Ranking Local Tree Needs and Priorities Through an Interdisciplinary Action Research Approach

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Abstract: *There is today a consensus around the fact that local development should address the needs and priorities of local actors in order to be successful. However, the identification of local needs, understood in their context, is far from easy. This article reviews different ranking methods used within PETREA, an action-research programme aimed at improving local livelihoods through improving access to trees and tree products. It is argued that none of the existing ranking methods, taken alone, can claim to identify local needs. Only an interdisciplinary approach can hope to provide a full-picture and an in-depth understanding of the local context. But interdisciplinary collaborations are rendered difficult by the institutional settings in which they are developed. Instead of being seen as complementary, the different academic traditions can be seen as opposed, especially when scientists struggle to secure their participation in a project with limited funding, or when they feel challenged about the legitimacy of their methods and focus. The danger is that they end up defending their own interests rather than those of their target population. Interdisciplinary action research meets the same challenges as other types of research when it comes to integrating local participation within its approach.*

Key words: Interdisciplinary collaboration, ranking methods, participation, need assessment, Trees, Agroforestry

1. Introduction

Today, it is widely recognised that local development, in order to be successful, should address local needs and priorities, and that local people should play an active role in the definition of these objectives (Chambers et al. 1989; 1991; Cornwall 2000; 2002). An example of this thinking is represented by the PETREA ("People, Trees and Agriculture in Africa") research programme funded by the Danish Council for Development Research. The objective of PETREA is to improve livelihoods through the use of trees and shrubs in Tanzania and Burkina Faso (Nathan et al. 2002). Identifying people's needs and priorities relating to trees and identifying constraints and opportunities linked to their utilisation is seen as a first step to reaching this aim. Finding creative, adapted, and sustainable solutions to overcome them, is a second step.

During the common fieldwork of our research, each scientist applied the methods characteristic of his or her own scientific background, in order to clarify particular research concerns in order to produce knowledge about tree-related needs, priorities, constraints and opportunities. The methods used were the following: Qualitative interviews (semi-structured or unstructured interviews, informal conversations, participant observation), structured questionnaires, participatory matrix and pair-wise rankings, quantitative ethnobotany, botanical inventories, and quantitative botanical composition of livestock diets. Moreover, a number of participatory research experiments have been started locally (Border tree planting in Tanzania, grafting of shea trees in Burkina Faso). The aim of this article is twofold. First, it will describe different ranking methods in general terms and discuss whether, and how they can contribute to ranking the local needs relating to trees. It will be argued that an interdisciplinary combination of methods is needed to provide an in-depth understanding of the local context. Second, the article will discuss the priorities underlying the various ranking methods favoured by different researchers and take a critical look at interdisciplinary collaboration. These problems are addressed by questions such as: What was gained from working in inter-disciplinary teams and combining different kinds of rankings? Did we rank needs according to the priorities of the local community or according to our own priorities as researchers? How "objective" are decisions made by an interdisciplinary team, and how much do these decisions owe to development and research politics? Here, it will be argued that an interdisciplinary approach can be made difficult by the institutional settings and the different academic traditions in which it is developed, and that this can threaten the collaboration among researchers, and between them and their target population.

It is hoped that the experience described here can help similar kinds of interdisciplinary projects to plan their research, and to acquire a better understanding of the difficulties involved in ranking needs, in understanding the complex context in which the use of natural resources is inscribed, and in interdisciplinary collaboration.

2. Ranking Needs

Identifying local needs and prioritising them is not an easy task. Trying to promote trees as *the* solution to address these needs is even more difficult. Deciding which of the needs should be addressed by which of the trees and for whom depends on at least four different factors. First, different stakeholders might have different priorities. Farmers and herders have different needs. Within the community, gender, age, occupation, ethnicity might lead to different needs and interest in trees. Outside the community, policy-makers and scientists might have yet another set of priorities. Second, trees can potentially satisfy a great number of different needs - energy, medicine, fruit, fodder, soil fertility, construction material, shade, money, etc. Some needs might be generally considered as more important than others might. Moreover, some trees can address only one very specific need (single-purpose trees), while others can address combinations of different needs (multipurpose trees). Third, the trees which can address needs must be perceived as an acceptable solution. Generally speaking, to address needs in a sustainable manner, the benefits derived from the trees must be more important than their cost, and this cost-benefit ratio must be more favourable than the one provided by other types of solutions. Some needs might be better addressed by other means than trees, such as alternative sources of energy, modern medicines, fertilisers, commercial fruits or fodder, improved access to credit, building a dam to provide water for cattle, etc. So we should be aware that some types of solutions might locally be preferred over others, and that solutions have different costs and benefits for different stakeholders. People might *need* solutions to their problems, but these solutions do not *need* to be trees. Furthermore, even if trees are perceived as an acceptable solution, it might be for their commercial value rather than for their subsistence use. Indeed, although some people might prefer trees which address direct problems (firewood, fodder, fruits, medicines, soil fertility), others might prefer trees which generate a monetary income, enabling them to address the household needs by buying products such as fuel, fodder, fruits, medicines, fertilisers, etc. Fourth, in order to improve access to tree products, people might need solutions to overcome existing constraints (climate, tenure, widespread poverty, growth rate of the trees, and so on).

Thus, ranking tree-related needs and priorities is a complicated matter that requires the study of a variety of problems, with a variety of methods. Researchers have to look at the local community's problems, and understand which problem is more important for whom. Within PETREA, we tried to see whether trees could address any of people's problems, which tree was better suited to do this, what were the constraints linked to the promotion of these trees, as well as the cost and benefit (seen for the different stakeholders) of the enterprise. In the following, I will describe different methods used by the PETREA researchers, and discuss how they contributed to identifying and addressing people's needs relating to trees.

2.1. Ranking local problems and identifying those that can be addressed with trees

In an action research, participants must assess what they can realistically achieve and what is out of the scope of their research. In Burkina Faso and in Tanzania, the needs that could be addressed through trees were identified through problem-tree exercises, where people were asked to describe their main problems, and analyse their causes. In both countries, education, access to water and infrastructure were mentioned as some of the most important problems. Although some of these problems relate indirectly to trees (one may need water, education and access to market or extension services in order to grow trees), these problems cannot be *addressed* by trees as such, and were therefore deemed out of the scope of this research. Other problems, such as lack of fire wood (in Tanzania), declining soil fertility, lack of fodder during the dry season, and especially widespread poverty (in both Tanzania and Burkina Faso), were within the mandate of our research programme.
Ranking of use-categories can inform researchers whether trees are preferred by different types of informants for their commercial, nutritional, medicinal or other uses. A PRA pair-wise ranking in which every use-category is compared with every other one shows which one is considered more important than the others are. This results in a ranking of preference relating to use-categories (independently of any species), as can be seen in table 1.

Table 1: Example of pair-wise ranking of tree use-categories from the central plateau in Burkina Faso. Each category is compared to each other category, and the informant is asked to state which one of the two is the most important. In the above example, the most important criteria are money (6 points), followed by firewood (5 points), and fruits (4 points), etc. It should be mentionned that the two young male informants in this exercise are occasionally involved in selling firewood and poles as construction material in order to earn some money.

	Fodder	Medicine	Vegetable	Fruits	Fire-wood	Money	Tools	Total
Fodder (leaves)		Medicine	Vegetable	Fruits	Fire-wood	Money	Fodder	1
Medicine			Medicine	Fruits	Fire-wood	Money	Medicine	2
Vegetables (leaves)				Fruits	Fire-wood	Money	Vegetable	3
Fruits to eat					Fire-wood	Money	Fruits	4
Firewood						Money	Fire-wood	5
Money, income							Money	6
Wood to make tools								0

The most important use-categories can also be identified through semi-structured interviews, or even from a quick look at the tenure and spatial distribution of trees (see point 2.2 on tree tenure). In a village in south-western Burkina Faso, the two most important use-categories for trees are money and food, as most people invest a lot of time and energy in growing and exploiting Mango, Cashew, African locust bean and Shea trees whose products can be sold or consumed directly by the household, thereby saving money from not buying a replacement for the product. Since fruits are in high demand, food is another highly valued criteria for tree use-value. In a village on the central plateau, however, firewood is seen as more important than fruits. In the region of Gairo in Tanzania, the area is so devoid of trees that people are forced to burn stalks of maize or cow dung as fuel. Firewood is therefore a highly valued quality for trees.

The ranking of use-categories for tree qualities is often not as easy as one might think. It often relates to social categories and occupations. Cattle herders are generally more concerned by the lack of fodder, male farmers by deriving income from trees (see for example note 1), while women usually have a much higher stake in firewood and non-timber forest products (NTFP, such as wild vegetable or medicines) (Yago et al. 2003). This also means that to produce a ranking with a *group* of informants can be highly problematic, as those subtle differences are hidden by the fact that powerless informants will give way to the view of powerful ones, so that a pseudo-consensus can be reached.

2.2. Tree tenure and spatial distribution of trees

After the scope of the research has been defined, it is important for researchers to have an idea of what already exists, as a preliminary step in identifying what remains to be done. Studying the spatial and tenure distribution of trees provides information about what type of trees are found in the landscape and who owns them. The number and state of existing trees can be interpreted and provide indirect information on which trees are used, planted or protected. Trees found on agricultural land, for example locust bean and shea in Burkina Faso, are often protected against felling because they provide important products. But the rarefaction of a useful species, such as ebony in Tanzania, might also reflect its over-exploitation and the lack of institutional mechanisms able to enforce its sustainable management. Knowing the spatial and tenure distribution of trees found in a landscape or village gives therefore an idea of the importance of trees, and of who controls them - but this type of knowledge can only be deduced on the basis of complementary studies, mainly relying on interviews.

The tenure distribution of trees refers to ownership of and access to trees. One way of ranking tree ownership is to design a questionnaire and ask a sample of farmers what trees they have on their land, how many they have, how old the trees are, etc. This type of information is interesting in that it can allow the researcher to correlate the amount and type of trees owned by different social categories and this, in turn, is reflected in the priorities set by the different social categories. In Burkina Faso, for example, the ownership of trees is closely correlated to gender, and to the distinction between first-comers and latecomers - i.e. to ethnicity as can be seen in figure 1 (see also Gausset *et al.* 2003a; 2003b; Yago *et al.* 2003).

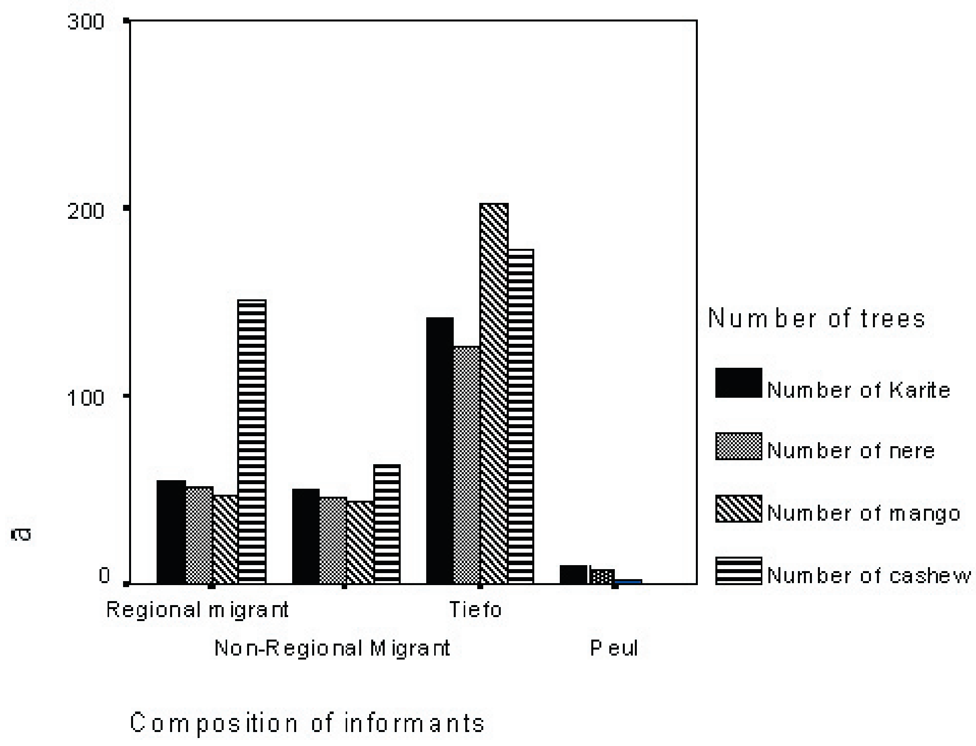

Figure 1: *Tree ownership according to the geographical origin of informants in the village of Peni (Southwestern Burkina Faso). Informants are distributed in four groups: the autochthonous group (Tiefo), the migrants from the southwestern region (regional migrants), the migrants from elsewhere (mainly Mossi), and the semi-nomadic pastoralists (Peul). The data derive from a household survey conducted in the village of Peni on 102 households (20 % sampling intensity). It shows that the members of the indigenous group own in average much more trees than all other groups, and that the access of herders to the selected species is marginal.*

A study of the tree tenure might also reveal that some people do not have any access to trees at all. In the case of PETREA, this includes people who have no material goods, no land, no trees, and no income, perhaps even without family, and who survive on community solidarity. Although these people may never work directly with agro-forestry, it is important to understand their role in the community, in order to evaluate the expected impact (or lack of impact) of a future project on different categories of people. One of the risks related to questionnaires is that of getting a biased result because farmers tend to focus on the trees which are the most important economically, and which are the object of specific tenure rights (such as Mango, Cashew, African Locust Bean, Shea or Eucalyptus in Burkina Faso). Another limitation lies in the phrasing of questions, as some people might borrow fields and use trees belonging to someone else. In this case, many trees will be recorded twice[1]. Thirdly, farmers do not always know exactly how many trees they own or how big their field is. If it is necessary to know exactly how much land or how many trees a farmer owns, triangulation is needed.

A study of the spatial distribution of trees might distinguish them not only according to their location (in fields, in home gardens, along rivers, in protected areas, etc.), but also according to their size, age and health. Botanical inventories are designed to provide such information. Quantitative measures of the location, health, age and size or trees can state whether the species are rare or abundant. This can then allow the researcher to rank trees according to their prevalence as well as predict the future availability of trees (through the age distribution of trees) or their economic potential (c.f. Gijsbers et al. 1994, Lykke et al. 1999). In Burkina Faso, for example, a botanical inventory revealed a lack of regeneration of African locust bean in one of the villages studied. It also showed that, contrary to expectations, shea trees did not show signs of low regeneration rates. Whereas botanical inventories can give an idea of the spatial distribution of trees and of their regenerative state, they give limited information on the management factors that explain the current situation – they do not tell why the vegetation looks the way it does. It should therefore be made in collaboration with other methods providing information on tree tenure and management, such as questionnaires and interviews. For example, the relatively small and old population of African locust bean trees documented in one village of Burkina Faso could be related to the fact that the village chief customarily owns all these trees, which does not give any incentives for people to protect and care for them.

2.3. Ranking trees according to their potential use-value

Ranking trees according to their use-value allows researchers to document the potential importance that different trees are assigned by different people. Ranking trees according to their use-value can also give information on whether people rely on a few multi-purpose trees, or whether they rely on a diversity of specialised trees. If it is documented that people rely on a variety of trees for specific non-timber forest products (this was the case both in Tanzania and Burkina Faso), then future projects aimed at improving access to these products might focus on securing access to a diversity of trees rather than to a few multi-purpose species.

One method used to rank the use-value of trees is the PRA matrix ranking[2]. A group of informants is asked to name the different trees that they know, then to name the different potential uses known for trees, and finally to rank the different trees according to the different use-categories, as can be seen in table 2.

Table 2: Example of matrix-ranking of trees (local names) according to use-categories. The exercise was conducted with a group of 20 women in Tanzania. VG = Very Good; G = Good; A = Average; B = Bad; VB = Very Bad; ? = Unknown

	Poles	**Medicine**	**Firewood**	**Food**	**Money**	**Soil**	**Fodder**	**Shade**
Msaji	A	B	VG	VB	VG	VG	B	G
Melea	A	B	G	VB	G	B	G	G
Muarubaini	VG	VG	G	VB	G	G	G	G
Eucalyptus	VG	G	G	VB	VG	VB	B	B
Mlongelonge	A	VG	A	VB	A	VG	B	VG
Mkolokopasi	A	B	A	VB	A	VG	B	VG
Mkungu	A	B	A	VB	B	G	A	VG
Mpilipili	VB	VB	G	VB	G	G	G	G
Mgrivelia	VG	B	A	VB	A	G	VG	A
Guava	VB	G	A	VG	VG	VG	?	G
Orange	G	B	A	VG	VG	VG	?	G
Papaya	VB	G	VB	VG	VG	G	G	G
Seblela	A	VB	G	VB	G	G	G	G
Msufi	VB	B	B	VB	G	B	B	G

This method is often used with group interviews. In such cases, the researcher must be aware that the consensus reached might in fact hide a great diversity of opinions and needs among informants (Pottier and Orone 1995). Moreover, it is important that the researcher is very specific about whether the ranking is about the potential use-value, or about the actual quantity really used of a tree. The two things can be very different. For example, a tree such as ebony is a very strong and valuable wood, which can be ranked highest for furniture or artefacts. But because this tree is extremely rare, it would be very seldom used (it would rank lowest according to its actual use). When comparing trees for income generation, the potential price obtained if the trees were cut and sold (for timber or fuel) would be different from the income generated annually through selling of the fruits, bark or dead branches that they produce. When ranking trees according to their utility as food, a theoretical preference that does not take into account whether the species are rare or abundant differs from the actual everyday nutritious importance of the species for the household. As these examples show, it is very important that the researcher is extremely precise about the criteria used for ranking when interviewing informants. It is not enough to ask informants to rank trees according to their ”importance”. It has to be specified whether the ”importance” should be evaluated in terms of the potential use-value (quality) or actual use (frequency, quantity).

Quantitative ethnobotany is another method that can provide a ranking of the use-value of trees (Prance *et al.* 1987, Cotton 1996, Phillips 1996). A number of informants are chosen and asked individually to describe the different uses of specified trees found in a forest plot or in the area, and to rank the importance of the tree for each use described (in our case, giving the value 0,5 for “usable”, 1 for “suitable” and 1,5 for “very important”). The values for the different uses are added to one another, and give a global value for each species, as can seen in table 3. The results can be compared by tree or use, and a ranking of trees according to their use-values can be produced (cf. Krogh *et al.* (forthcoming) for Tanzania and Belem (2000) for Burkina Faso).

Table 3: Ranking of trees according to total use-value of a few species included in ethnobotanical survey in Majawanga (Tanzania). Numbers in brackets show ranking of the three top species within categories[3].

Species name	Total Use-value	Construc-tion	Food	Medicine	Fodder	Commer cial
Vangueria infausta Burch.	3,6	0,7	1,3	0,7	0,0	0,9 (2)
Psidium guajava L.	3,4	0,0	1,5 (2)	0,5	0,2	1,2 (1)
Lannea schweinfurthii (Engl.) Engl.	3,2	0,7	0,9	0,7	0,6	0,3
Carica papaya L.	3,2	0,0	1,5 (1)	0,7	0,1	0,9 (2)
Acacia nilotica (L.) Willd. ex Delile	3,0	0,9	0,0	1,0 (3)	0,8	0,3
Dichrostachys cinerea (L.) Wight & Arn.	3,0	0,9	0,0	0,8	1,0 (3)	0,3
Azanza garckeana (F. Hoffm.) Exell &Hillc	2,9	1,0	1,2	0,0	0,0	0,7
Premna senensis Klotzsch	2,9	0,8	1,2	0,3	0,4	0,2
Vitex payos (Lour.) Merr.	2,8	0,5	1,2	0,4	0,0	0,7
Erythrina abyssinica Lam. ex DC.	2,8	1,5 (2)	0,0	0,8	0,2	0,3
Acacia tortilis (Forssk.) Hayne	2,5	1,1	0,0	0,0	1,1 (2)	0,3
Zanthoxylum chalybeum Engl.	2,3	1,0	0,1	0,9	0,2	0,1
Allophyllus rubifolius	2,2	0,5	0,3	1,0 (2)	0,3	0,1
Azadirachta indica A. Juss.	2,1	0,4	0,0	1,5 (1)	0,0	0,2
Eucalyptus tereticornis Sm.	2,0	1,5 (1)	0,0	0,2	0,1	0,2
Albizia anthelmintica Brongn.	2,0	0,6	0,0	1,0	0,3	0,1
Leucaena Leucocephala (Lam.) de Wit	2,0	0,5	0,0	0,0	1,3 (1)	0,2
Manihot glaziovii Müll. Arg.	1,6	0,0	1,4 (3)	0,0	0,2	0,0
Erythrina burttii Baker f.	1,5	1,2 (3)	0,0	0,0	0,0	0,3

The result can be a table similar to that produced by the PRA matrix-ranking but minimises problem of consensus and of comparability of data. The rankings produced by quantitative ethnobotany can therefore better account for a diversity of interests and opinions than the PRA matrix ranking, but is also more time-consuming. However, as with PRA matrix ranking, it is important that the researcher clearly specifies whether the ranking is about the potential use-value of trees or about the actual use of trees. It is extremely important in ethnobotanical surveys, as well as PRA interviews, that the questions asked are clear and concise. Another limitation is that quantitative ethnobotany does not rank which use-values are preferred, although in reality, some use categories may be considered more important than others. For example the economic value of trees may be considered more important than their value in providing shade (see note 1 and point 2.1 on ranking local problems). Moreover, some use categories might overlap. Ranking the importance of a tree for honey or for money might be the same thing if honey is primarily sold, which means that one ranks the same thing twice and gives twice as much weight to the two overlapping categories than to the other ones. Thus, the ranking produced by a quantitative ethnobotany depends as much on the informants than on the researcher's definition of use categories.

2.4. Ranking trees according to their actual uses

As we have seen above (point 2.3), ranking the use-value of a given tree can be the ranking of a potential or ideal use, and can be very different from ranking its actual use. The actual use of trees reflects a certain choice, which may not be deducted from the potential use-value (point 2.3), but might also depend on tree tenure and on the spatial distribution of trees (point 2.2). People might be prevented to use trees of high quality because they are rare or concentrated in the hands of a few, and forced to rely, *faute de mieux*, on trees of poorer quality which are open access and found in higher quantities. Ranking the actual use is therefore interesting because it gives information on the *actual* importance of different kinds of trees for the households and for local livelihoods. This importance can eventually be evaluated in monetary terms.

Methods that rank actual use usually try to identify as precisely as possible what kind of trees are used, for what purpose, and in which quantity. For example, if one is interested in the importance of non-timber forest products (NTFP) for nutrition, one might design an economic survey from a sample of households, within which the consumption of NTFP is carefully registered for at least a whole year (to account for seasonal variations) (Mertz et al. 2001). This method can provide accurate information on the importance of NTFP for nutrition, for medicinal purposes, for building material, or other uses. The importance of the given NTFP can then be compared to the importance of cultivated products. Both PRA and quantitative ethnobotany (see point 2.2) can also be used to rank actual tree uses, but this requires that informants are clearly asked about the actual use and not about the potential use-value.
Ranking which trees are eaten by ruminants and in what quantity can be done by study of the microscopic plant fragments ingested by cows or sheep and found in their faeces (Sparks and Malechek 1968). When the result of the microhistological survey is compared with the actual frequency of trees found in a landscape (see point 2.2 on the botanical inventory), the choices made by cattle when eating can be determined. If some species found in the dung are over-represented compared to their actual presence in the landscape, it means that animals have selected these species over the other ones.

The actual use of trees reflects their everyday importance for the different stakeholders. It is possible to evaluate this importance by quantifying the use of NTPF, usually through a household, ethnobotanical or microhistological survey, and calculating how much money, time or energy it would cost to replace these products if they had to be bought on the market or cultivated in fields. This can be used to argue that the reduction of forested areas has a direct cost for the households, as people are forced to spend time or money to replace the lost resources. This cost can then be integrated in a social impact assessment of a project having an impact on forested areas. Of course, the reduction of forest areas can also be linked to the development of agriculture and lead to a higher agricultural income. The costs and benefits therefore have to be carefully balanced, and compared for all stakeholders to see gains and losses.

The previous paragraph relates to the actual use of NTFP within the household and to expense-saving activities. But tree products can also be sold on the market and actually used outside of the household. In this case, trees are important as a direct source of income, which can be evaluated in a household survey focusing on household production, for example. One can design a questionnaire asking the number of trees owned, the production of trees, the quantity which is sold, and the price (see point 2.2, including for the bias of this method). This can then enable researchers to calculate how much money is generated by the tree species producing cash crops, and correlate this with social categories (see figure 2 for an example).

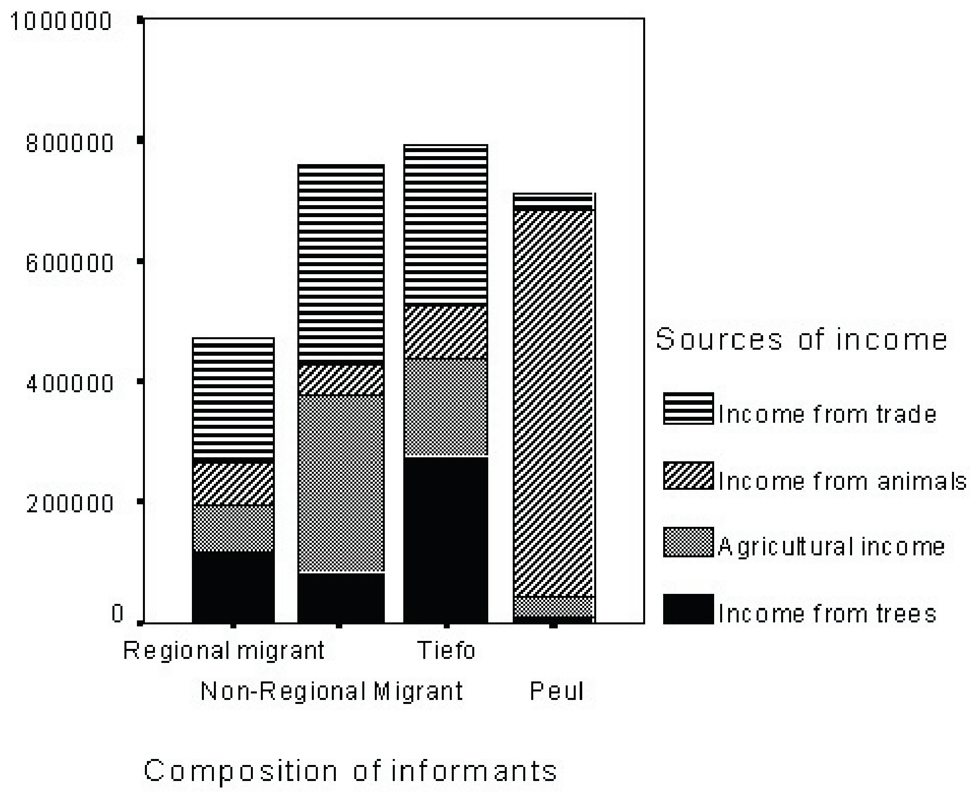

Figure 2: *Comparison of the sources of average income per household, in CFA francs, according to the geographical origin of informants, in the village of Peni (Southwestern Burkina Faso). The data derive from a household survey conducted in the village of Peni on 102 households (20 % sampling intensity). It shows that trees constitute a much bigger source of income (both in absolute and relative terms) for the indigenous Tiefo than for the migrants, and is a marginal source of income for the semi-nomadic Peul pastoralists.*

2.5. Ranking opportunities and constraints

It is important to realise that the ranking of the trees determined by the methods previously discussed does not necessarily reflect the needs that should be addressed by a development or research project. Firstly, some of the most important tree species for household consumption might be so widespread and regenerate so well that it could be unnecessary to improve access to them (such as African locust bean in Burkina Faso, for example). Future projects should address lacuna, i.e. situations where the use of trees is sub-optimal as judged by both the population and the project personnel. Secondly, the most useful species might not grow well locally or might be so valuable that it is difficult to protect in the wild. Ranking usefulness says nothing about the constraints which prevent the local use of trees. Thirdly, the most consumed species might not cover all needs, and might be a second best choice. Ranking consumption says nothing about the need for trees which are rare or absent - since they are not recorded as used. The actual consumption of trees reflects people's preferences within existing constraints, but does not reflect what they would prefer to have if they were free from any constraints. The understanding of people's needs and priorities should therefore include a thorough understanding of existing constraints, since people's preferences would be different if all constraints or problems could be solved.

In order to measure preferences in a world free from constraints, experiments can be designed to overcome as many constraints as possible. For example, when studying fodder, one can eliminate all constraints relating to distance and availability by providing cattle with a diversity of useful leaves in unlimited quantities, and see which one they prefer to eat. The constraints linked to the access to seedlings can be removed by providing farmers with a variety of free seedlings, to see which ones they prefer to plant. In Tanzania, for example, 20,000 seedlings of Eucalyptus, Acacias, Azanza and Gliricidia were distributed for free to villagers, so that they could plant them wherever they wanted. People first took Eucalyptus, then Acacia, and it is only when there were no more of these that they began to take seedlings of Azanza and Gliricidia. This shows a ranking of a certain willingness to plant between these four species. This hierarchy does not just relate to the actual use of trees (Eucalyptus is an exotic species that is mainly sold). But it shows a willingness to plant trees, once the constraints of cost and delivery of seedlings are removed. However, other types of constraints such as space available for trees, type of soil, labour, watering, tenure, access to market, or even knowledge since Gliricidia is unknown by the villagers, continue to play a role. Since it is difficult for informants to express or analyse all constraints linked to planting trees, and since it is well known that there might be a gap between what people say they want to do and what they really do in practice, this type of experiment might give a better idea of the local preferences than interviews or PRA exercises. However, what it says remains limited since it only removes a few constraints (cost, timing and access to plant material), leaving the other ones unsolved (access to land, water, labour, and so on, see below).

Trees are chosen and preferred according to a whole range of criteria, such as the availability of seedlings, geography and landscape, tenure, use-value, productivity, growth rate, type of land available, climate, cost of planting, commercial aspects, technology required and available, etc. If the aim of a research or development project is to help people grow the trees which they prefer, it is important to look at the opportunities linked to trees - the unexploited potential of trees linked to their productivity, possible uses, commercial importance, the needs that they can fulfil, the solutions that they can provide to different kinds of problems, etc. But it is at least as important to address the constraints that hinder the use, planting, tending or maintenance of trees (regeneration, health, productivity, characteristics of trees, labour, commercialisation, gender, local social and political institutions, land tenure). In Tanzania, for example, most informants said they want to plant fast-growing species. They expressed knowledge that different trees grow better on different types of soils - eucalyptus was known not to grow well on rocky soils, guava trees grow better along river banks, some trees grow better on sandy soils, etc. Moreover, they took into consideration the place in which they intended to plant them - multi-purpose trees on the border between two fields, eucalyptus on a field, shade-trees or fruit-trees at home, etc. Finally, the choice of trees they wanted to plant was partly determined by their livelihood strategies (livestock owners were more interested in fodder species, etc.). On top of these personal constraints, many general constraints must be taken into account, such as watering, labour, agricultural and cattle management, land- and tree-tenure, gender, local ways of managing conflicts, forest policies and legislation, etc. Looking at opportunities and constraints requires an interdisciplinary approach able to cover all aspects having an impact on tree management, in a holistic way (cf. Gausset et al. 2003b).The results can be summarised in a table, as can be seen in the following example (table 4).

Table 4: Comparison of advantages and disadvantages of agroforestry relying on the four main trees in southwestern Burkina Faso (African locust bean, Shea, Mango and Cashew). The table shows that african locust bean and shea share most advantages and disadvantages. It also shows that these advantages and disadvantages are very different from, and in most cases, radically opposite to those of mango and cashew[4].

	African locust bean	Shea	Mango	Cashew
Local source of food	+ +	+ +	+	-
Commercialisation	+ +	+ +	-	+ +
Investment (labour, cash, technology)	+ +	+ +	- -	-
Income (men)	+	+	+ +	+ +
Income (women)	+ +	+ +	-	-
Security of ownership of trees	-	-	+ +	+ +
Source of land conflicts	+	+	- -	- -
Availability of labour to harvest and transform	+	-	+	+ +
Intercropping	+ +	+ +	+	-
Agro-pastoral conflicts	+ +	+ +	-	-
Vegetation and biodiversity	+	+	+	+
Susceptibility to diseases and pests	+	+	-	-

+ = good or no problem - = bad or problematic
+ + = very good or no problem at all - - = very bad or very problematic

Thus, it is of utmost importance to understand constraints, and to study the cost-benefit ratio of practices, if one wants to understand the needs and opportunities linked to trees. Helping people to overcome existing constraints might be the best way to improve access to tree products. Although qualitative interviews and participant observation are better able to produce in-depth understanding of constraints, it is important to combine a variety of methods to generate a general, holistic understanding of a complex situation. Each method and researcher, apart from generating specific academic knowledge on trees, provides also a wealth of information on opportunities and constraints, and their combination presents a unique possibility to understand the practices and priorities of different groups of the population.

3. Addressing People's Needs and Priorities

Once researchers have identified what people want, and what prevents them from having it, it becomes easier to devise projects that can address their concern and improve their livelihood. If people need access to a variety of NTFP, one might help them preserve, rehabilitate or manage existing forested areas, for example with community forestry projects. If people want to plant some trees but have no access to seedlings, one might develop tree nurseries in different villages. If people want to plant trees and have access to seedlings but are prevented from doing so for a number of reasons (technical, social, institutional, linked to tree- and land-tenure, etc.), one might help them design solutions to overcome these problems. If farmers are very happy with the tree species and farming systems they have but need to increase production, research can be undertaken or solutions devised on how to improve the productivity and sustainability of farming and forestry practices.

Researchers often choose to focus primarily on increasing production. Within PETREA, for example, some researchers try to improve agricultural, animal husbandry and tree productivity. In Tanzania, research is being undertaken on the best way to combine the need for firewood, fodder, and better soil-fertility within agroforestry practices. In Burkina Faso, where shea trees are extremely important for the local livelihood and where, in some villages, there is a problem of tree regeneration, researchers are trying to identify, in a participatory way, varieties of shea trees with a high production and fruits appreciated by the local population[5]. The trees with the most desirable characteristics will then be used for grafting, in order to speed up and maximise the production.

But improving tree productivity and farming sustainability is only interesting for the farmers if it is feasible given the social, economic, political and environmental context, and if the benefit is clearly higher than the cost (see point 2.5). If it is not the case, enhancing productivity will not be perceived as a priority. In the case of shea trees, for example (see above), it remains to be seen whether villagers will engage in grafting trees which grow in the wild and are considered as open access to everyone. In this case, tree-tenure might be a bigger constraint than the speed of growth or the productivity (Gausset *et al.* 2003a; 2003b; Yago *et al.* 2003). It is therefore important to look beyond productivity and technical solutions, and to address also the other types of constraints relating to trees, especially social, economic and political, which often preclude any improvement of the local livelihoods. For example, in Burkina Faso, land and tree tenure has been identified as one of the major aspects constraining the use of trees (*ibid.*). Both migrants and women are denied the right to own land and therefore to plant trees. The coming research phase intends to propose solutions to this problem through a pilot project designed to improve the security of land-ownership, in order to increase the willingness of owners to lease land to migrants and women who want to create tree plantations. To take another example, grazing management is a major constraint to tree planting, both in Burkina Faso and in Tanzania. Wandering cattle can easily eat or trample young tree seedlings. Some PETREA researchers will therefore do more research on the institutional solutions that can be devised to overcome this problem. Thus, an interdisciplinary approach is necessary to see whether improving tree productivity is a local priority, and if not, how to address the most important problems.

4. Discussion

Although the present article tried to present the different aspects of ranking needs in a structured way, these reflections came only after the fieldwork. Before going into the field, each researcher planned his/her research on the basis of his/her own academic methods, without discussing the overlap between methods and without discussing how their method was susceptible to contribute to ranking needs and priorities. The integration and triangulation of information was not planned as such, but derived on the basis of the interactions among researchers during and after the fieldwork. Researchers produced many types of rankings, a number of which can be seen in the notes at the end of the present article. We ranked trees (ordered them) according to a number of criteria, such as the prevalence of trees in the landscape, their age, the ownership of trees (tenure), the income derived from them by different social categories, the potential use of trees, the actual use of trees, their importance as a source of fodder, the opportunities and constraints, etc. But despite the fact that these different rankings provided extremely valuable knowledge about our research locations, we still have difficulties in producing a clear-cut and consensual ranking of tree-related needs. Many actors have many different needs, impeded by many constraints - to choose to focus on a few of them is a complicated matter. It is also, and above all, a *political* matter (politics being here understood as the place where diverse interests are negotiated). We have had to make choices for our future research. These choices were not only based on our interdisciplinary approach and on the combination of the various methods, allowing us to acquire a better understanding of the complexity of the local context. Our choices were also reflecting trades-off between what we were qualified to do, what we thought was realistic to do, and what different kinds of local stakeholders expected us to do.

In Burkina Faso, even though researchers did not rank needs as such, we agreed to focus on four species (mango, cashew, shea, african locust bean), simply because they were the main focus of interest in south-western Burkina Faso, and were very important for the local livelihoods and households income. We chose therefore to focus on finding solutions to constraints relating to the four priority species (both technical and socio-economic or political). We are however aware that, by making this choice, we might neglect other types of needs which might also be important (linked mainly to NTFP in forested areas). In Tanzania, tree-related needs were not ranked as such (as in Burkina Faso). But unlike Burkina Faso, there are not many trees in the landscape, and it is therefore much more difficult to identify what kind of trees are of interest for the local people. Moreover, the limited time spent in the field was not sufficient to address this question satisfactorily. Researchers currently disagree about which need should be prioritised (fodder, soil-fertility, firewood, or income-generation?), and with which trees (eucalyptus, Acacia, Azanza, Gliricidia, Tephrosia, a combination of these, or others?). However, as in Burkina Faso, tenure and institutional problems seem to be one of the major factors constraining the planting and management of trees. We already know that it will be difficult to undertake any project involving planting trees or protecting forested areas unless we can find ways to solve the problems relating to the management of the agricultural space and the grazing strategies.

Many questions can be raised as to whether our research approach and the choices that we made were the best in order to identify, rank and address local needs relating to trees. We can also question our responsibilities towards the local communities. Some PETREA researchers argue that our main purpose was to rank local needs and priorities and address them. Others think that our assignment was to describe the social, agro-pastoral and ecological context and problems, and that the design of solutions should be the job of development actors, not of researchers. The present discussion will focus on two questions. Could we have saved time and energy by avoiding the overlap between some methods? Do the political choices that we made address people's needs rather than (or at the same time as) our own needs as researchers?

Let's first address the question of the overlapping methods. A quantitative ethnobotanical ranking and a PRA ranking will both produce information on tree use. Inventories and questionnaires will both produce information on what trees are cultivated and in which quantity. Interviews of cattle herders and microscopic identification of plants in cattle faeces will give information on diet grazed. The overlap in the PETREA research was partly due to inexperience in interdisciplinary collaboration. Not knowing each other's method (lack of interdisciplinary experience) was a serious constraint, which prevented us from having thoughtful planning of the common research. Moreover, since the team of researchers was identified beforehand to cover a spectrum of disciplines that the project managers thought would be necessary, and since we did not know much about local problems, it was difficult to comment on the plans of colleagues and make sure that all research plans were relevant. Finally, some researchers tried to develop detailed research plans (well prepared but running the risk that they would not be relevant locally) while others tried to devise broad research plans (keeping an open mind for unknown problems but running the risk that they would lack any focus in the field). This added to the difficulty of planning interdisciplinary research prior to fieldwork. It is through working together in the field that we really became a team. So, even though the overlap of methods could have been avoided, the context in which the research was started made this possibility very difficult.

This being said, even if there is some overlap, and even if some methods did not say much about ranking local needs (see points 2.2-2.5), it has not necessarily been a waste of resources. First, it has allowed us to triangulate the results produced by different methods. For example, the actual tree composition in a fallow land and the perception that farmers have of the tree composition on their land might differ widely. Second, it has allowed us to describe the concern of different actors, in different ways. While a PRA exercise, through its reliance on group interviews, might end up prioritising trees for which everybody has a mild interest, ethnobotany, questionnaires, and less structured interviews, because they make better room for diversity of opinions, might instead focus on different trees for which different people have a very strong interest. Finally, and most importantly, the different researchers, with their different methods, have generated a wealth of knowledge which has enriched our understanding of the complex local context.

The second question that we need to discuss is how much the choices that we made for our future research have been determined by us (the researchers) or by the local farmers themselves. Although we tried to involve a broad range of stakeholder in our research, their participation tended to be limited to the role of informant, without much decision power regarding the future orientation of research. Two things might be said about this.

On the one hand, devolving all decision power to local stakeholders might not be the best way to reach sound and equitable decisions. A local community is seldom homogeneous and is not always able to analyse closely the complexity of the local context or to give an equal voice to all actors (Cornwall 2000, 2002). Some might argue that it is the duty of researchers to empower local communities in organising their own research and making their own decisions democratically. This has not been the approach of the PETREA researchers since we have, in practice, limited local participation to the collection of information and the suggestion of solution. Even the PRA exercises performed were far from enough to secure the local backing of results, for a number of reasons (their rapid character preventing in-depth understanding of problems, the fact that PRA was limited to a few rankings, the questionable choice of informants to represent the whole community, the fact that the matrix rankings concerned an ill-defined "importance" of trees rather than needs and priorities, which did not add much to the analysis of existing constraints, etc.). Of course, the research reports and the suggestion for future research have been presented to the local community and discussed with them. But since the local community had no formal and organised power in the PETREA programme, these discussions were a formality. I would argue that if the participation of local actors in the research is a necessary condition to its success, the participation of researchers in the local life is just as important to acquire an in-depth understanding of a complex situation. When reflecting on the way we ended up ranking needs and priorities at the end of the first phase, it depended much more on the first-hand experience that the researchers had acquired by being together in the field and living as close as possible with the local community than on the specific disciplinary methods that were used to rank different things. Although the conclusions reached might not reflect any single local point of view in particular, it hopefully makes the synthesis of the different perspectives and strike a balance or trade-off between them, as well as between the power imbalances that exist locally. It is here that the interdisciplinary nature of the research team is important, as the complexity of the local context is usually beyond the understanding of any single researcher (just as it is beyond the understanding of any single local actor), and as different researchers tend to defend the interest of different stakeholders.

On the other hand, however, it is clear that if the local communities had had more to say in the research programme, PETREA would have probably been very different. They might have insisted on having a different composition of the research team, or other options chosen for the second phase of the project. But when local stakeholders have no formal decision power in the management of a research programme, each researcher is free to develop a tendency to legitimate his/her own presence by putting his/her area of expertise higher up in the ranking of needs, instead of letting local people determine the agenda. A biologist might tend to focus on the potential use of trees, and argue for preserving biodiversity or using genetic engineering. A specialist in animal husbandry might tend to focus on fodder and insist on the importance of cattle. An agronomist might tend to concentrate his/her efforts on increasing productivity. A plant technician might want to focus on grafting, tree nurseries and the domestication of wild species. And an anthropologist might argue that social, economic and political problems are central and should be addressed before anything else can be done. There is a possibility that everybody is right, and that all these aspects may contribute to improve local livelihoods. After all, one of the dangers of a ranking is that it tends to concentrate on a few points and to disregard all others, although they might still have a crucial importance. But there is also a possibility that a ranking of local needs is possible, and that our difficulties in producing a consensual ranking can partly be explained by our various background and our fight to find a legitimacy within the PETREA programme. This is a serious concern. If it is true that our own interest is more important than the local priorities, we run the risk to end up promoting solutions that are not adapted locally because local stakeholders are not interested in them, or because they have a negative cost-benefit ratio given the existing constraints.

These problems are very general, and interdisciplinary research is just as exposed to them as other types of research. How can we deal with disagreements among researchers regarding the needs and priorities? What should be the criteria to rank what is more important? Who should have the power to decide? Should the local community have the last word in deciding what type of intervention they want - what needs and priorities they want to have addressed? But then, who is "the local community", and how do we account for the diversity of interests within it? These are some of the questions that will need to be answered during the second phase of PETREA. It should be clear, however, that although an interdisciplinary collaboration can be beneficial in that it covers a wider range of topics and produces a broader understanding of the local complex situation, it is not immune to the problems relating to local participation, top-down or bottom-up approaches, and to the unequal distribution of power among stakeholders.

5. Conclusions

Ranking local needs and priorities relating to trees is a complicated enterprise. There exists a range of scientific methods ranking some form of local preferences (potential use-value, actual use, social and spatial distribution, opportunities and constraints, or cost and benefits, etc.) but these methods only rank some very specific aspects, which provide a partial understanding of a complex situation. None of these methods taken alone can give a full picture of what people need and want to develop, not even a PRA approach whose "rapid" and "consensual" nature are not conclusive to understanding complex problems and power imbalances. Scientists or development actors should therefore be extremely careful not to overlook the difficulty of identifying needs and priorities, and should not claim to be able to do this with one method or discipline alone - hence the interest of having an interdisciplinary approach.

But an interdisciplinary approach has its own specific problems. The collaboration between scientists having different academic backgrounds and the integration of their results is made more difficult by the different values and approaches developed in their research which, instead of being always seen as complementary, can easily be seen as opposed. This is especially true when research money is scarce and has to be shared among scientists, who are then struggling to legitimise their participation in the project. Moreover, scientists are not used to be challenged and questioned on what they usually take for granted, such as the relevance and usefulness of their methods, or even of their research focus. The danger of this interdisciplinary debate is that scientists end up defending their own academic values and traditions at all cost, in order to legitimise their participation, which can lead them to advocate for solutions which are not adapted locally. It should be recognised that an interdisciplinary collaboration is also a political enterprise, and that the development of sound interdisciplinary and participatory research programmes requires a reinvention of democracy among scientists, and between them and their target population.

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7. Notes

[1] For more on limitations of questionnaires, see for example Babbie 2001, Cashley and Kumar 1988; Furze 1996, Wallman and Dhooge 1984.

[2] In this article, though, we focus on matrix ranking (the comparison of trees according to identified uses and qualities) and on pair-wise ranking (such as for ranking of criteria of usefulness), since we are interested in comparing different ranking methods. Other typical PRA methods are village maps, Venn diagrams, agricultural calendars, wealth ranking, village transect, problem tree exercises, direct or participant observation, focus groups discussions, and semi-structured interviews (Chambers 1991; Furze et al. 1996; Mikkelsen 1995).

[3] For the sake of space, this ranking is just given as an example, with only 5 use-categories. It is very different from the original ranking which is based on more use categories and described in Krogh *et al.* (forthcoming). The differences in the two rankings produced show how much quantitative ethnobotanical rankings depend on the choice and definition of the use categories.

[4] The two systems have different foci. Traditional agroforestry (african locust bean and shea) focuses on subsistence agriculture, the new one (mango and cashew) focuses on cash crops. The two systems concern different types of trees that are managed differently - wild indigenous trees with a low crown cover on one side, and planted exotic trees with a high crown cover on the other. They produce different types of fruits. These two types of agroforestries are therefore complementary. Their co-existence makes sense when seen as a strategy of diversification of households' livelihood strategies whose aim is to optimise agricultural production while taking into accounts all the aspects that constrain it (Gausset et al: 2003b).

[5] The research is made in collaboration with a group of women, who first identify shea trees that have an outstanding production of nuts (both in term of quantity of nuts and in term of their size). During the second step of the experiment, women harvest the fruits of each trees and rank them according to the quantity and quality of the oil extracted from the nuts. One of the reasons why shea trees have regeneration problem is that it takes between 7 to 10 years before they begin producing fruits, which discourages people from tending these trees. It is hoped that grafting can shorten this period and encourage people to better tend the regenerating trees.

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