is that it is primarily the staff and consultants of the PSR organisation itself (e.g. ILCA) who will be involved.

However there are two shortcomings in this point of view. Firstly the probability that a host government will take the necessary steps that will allow a successfully tested improvement to be adopted subsequently will be directly proportional to the degree of its own involvement early in the process of decision making that led to the development of the improvement. Such early involvement by the host government will not only lead to its greater sense of commitment to the introduction of the improvement and to an earlier awareness of the institutional changes it may subsequently have to make, but also to its providing ILCA earlier with information about the host government's own intentions that may affect the chances of adoption. That is the positive aspect. The negative aspect is that unless the host government's involvement in decision making on the improvements to be designed and tested is to be merely token window-dressing, then ILCA risks being prevented from developing improvements, which could be highly beneficial, by host government officials who may not have the training or time to be able to appreciate an improvement's real potential. Host government involvement may be either a help or a hindrance.

The other shortcoming is that an important argument raised in favour of a systems research (FSR/PSR) approach is that it more closely considers small farmers'/pastoralists' point of views and is more influenced by their values and opinions than are other research approaches. Clearly this "advantage" is in danger of being lost if, at a critical stage when decisions are being made about the improvements to be tested or studied, farmers'/pastoralists' opinions are not directly canvassed but are only "represented" by what natural or social scientists think farmers ought or are likely to think. Consideration needs to be given as to how the opinion of pastoralists might be incorporated into the selection of improvements for testing.

The "literature" on FSR is somewhat silent or opaque on this subject. Most of the discussion in the literature about farmer's participation in FSR is about their involvement in identifying constraints, in carrying out on-farm trials, and in subsequent adoption of innovations. Literature dealing specifically with the issues of the institutional devices required to incorporate farmers'/pastoralists' opinions into the process of identifying improvements cannot be identified.

Three points are worth making here. First the staff of many government services for implementing development are unlikely to represent farmers'/pastoralists' opinions any better than research scientists. In many countries, indeed, especially where FSR/PSR has been willingly adopted as an approach by the research services, the researchers are more likely than are the agents of the often 'top-down' oriented extension services to be able to understand farmers' points of view. Secondly, in seeking pastoralists' opinions care has to be taken to obtain an adequate cross-section. It is not enough to consult political leaders, or leaders of pastoralists' associations, or "prominent" or "progressive" pastoralists. Such people are likely to be drawn from among the better-off and are likely neither to understand well the problems of the less well-off, nor, if they understand them, to represent them if such views are contrary to their own interests. Nor is it enough just to call a public meeting to discuss selection of improvements. At such public meetings the interests of the less well-off, even though they attend, are unlikely to be strongly defended.

The third main point is that if pastoralists are to make the contribution to identification of improvements that is needed of them, then time and care has to be devoted to discussing with them what the different improvements may involve. Of course, if asked "would you like a new kind of livestock feed which will make your animals give more milk? the response will be affirmative. That sort of consultation is mere window-dressing. What needs to be done is to thrash out in some detail what the innovation may mean (including any alternative options) in respect of, for example, cash cost, labour-use profiles, risk, land tenure, loss of pastoralists' independence etc.

This is inevitably time-consuming and will not lead to published articles in internationally referreed journals in the way that conventional disciplinary research (even if subsequently ignored by pastoralists) will yield. But it is more likely to lead to the design and testing of innovations which *will* subsequently be adopted. The point is that pastoralists cannot be expected to grasp immediately all the implications for their pastoral system of a potential technological change. Little in their own experience will have fitted them to know what sort of questions one needs to ask about new technology. But if scientists and pastoralists will sit down together to thrash some of the issues out, from the union of their past, separately inadequate, experience something useful may emerge. In the case of the participation in decision making by both pastoralists and officials of the host government's service for implementing development, care has to be taken to establish a proper institutional framework for that participation and to ensure that participants are adequately oriented and briefed so that their participation is both genuine and has positive results.

Techniques for assessing potential improvements

This section of the paper deals briefly with the kind of techniques available for assessing the relative merits of different potential improvements once these have been identified.

Early on in the preparation of this paper the idea was discussed that it ought to be possible to make generalisations, about impact, about probability of adoption, about rapidity of fruition, based on broad categorisations of, on the one hand, "types of improvement" and on the other "kinds of situations" in which the improvements are to be introduced: for example, "individual land tenure" areas would be one kind of situation, "communal tenure" areas would be another. Categorisation of improvements could be by a number of different criteria. One of these would be in terms of western concepts of disciplinary boundaries, and would lead to a categorisation as follows.

1. Improvements to the primary productivity of the natural vegetation leading to better animal nutrition.

2. The growing of introduced grass, browse and other forage.

3. The supply of supplementary feed (minerals, protein, energy etc.)from non-rangeland sources.

4. Improvements in animal health.

5. Genetic improvements (whether from imported genes or by intra-area selection).

6. Improvement in water supplies - leading to more frequent watering, with higher quality water at less energy cost in watering.

7. Improvement in animal husbandry (e.g. breeding seasons, weaning practices, housing etc.); i.e. improvements in the care of individual livestock kept not subsumed under 1 to 5 above.

8. Improvements in marketing that lead to greater market efficiency, convenience and equity.

Categorisation by disciplinary boundaries did not lead to many useful generalisations. Possibly the only important one was about rapidity of fruition. In many pastoral areas the full scope of available animal health technology has not yet been exploited and quite short periods of survey, followed by short trials on pastoralists' herds, can lead to rapid results on a wide scale. Although improvements on the health side may not substantially affect the overall productivity of the pastoral system unless the nutrition constraint is also overcome, they can provide early and dramatic evidence of the efficacy of PSR as far as the productivity of individual animals is concerned.

A possible categorisation of improvements in terms of those which are susceptible to testing by standard experimental techniques and those which are not was also considered. The distinction is not absolute but one of degree (more or less). Most technological changes are susceptible to standard experimental techniques when tested on a research station, and some of these, for example, forage crop trials on individually owned fields, weight gains of individual animals due

to supplementary feeding, can also be tested in this way "on-farm" ("on-range"). In other cases, however, because of difficulty of measurement, e.g. in the case of milk yields of cows with calves at foot, or because of difficulty of experimental control, e.g. with different range management techniques on communally grazed land, even technological improvements are barely testable in "on-farm" experimentation. Most social changes are not susceptible to standard experimental techniques of the kind applied to technological innovations because it is simply not possible to conduct a controlled experiment with them. However, it should not be concluded that experimentally testable improvements are legitimate and important and that untestable ones are not. On the contrary, many experimentally testable improvements may offer only trivial advantages whereas the major scope for improvement may be through untestable innovation.

Although it cannot be concluded that improvements which are experimentally testable are, *ipso facto*, likely to be more or less important than those which are not, they have some advantages when it comes to reducing the risk of failure in large-scale implementation. With improvements that are experimentally testable there will be some points, short of full-scale implementation, at which the impact of an improvement on increased production can be verified. Of course, even in this case what will be measured, when doing experiments, are changes in output under conditions of experimental control or of supervision or guidance by scientists. These may comprise rather different conditions than would be the case in the event of large-scale adoption by pastoralists at a later time. On-farm testing, if done for long enough and on a large enough scale, can also in theory involve assessments of risk and the inter-class and inter-household distribution of costs and benefits. In practice it seldom can be done for long enough or on a large enough scale to achieve this.

However the scope for success in the introduction of improvements will be determined more by the characteristics of the particular situation (in time and space) on which PSR and development are focused rather than by the category of improvement. Particular situations differ from each other in so many different ways (environ-

mental, economic, social, political etc.) that useful categorisations and generalisations are not possible here. Categorisation by one criterion (e.g. rainfall) cuts across categorisations by another (e.g. social structure) in a way that yields a myriad of sub-categories. In other words, the assessment of potential improvements cannot be done simply by reference to simple rules of thumb (generalisations applied to broad categories of improvements and situations) but will require specific analysis in each instance.

Thus, in assessing potential improvements, broad generalisations based on categories of improvements and of situations cannot be relied upon to predict likely impact and probability of adoption. Rather reliance will need to be wholly on case-specific predictive models. In a few cases, if it is decided to select that improvement for subsequent component research, some experimental evidence will subsequently become available to shed light on the validity of the original models.

The models can be of varying degrees of complexity depending on the time and resources available to construct and test them and on the input data available. At one extreme of simplicity, the model may be no more than a "back-of-the-envelope" calculation (simple "partial budgeting") to decide whether the average cash cost of, say, a mineral block is likely to be exceeded by the average value of extra liveweight gained as a result of using it.

A first step improvement on the "back-of-the-enveloppe calculations model would be one which:

1. estimated *probabilities* of different values of net cash returns, thereby taking at least partial account of the substantial impact of variability in pastoral systems on the pay-off from an improvement.

2. included a cash flow exercise which estimated how the period and financial deficit between the time at which cash costs are incurred and cash returns are received might be bridged by different classes of pastoralists.

3. showed the impact of a potential improvement on the labour-use profile of different classes of pastoralists. In many pastoral (and farm) systems, labour is as critical a limiting resource as cash. It is, therefore, important to calculate whether the extra labour demand generated by an improvement can be accommodated solely by sacrificing leisure (and if so whether the net returns per extra man hour are comparable to those obtained by other activities currently carried on), or whether it will require the displacement of some other productive activity, and if so with what result. Such calculations are equivalent to the "gross margin" kind of calculations carried out for conventional cropping enterprises which show which activity is likely to yield the highest margin per *hectare* and which activities are likely to be displaced by the more profitable new one. Models that deal with labour-use are more complex than "gross margin per hectare" analyses. For example in the case of irrigated land whereas land can be allocated at most to three different crops in succession each year, i.e. once every four months, competition between activities for labour occurs on a much more frequent basis.

The types of models discussed so far are extremely simple and for the most part are economic models. If time and data allow far more complex models can be used. In agropastoral enterprises, linear programming maximizing models have already been used (e.g. by Eddy (1979) and Delgado (1979))but not yet for purely pastoral enterprises except at an excessively aggregate scale, e.g. it has been done for the Sahel as a whole (Picardi, 1974). Konandreas and Anderson (1982), building on work by others, have devised a simulation model which can be used to forecast some of the changes in livestock systems which will spring from changes in technical parameters. Both these kinds of models are essentially economic ones, are expressed in mathematical terms, can be computerised, and deal with rather few relations and variables at a time (the Konandreas and Anderson model contains some 25 key equations). On the whole, the economic models developed so far are best at predicting the impact of improvements on net output (production less costs) and are not directly concerned with the probability of adoption or the effect on the quality of life as spelt

out in this paper. Most anthropological models are verbal, not mathematical, and are much more complex but correspondingly less precise. They are much more concerned with questions of adoption and of interpersonal equity. A feature of all complex models is that they require considerable time and effort not only to collect data but also to manipulate the model and consider its results.

Concluding summary

There are four main tasks to be carried out when identifying the scope for improvement: identification of potential improvements and then, in respect of each of those identified, prediction of the likely impact in terms of at least two criteria (increase in net production, change in the quality of life), prediction of the probability of adoption and of the rapidity with which the improvement will bear fruit if adopted. These are not very radical suggestions but they are seldom practised. Furthermore it has been suggested that when identifying scope for improvement not only should the natural and social scientists of the organisation practising PSR itself be involved, but also pastoralists and officials of the implementing agencies of the host government should participate as well. For such participation to be fruitful, however, thought, trouble and time have to be devoted to ensure that their participation is genuine and properly structured and informed. In making predictions, generalisations based on categories of improvements and categories of situations in which the improvements are to be introduced are of very limited use. Case-specific analysis will be required which will use predictive models of varying complexity and from different professional disciplines. Because the predictions are being made in advance even of on-station research, they cannot be precise but can only be estimates of probabilities concerning the balance between benefits and costs or between positive and negative factors.

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Envergure des innovations

Résumé

Cette étude prend comme point de départ que le système existant à été étudié, décrit et analysé de manière adéquate dans le cadre de la recherche sur les systèmes pastoraux et que les contraintes relatives au développement futur du système ont été identifiées. La phase suivante dans le cycle consiste à identifier l'envergure des innovations.

Il y a quatre tâches essentielles à effectuer dans l'identification de l'envergure des innovations: l'identification des améliorations potentielles et ensuite,par rapport à chacune des innovations identifiées, la prévision des effets potentiels, compte tenu tout au moins de deux critères (accroissement de la production nette, changement de la qualité de la vie), la prévision de l'adaptabilité de l'innovation et de la rapidité avec laquelle celle-ci portera des fruits si elle est adoptée. Le CIPEA peut évaluer l'impact probable des améliorations potentielles sur la qualité de la vie de plusieurs manières. L'impact sur l'environnement fait partie de celles-ci. Le CIPEA peut également évaluer la mesure dans laquelle les améliorations potentielles profiteront à toutes les composantes de la collectivité. Troisième aspect non moins important: la manière dont une amélioration influe sur la distribution des avantages et des inconvénients au sein des ménages.

En identifiant l'envergure de l'amélioration, il faudrait faire appel non seulement aux chercheurs spécialisés en sciences sociales et naturelles participant à la RSP mais également aux éleveurs et aux responsables des organismes d'exécution du Gouvernement du pays hôte. Pour qu'une telle contribution soit fructueuse cependant, il faudra faire en sorte qu'elle soit bien structurée et que les participants à cette recherche concertée disposent des informations requises.

Dans les prévisions, les généralisations basées sur des catégories d'innovations et des catégories de situations dans lesquelles les

améliorations doivent être introduites sont d'une portée limitée. Des analyses de cas spécifiques, fondées sur des modèles de prévision de complexité diverse, effectuées dans diverses disciplines seront nécessaires.

Les modèles peuvent être de complexité diverse, compte tenu du temps et des ressources disponibles pour les mettre au point et les tester et compte tenu des données disponibles. Il peut être très simple mais il peut également être assez complexe et estimer par exemple les probabilités de différentes valeurs de revenus monétaires nets, inclure des calculs sur la marge brute d'auto-financement déterminant la manière dont le déficit financier qui intervient entre le moment auquel les dépenses monétaires sont effectuées et celui où les revenus monétaires sont perçus peut être comblé par les différentes classes d'éleveurs et montrant l'impact d'une amélioration potentielle et le profil de l'utilisation de la main-d'oeuvre de différentes classes d'éleveurs. Si le temps et les données le permettent, des modèles beaucoup plus complexes peuvent être utilisés.

Etant donné que les prévisions de tels modèles se font à l'avance (même avant d'entreprendre la recherche au niveau de la station), elles ne peuvent être précises. Toutefois, elles peuvent constituer des estimations plausibles sur l'équilibre entre les coûts et les bénéfices ou entre les facteurs positifs et négatifs.