

From scientific monoculture to intra- and inter-cultural dialogue – endogenous development in a North-South perspective

Stephan Rist*, Urs Wiesmann*, Juan San Martin, Freddy Delgado****

* CDE, Berne, Switzerland

** University of San Simón, Cochabamba, Bolivia

Introduction

By the end of the 1980s the World Commission on Environment and Development (1987) defined sustainable development in terms of ‘meeting the needs of the present without compromising the ability of future generations to meet their own needs’. It gave rise to the ‘age of sustainable development’, which in 1992 became a globally shared goal for development.

In 2002, at the World Summit on Sustainable Development (WSSD) held in Johannesburg, the participants stated that the progress that has been made in sustainable development is rather ambiguous. On the one hand, wider social awareness of the need for sustainable development has proved to be a slow and time-consuming process. Key indicators show that the situation today is worse than it was ten years ago, especially with regard to the pollution of air, water and soil, resource consumption, as well as poverty and North-South income disparity. On the other hand some progress has been made with regard to the Agenda 21 issues: population growth and mortality rates have slowed down, access to health and education has increased and the role of women has been strengthened (Hens and Nath, 2003:12).

A major challenge for the implementation of the concept of sustainable development is its essentially normative character. It defines what to aim for without saying how to do it in specific social, ecological, economic or historical situations. In order to make the concept operative it must be translated into a set of new action-guiding ethical values by individuals and groups (Wiesmann, 1998). Through these, sustainable development brings into play a highly complex, broad range of often contradicting actors, structures, institutions, norms and values. They constitute the arena in which the normative principles of sustainable development have to be translated into new ways of producing and reproducing natural, material, human, social, and cultural resources. Such a broader view on sustainable development has contributed to overcoming the initially dominating emphasis on the protection of natural resources, mainly based on a specific combination of ethical values associated with the idea of intrinsic values of nature and the application of bio-ecological sciences and corresponding technologies. Although it is highly productive to organise sustainable development on the basis of the recognition of the intrinsic values of nature, it does not guarantee that this concept finds societal consensus when concrete issues of development are at stake (Kellert, 1997). This means accepting that not all

groups share the intrinsic values of nature, which is especially true for those who have the interests in, power and/or resources to act against the corresponding principles.

As a consequence, overexploitation, conservation or sustainable use of natural resources have to be understood as ecological expressions of specific, socially and politically defined institutions, norms, values and structures (Pretty, 2003; Veeman and Politylo, 2003). The resulting 'societal turn' has led us to understand sustainable development as a result of social and political negotiation and learning processes between main actors involved (Leeuwis, 2000). However, taking account of the central position of 'future generations' in the definition of sustainable development brings a normative element into play, which is directly related to a specific concept of the 'nature' of humans and the relations through which they interact. Considering the needs of future generations can only be meaningful when the conception of humans goes beyond a merely ego-centric and materialist understanding of life and living beings. This implies recognising that, without a specific view on the world, which allows us to establish a meaningful – and thus action-guiding – relationship between humans, society and nature, sustainable development will remain literally without sense. This means social interaction cannot be understood only in terms of a negotiation-based and ego-centric optimisation of utilities. In such a view the questions on how to consider the widely unknown interest of physically and socially not yet present 'future generations' in a negotiation process of ego-centric oriented actors will be almost impossible to answer in a satisfactory manner. It is therefore not surprising that many initiatives in the field of sustainable development relate implicitly or explicitly to a concept of humans which – while not ignoring ego-centric or strategic action by principle – takes account also of the capabilities of humans for 'communicative' action (in the sense of Habermas' theory of communicative action), embracing an important resource for societal transformation beyond mere aggregation of individual preferences (Röling, 2002).

Relating the notion of sustainable development to 'future generations' not only implies a certain understanding of social actor and interaction, but also means putting forward the question of adequate understanding in regard to space, time and scale. What are adequate definitions of space, time and scale for assessing the impacts of the current forms of social and economic organisation and how many 'future generations' should be taken into account? Where will they live? These are becoming concrete questions, which have to be answered in order to operationalise the principles of sustainable development in concrete actions of today. In such a view the modernist, technocratic view of sustainable development has been replaced by a new vision of the world, in which the authority of science and technology is questioned and more emphasis is placed on cultural diversity (Redclift, 1993).

Sustainable development therefore requires the definition of basic concepts on what humans, social relations, society, nature, space and time are, and the determination of the relations through which they are interrelated. Consequently, the discourse of sustainability is related to a specific, socially constructed and culturally shaped theory on the nature of basic subjects related to sustainable development. Considering the importance of cultural diversity in the definition of concrete actions aiming at the implementation of sustainable development means recognising that this can only be achieved as far as it is based on a shared theory of 'how things are'. Such a 'theory on how things are' is considered an ontology. By ontology we refer to 'the

theory of objects. And it is so of every type of object, concrete and abstract, existent and non-existent, real and ideal, independent and dependent. Whatever objects we are or might be dealing with, ontology is their theory' (Poli, 1996). Moreover the same author refers to three theses which in the context of the search for an ontology of sustainable development have special importance. First, an ontology is not a catalogue of the world or a taxonomy but refers to a general framework or structure within which catalogues or taxonomies may be organised suitably. Second, an ontology is not reducible to pure cognitive analysis and is therefore not an epistemology and, third there is nothing to prevent the existence of several ontologies, rendering the top categories explicit and therefore enabling verification of whether there are reasonable translation strategies and which categorisation can serve best to achieve certain objectives.

Such an understanding of ontology provides a framework that allows dialogue between different theories of objects, whether they are reducible to pure cognitive levels or not. Such a framework makes it thus possible that scientific as well as other endogenous or local-based 'theories of objects' can engage in a dialogue in order to define the 'nature' of the basic objects related to sustainable development.

That the definition of an ontology in regard to sustainable development is far more than a challenging theoretical exercise is illustrated by the case of agri-food studies for which it has been shown that the ontological choices are determining the analytical points of entry in the relationship between theory and praxis of the normative stances involved (Goodman, 2001:182). Pointing in the same direction are the works on the underlying principles of green revolution or a traditional form of natural resource management of Dayak people in South East Asia where the ontological foundations define the specific content of what humans, society and nature are, delimiting through this the scope, direction and rationality for defining what natural resources are and how they have to be used (Dove and Kammen, 1997; Yapa, 1993). In such a view it becomes clear that the definition of elements for an ontology of sustainable development could contribute significantly to overcoming the 'vagueness' and incidental or instrumental interpretations of sustainable development.

A clear expression of this is also found in Agenda 21 (1992). In this worldwide agreement on sustainable development, chapter 35 states that current research should be broadened to include, on the one hand, more involvement of the public in defining long-term societal goals and formulating sustainable development scenarios, and on the other hand to develop methods for linking the findings of established sciences with endogenous knowledge.

The principles of Agenda 21 reveal that sustainable development requires a conceptual differentiation that is able to meaningfully articulate scientific and non-scientific forms of knowledge. Taking account of the need to define the ontological foundations of sustainable development based on social negotiation and collective learning processes raises the question of how such an 'inter-ontological' dialogue could be operationalised in concrete interfaces of development.

The objective of the present paper is therefore to examine some of the foundations on which such a dialogue between 'ontologies' is possible. In a first step we will define the basis upon which academically recognised sciences can interrelate with other, e.g. endogenous forms of knowing. In a second step, a comparison of the

conceptions of plant growth, underlying Western agronomic and Andean knowledge will help to identify some key factors that have to be considered when a dialogue between different ontologies is at stake.

‘Modern science’ and endogenous forms of knowledge

Sustainable development in general and sustainable management of natural resources in particular have to draw on a broad range of knowledges, which encompass both academic and non-academic, e.g. endogenous, indigenous or ‘local’, forms of knowledge. This challenges those forms of natural resource management that are based on disaggregating knowledge into specialised disciplines and specialisations. However, it is not the mere fact of the disaggregation of knowledge that is challenged; the critical aspects are related to the questions on who is setting the issues for a particular disciplinary research agenda and how the findings should be re-integrated in function of a societal process oriented in the principles of sustainable development. As a consequence, the roles of conventional scientific knowledge production in the context of societal processes are placed under public scrutiny.

A first reaction to the societal demands on a disciplinary mode of scientific knowledge production is an interdisciplinary approach. Although still based on a disciplinary vision of knowledge, it seeks to coordinate the objectives and methodologies in order to achieve a less fragmented view on environmental issues, e.g. as is currently happening in research on climate change (Norgaard, 2004). Although interdisciplinarity allows us to integrate natural and social sciences and humanities, the definition of the issues to be addressed and the corresponding ‘theories of objects’ or ontological foundations essentially remain within the academic community. As a result, the problems of a lack of societal participation in issue-setting and its application to concrete development goals are almost the same as they are in the case of disciplinary based knowledge production.

A second more comprehensive reaction to the societal claims about a disciplinary based knowledge production is the transdisciplinary approach. By increasing the scope and the number of interactions of knowledge production it seeks to go beyond the boundaries of scientific actors and has thus become a key feature of sustainability research (Hirsch-Hadorn, 2002). Transdisciplinarity aims for a shift from disciplinary based scientific, to a more societal mode of knowledge production by integrating everything that is between, across and beyond disciplines (Nicolescu, 1996). Transdisciplinary approaches to research are therefore essentially based on a societal issue setting and the building of bridges between natural, social sciences and humanities as a basis for integrating scientific as well as non-scientific forms of knowledge and actors (Hurni and Wiesmann, 2004).

This societal mode of knowledge production is the logical concretisation of a fundamental fact that has not been sufficiently taken into account by the scientific community for a long time: although science – usually defining itself as an autonomous, value-free knowledge system – has been very successful, it has always been – and will always remain – part and parcel of the ‘social processes’ that bring

actors, institutions and nature into specific, culturally shaped and historically evolving relations (Norgaard, 1994). Transdisciplinarity takes into account that science is part of the processes it describes and therefore focuses on a systemic view of social and 'natural' dynamics that are shaping the world. It also recognises the plurality of forms of knowledge, world views and the ethical values connected to them within different social and cultural groups (Scholz et al., 2000). A major challenge for transdisciplinarity therefore consists in finding ways of encouraging a dialogue and cooperation between heterogeneous groups of social actors with different forms of knowledge, instead of imposing a single, internally thoroughly coherent view of the world through a hegemonic discourse that silences all other discourses, by positioning itself 'outside' the issues to be addressed.

When looking within the academic sciences at how this could be achieved, we consider that the so-called 'ethnoscience' could play an important role in advancing transdisciplinarity and sustainable development. By ethnoscience we use Atran's definition (1991): a scientific realm which aims to understand how humans – in spite of their fragmented and limited interactions with the world – develop different forms of knowledge and beliefs. This allows us to understand how humans vary their knowledge and beliefs within different ecological and historical contexts in order to express the manifold possibilities offered by human cultures. More concretely, ethnoscience refers to the set of concepts, prepositions and theories that are unique to each particular culture group in the world (Meehan, 1980). Ethnoscience is essentially cross-disciplinary, based on increased collaboration between social sciences and humanities (anthropology, sociology, history of science, psychology, philosophy) with natural sciences such as biology, ecology, agronomy, climatology, astronomy, or medicine. At the same time ethnoscience is increasingly transdisciplinary in its nature (Ingold, 2000). Integrating ethnoscience into societal modes of knowledge production allows us to systematically take account of the cultural – and therefore also ontological – differences and similarities of the forms of knowledge of the actors involved in specific issues of sustainable development. Hence ethnoscience allows us to explore the dimensions and boundaries of the arena in which an inter-ontological dialogue would be possible.

How can we relate academic and endogenous forms of knowledge?

As shown above, a central issue related to science and sustainable development concerns the links between academic, local or endogenous forms of knowledge. For a proper definition of such a relationship it is necessary to examine the corresponding choices. The debate in science about its relation to endogenous knowledge is not new: since the beginning of the Enlightenment, the natural – and to a lesser extent – social sciences have always understood their 'mission' as a conscious and critical revision of 'local knowledge', often considered superstitious or romantic. It is therefore not surprising that the relation between academic and other forms of knowledge is often reduced to an evaluation of the coherence and consistency between the two forms of

knowledge in question, with science making a hegemonic claim to truth. However, as Table 1 shows, this is not the only possible relationship.

The typology reveals that an intercultural perspective is the most adequate way of relating different forms of knowledge, because it encompasses the highest potentials for cooperation based on mutual respect, maintaining the autonomy of the different processes of knowledge production. Suggesting an intercultural relationship between different forms of knowledge raises three major issues that need to be addressed.

First, the comparison between the different attitudes reveals that the relation between science and local knowledge depends on specific ethical positions. No relation between academic and endogenous knowledge can thus be ‘value-free’, making it impossible to define something like an ‘objective’ or ‘science-based’ relationship. Second, an intercultural perspective implies establishing the broadest possible field of interaction between different types of knowledge. This means that the interrelation must be based on a process of deliberation that should at least involve the interrelated dimensions of practice, values, worldviews and cosmovisions. Another necessary condition is the agreement on fundamental ethical principles before embarking on intercultural dialogue. The main one is the will to communicate, which can be formulated as: ‘I accept the possibility that the Other may be right’. An intercultural relation means shifting from competition and uniformisation to the search for complementarities and cooperation between different forms of cultural knowledge that aim for mutual learning and adaptation in the light of obtaining new insights rather than just confirming existing ones. The drawbacks of non-acknowledgment, arbitrariness and paternalism presented in the typology can only be overcome by founding the relationship between different types of knowledge on an intercultural basis.

Attitude of science towards local knowledge	Characteristics	Examples
Unacknowledging	Science simply ignores a practice based on local knowledge.	Veterinary research does not investigate the effects of a ritual to prevent mouth and foot disease in the Andes.
Utilitarian	Elements of local knowledge that can be scientifically understood or validated are accepted and increase the stock of scientific knowledge.	Aspirin is based on a local practice developed by the Ancient Egyptians (using dried myrtle leaves) and the Greeks (with willow bark), unaware of its active ingredient (salicylic acid).
Paternalistic	Traditional knowledge is conceived of as a starting point that requires ‘updating’ by science.	Indigenous field crops are modified through genetic engineering and traditional livestock breeding is ‘blended’ with ‘modern’ technologies.

Attitude of science towards local knowledge	Characteristics	Examples
Neo-colonial	Traditional knowledge and local data are taken from local people and research institutions.	Scientific studies are carried out in developing countries by researchers from industrialised countries without collaboration at the publication level
Essentialist	Local knowledge is fundamentally better than science, it should not be influenced by Western technology and should have the right to remain as is.	‘Going native’, rejection of potential contributions from science; focus on preserving local knowledge in its ‘pure form’.
Intercultural	Science is aware that it is only one type of knowledge among others, and that knowledge is always embedded in cultural and historical settings. Science and local knowledge can benefit from comprehensive interaction.	Development of complementary medicine and health care systems; clarification of interactions that have not (yet) been explained by science (e.g. homeopathy, traditional healing).

Table 1 Typology of academic and endogenous forms of knowledge (based on Rist and Dahdouh-Guebas 2006)

The third issue relates to the fact that real intercultural communication is more likely to happen when the parties involved have shared questions on fundamental aspects related to the form of knowledge they represent. Consequently, the identification of such questions of common interest is turning out to be an important condition for the establishment of a dialogue between different forms of knowledge.

Ethnoecology and sustainable management of natural resources

A most prominent field of ethnosciences is ethnobiology. This is often almost identical to what is defined as ethnoecology. Bentall (1993) defines ethnobiology as a new branch of science which brings together two important areas of human knowledge – ethnology, the study of cultures, and biology, the study of life. Gragson and Blount (1999) define ethnoecology quite similarly as the study of the interactions between organisms (plants, animals, biodiversity) and the physical, biological and human factors to which they are related. Due to the similarities for the purpose of the following discussion, we consider ethnoecology and ethnobiology to be interchangeable.

Instead of disaggregating the practices as found in the life worlds of farmers, traders, craftsmen or shamans and packing them into the highly specialised disciplines of ecology, agronomy, forestry, botany, medicine etc., the ethno-approaches are adopting a more comprehensive view, focusing on social practices in order to reveal

the underlying cultural dimensions (Atran, 1991; Nazarea, 1999; Posey and Plenderleith, 2002; Winkler Prins and Barrera-Bassols, 2004).

Ethnoecology allows us to explore ways overcoming disciplinary views on natural resources by building bridges between aspects normally studied separately in the natural and social sciences or humanities. Gragson and Blount (1999) consider that a key difference between ecology and ethnoecology is the point of reference from which an explanation is derived. While in the first case the explanation is given by a scientifically informed analyst, in the case of ethnoecology the explanation derives from people belonging to diverse cultures, actively participating and intervening in relationships defining a particular system. Through this the ethno-approaches offer an interesting entry point to the study of the manifold human-nature relationships at the basis of many environmental conflicts. Ethnoecology also allows us to unfold the 'theories of objects' or the ontological assumptions of scientific as well as non-scientific forms of knowledge. Through this, ethnoecology sheds light on the specific background against which 'nature' is perceived, defining the grounds upon which 'natural resources' are defined and the ways in which they have to be managed (Wiesmann, 1998). From this perspective, ethnoecology permits us to keep in touch with 'concrete' aspects of natural resource management without ignoring the related more general social, cultural and cognitive aspects. Ethnoecology provides a conceptual tool for a more comprehensive understanding of the arenas, actors, forms of knowledge and the corresponding ontological and eventually existing epistemological foundations, which have to be taken into account in the search for more sustainable management of natural resources.

Although the starting points of the ethno-sciences are at local to regional levels, due to the rapidly growing interdependencies with the factors of global change, they are also highly relevant for analysing global tendencies. Ethnoecology allows us to demonstrate how new communication, transport or other technologies as well as unequal distribution of resources, power and opportunities affect the patterns of action, orientation and interpretation of local actors; furthermore, it allows us to trace these back to the norms, values and aspirations of endogenous and other marginalised people. Ethnoecology also gives evidence about 'local' counter-notions of globalisation which are derived from their own 'cosmocentric' – and therefore more than global views of life – allowing them to participate in the worldwide debates on the kind of globalisation which should be envisaged in view of sustainable development (Toledo, 2001). In light of this, the ethnosciences are helping to correct the widely accepted but mainly unjustified assumption that endogenous knowledge represents only a locally-based collection of an empirically generated body of experiences that is impossible to relate to current tendencies of global change. However, the ethnosciences show that, rather than lacking such a global dimension, local knowledge refers to a different ontological background against which global phenomena are interpreted.

However, it is important to underline that the claim for a better relation between academically accepted and endogenous forms of knowledge is not only relevant for a sustainable resource management in Southern or Eastern societies where indigenous people represent an important share of the population. In Northern or Western societies there is a growing acceptance that currently available alternatives for sustainable development are often based on 'local' forms of knowledge initially

developed outside of conventional sciences (Fry, 2001). Clear examples are organic and biodynamic farming (Conford, 2001; Kloppenburg, 1991) or the emerging field of agro-astronomy (Vogt et al., 2002; Zürcher and Cantiani, 1998). These 'alternative' forms of knowledge are based on recently generated experiences, often linked to specific social movements that are searching to overcome the present limitations of science-based processes of knowledge production. Organic agriculture provides an example of how scientific, expert and different forms of 'local' knowledge are interplaying, in the sense of a societal process of knowledge production that now represents the most advanced translation of the principles of sustainability into the agri-food system (Rist, 2003).

At a global level the relevance of endogenous forms of knowledge for sustainable development has been widely demonstrated mainly in regard to natural resources management, e.g. biodiversity (Maffi, 2001), water (Cremers et al., 2005), and soils (Winklerprins, 1999). But it is important to emphasise that the practical relevance of ethnoecology for sustainable resource management also consists in pointing out specific forms of social organisation that are compatible with the social principles underlying sustainable development e.g. community-based regulations of access, distribution and use of natural resources, considering changing contexts and needs in the perspective of adaptive and learning- oriented reasoning (Armitage, 2005; Rist, 2003; Rist et al., 2003).

The manifold 'alternative' approaches to knowledge production aim at linking sciences with local communities of 'practitioners'. They seek to jointly develop alternative ways of farming, foresting or healing, based on empirical and theoretical knowledge, only partially recognised by main-stream sciences.

Against this background, we identify four aspects that justify the high importance of ethnoecology for the search for more sustainable management of natural resources.

First, ethnoecology gives concrete conceptual and methodological insights on how to envisage inter- and transdisciplinary research in the field of natural resources.

Second, ethnoecology makes explicit norms, values, experiences and associated specific competences of users of natural resources in 'traditional' (peasants) as well as in 'modern' (organic farmers) societies. By making explicit the dimensions of valuation of 'nature', ethnoecology shows how 'natural resources' are socially constructed and also allows us to elucidate the factors acting on this process. This enables us to better grasp the underlying principles of a steadily growing number of examples showing highly significant contributions of local and endogenous forms of knowledge to a more sustainable management of natural resources.

Third, ethnoecology helps to make it clear that knowledge of local people do have notions of 'globality' which are based on their own cultural background and that they expect to participate with them in current discourses on globalisation and sustainable development.

Fourth, ethnoecology allows us to create a solid ground for better linking practices, orientations and patterns of interpretation in an intercultural perspective. Instead of competition and hegemony the relation between different forms of knowledge is based on respect, complementarity and cooperation. Cultural diversity, rather than being an obstacle, becomes a fundamental resource for joint knowledge

production, considering that the participants involved in the dialogue represent specific ontological foundations related to 'nature', humans and society and the relationships through which they are interacting.

Ethnoecology as a stepping-stone for an ontological dialogue between natural science and Andean cosmovision

In this section, we will explore how ethnoecology can help to identify continuities and discontinuities between natural science and endogenous knowledge. The following example is part of an initiative, carried out by the Agroecology Programme University of Cochabamba (AGRUCO), Bolivia and the Swiss Development Agency. The main objective is the establishment of an intercultural dialogue and the cooperation between scientific and Andean or endogenous forms of knowledge as represented by Aymara communities. In other words, ethnoecology served as a steppingstone for engaging in a societal mode of knowledge production based on the principles of transdisciplinarity and sustainable development.

Ethnoecology in Andean communities

Ethnoecological research has helped to reveal how the specific ecological knowledge and practices of indigenous people are underpinned and shaped by the specific forms through which they conceive nature, space, time, human and non-human spiritual beings and their mutual relationships (Delgado, 2002; Rist, 2002; San Martin, 1997). This Andean concept of the man-nature relationship becomes visible when considering the specific notions of plant growth of the Aymara communities: plants are considered to represent the hair of 'Mother Earth'; they produce as a function of how humans treat her. If she is treated well, she will give good harvests and protection for everyone. 'If we treat her badly, natural disasters will occur and the harvest will suffer or may even disappear', is an often-heard sentence in the Andes. Plants encompass physical, biological and spiritual qualities. Through this constitution, they inter-relate with other living beings like minerals, water, air, animals and humans. Plant growth is a mirror that reflects to what degree humans have achieved to interiorise the principles of 'Earth's Mother' (Pachamama) into their personal and societal action: 'If we are good hearted there is always good production' (Rist, 2002).

In regard to interpretation, the Andean concept of plant growth is concerned above all, with the question *why* plants are growing. Accordingly the patterns of interpretations are holistic, and relate and integrate the plants into a whole unity that include nature, human beings and society; the explanation of social or natural phenomena is based on the assumption of a meaningful intelligible man-nature relationship (see Table 2).

Andean people in the highlands of Bolivia perceive life as a continuously changing interplay of social, spiritual and natural-material aspects of life. Humans, on the basis of their social, cognitive and emotional capacities, participate in a spiritual world that is directly linked to social life and natural-material processes. The spiritual sphere of life becomes the main connecting element with the other domains of life.

Through this, the physical space is transformed into a 'living landscape' in which human beings, animals, plants and spiritual beings coexist. Time has a cyclical notion, in which life, seasons, stars and planets, historic periods or natural resources are constantly on their cyclical way between the different spheres of existence. Such a pattern of interpretation is based on the assumption that 'nature', in the shape of 'Pachamama', 'talks' to people related with her (Rist, 2002). Nature becomes thus meaningful and intelligible: instead of through 'words', communication happens through 'signs of Pachamama'. This helps to assess the current state of the interplay between the three basic spheres of life, the material, the social, and the spiritual spheres. The relationship between humans and nature thus shows a clear notion of co-evolution between the material, social and spiritual domains of life (Delgado and Ponce, 2003). It is worth noting that the Andean worldview is not finalist, as there is no concept suggesting that 'Pachamama' obliges people to behave or evolve in a preconceived direction. Thus, the relationship is based on communication rather than on determination. Achieving good growth of plants becomes thus a moral challenge. This brings into play a theory referring to 'how things are': an 'Andean ontology'. Such an 'ethno-ontology' admits the possibility of a relationship between mind, man and matter (Van den Berg and Schiffrers, 1992).

Although such an ethno-ontological interpretation of plant growth is helpful, we must be aware of its social constitution. While action-guiding values and norms are commonly present in the discourses of Aymara people, the underlying theoretical knowledge – in the sense of explicitly elaborated concepts – can only partly be perceived by most members of the communities. Nevertheless, it is important to highlight that there is growing evidence that people of Andean communities are engaged in elaborating something like elements for an 'Andean ontology'. An increasingly reflexive treatment of their own history, identity, religiosity, culture and the socio-economic and ecological context in which they are evolving is playing a major role in this (Delgado, 2002; Loayza, 1996; Rist, 2002; Ticona, 2000; Wachtel, 1990). Among these components of an 'Andean ontology', the peasants are paying much attention to the relationship between mind, man and matter e.g. expressed as the inquiry into whether rituals, moral behaviour or other symbolic practices can directly influence natural and social processes (Rist, 2002).

Ethnoecology of natural sciences

The ethnoecological findings on plant growth were fed back to the communities as part of the intercultural dialogue that they have maintained for many years with the University of Cochabamba. This provided a space for asking questions about the ethnoecology of the scientific interpretation of plant growth. The latter is an issue for natural-, especially agronomic sciences, and explains the matter from an essentially materialist background based in causality. It forms part of an ontology of 'modern sciences' which according to Guttenplan (1994:76) refers to a 'world [that] seems to consist of such things as particles, atoms and molecules governed by laws, and it is this orderly and increasingly complex arrangement of energetic matter that gives shape to the world we experience. One science – physics – studies the physics of energetic matter at the most basic level, and it is for this reason that the scientific worldview is often called 'physicalism'. Other sciences – from chemistry through biology – attempt to unravel the laws that govern more complex configurations up to, and including, the

organisms that have populated this planet.’ Such a view assumes that ‘natural laws’ are independent of human behaviour (see Table 2).

Natural science based view	Andean view
Plants are biologically determined organisms, which are the result of natural evolution driven by the ‘survival of the fittest’. They are face stiff competition from other organisms competing for the same mineral and atmospheric substances. Plant growth depends on environmental factors such as temperature, water, minerals and atmospheric gases. Agronomically, it is understood as a process of human manipulation of genetic (domestication, breeding) and environmental factors (fertilisers, pesticides, soil preparation) aiming at a maximum of economic utilities.	Plants are considered to be the hair of ‘Mother Earth’; they produce as a function of how humans treat her. If she is treated well, she will give good harvests and protection for everyone. If she is treated badly, natural disasters will occur and the harvest will suffer or may even disappear... Plants encompass physical, biological and spiritual qualities. Through this constitution, they inter-relate with other living beings like minerals, water, air, animals and humans. Plant growth is a mirror that reflects the degree to which humans have managed to interiorise the principles of ‘Mother Earth’ into their personal and societal action: ‘If we are good hearted there is always production’ (Rist 2002).
Interpretation: Explanation is concerned above all with the question of <i>how</i> plants are growing. Interpretation is reductionist, bound to a disciplinary view of natural processes, perceived to happen independently of human behaviour; explicitly empiricist-materialist non-intelligible explanation.	Interpretation: Explanation is concerned above all with the question <i>why</i> plants are growing. Interpretation is holistic, relating to an integrated whole that includes nature, human beings and society; explanation is based on the assumption of a meaningful intelligible man-nature relationship.

Table 2 Ways of interpreting plants and plants growth according to Andean and conventional agronomic sciences

Natural processes are conceived of as non-intelligible, meaning that they are based on causality and are thus independent of any human, social or spiritual category of ‘meaningfulness’

Taking a look at the ontological foundation of ethnoecology itself helps to further clarify the arena configured by the encounter of endogenous and scientific forms of knowledge. Ethnoecology, which forms part of cognitive anthropology, represents a ‘dualist ontology’ according to which ‘... persons can neither know nor act upon their environment directly, but only indirectly through the medium of their cultural representations. This supposition rests upon a cognitivist account of perception whose roots lie deep in the western dualist world view.’ (Ingold, 1992:40)

The example of the encounter of natural science with the vision of Aymara communities revealed fundamental ontological similarities and differences. Both can agree on the existence of three main realms of life, which can be called a social, material and spiritual sphere of the world (see Figure 1). The main differences are based on the basic assumptions about the ontological quality of, and the relationship between, a material, social and spiritual domain of life. Such a point of view makes clear why it is so difficult or even impossible to arrive to a consensus concerning

concrete issues, such as exploitation or conservation of biodiversity, the use of renewable or non-renewable energies or the role of markets within the wider society. Finally the basic values, which lead to a certain stance being given priority with regard to these questions, are an indication of the underlying ontological assumptions.

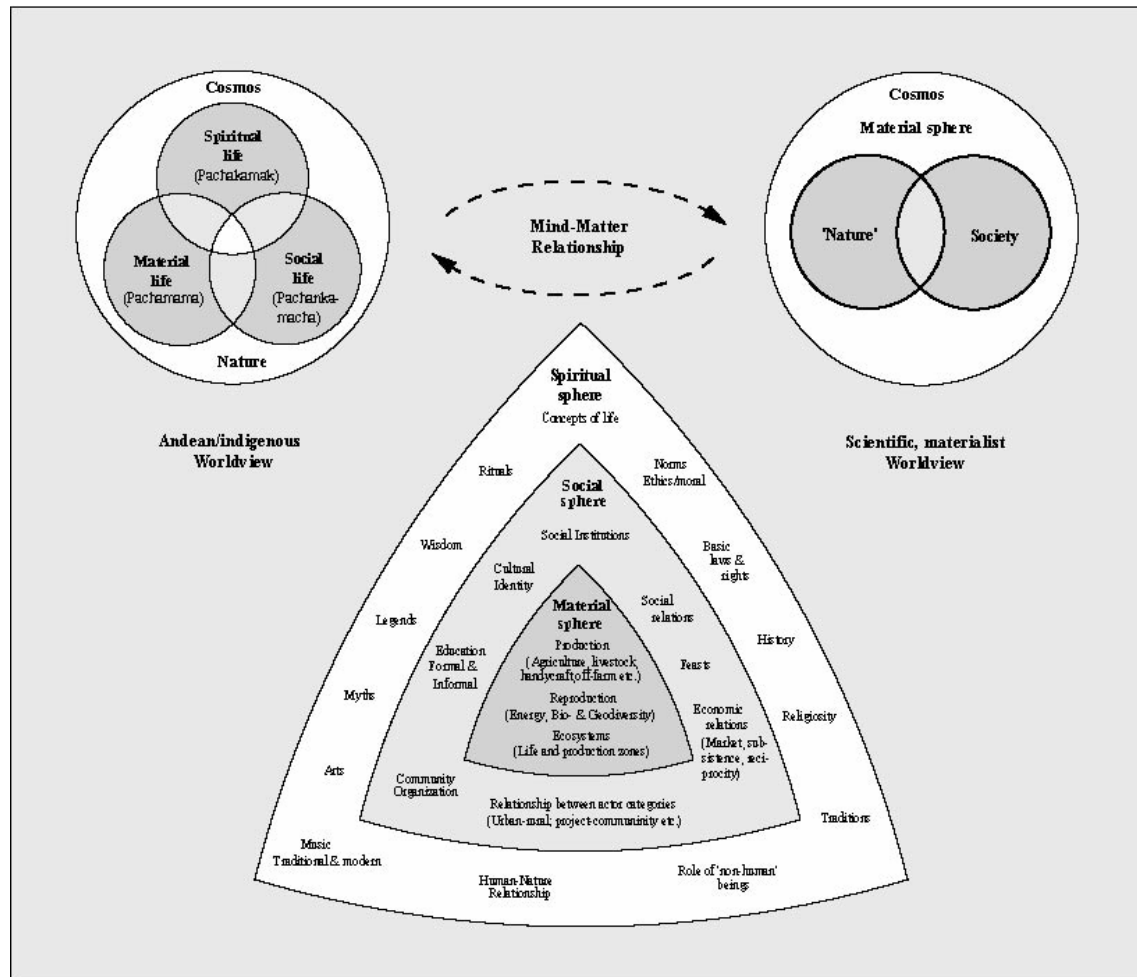


Figure 1 Key features of an Andean endogenous and scientific naturalist (materialist) ‘theory of objects’ or ‘ontologies’ (Rist and Dhadouh-Guebas, 2006)

The endogenous vision of the Aymara clearly suggests a direct relation between the spiritual domain of life and social and natural processes. Social and material life is perceived as a kind of ‘materialisation’ of spiritual phenomena – not necessarily based on causality – in the domains of social and material spheres. This view is also characteristic of many other endogenous cultures in Africa, East Asia and also in the case of biodynamic farmers in Western countries (see Haverkort et al., 2003) and can thus be considered a more general feature of approaches for resource management organised on cognitive fundamentals beyond a materialist or dualist understanding of life.

From the point of view of sciences, the two most prominent stances are the materialist and naturalist one. On the one hand, a materialist ontology suggests that ultimately processes belonging to the material sphere of the world determine all phenomena related to the social and spiritual domains of life. On the other hand, a

dualist view perceives social and cultural manifestations as unconnected to the 'laws of nature'. Mind is considered to belong to a subjective sphere of human existence rejecting the possibility that human consciousness can know whether or not there is any direct connection between mind, body and matter. In regard to Figure 1, this means posing the question whether social or material life are perceived as closely related to the wider domain of spiritual life or whether the social and spiritual sphere are determined by the central domain of the material sphere.

Ethnoecology, although based on a specific – dualist – worldview, allows us to describe the worldview of the Aymara Indians (or other indigenous groups) which is neither materialist nor dualist. However, ethnoecology leaves indigenous people alone when they start to ask themselves about the 'reality' of their own ontology on mind, body and matter: while the materialist and dualist points of view base their forms of knowledge in an ontological answer, the indigenous people seem to suggest organising the dialogue between the three different 'ontological communities' involved, into a question about the relation between mind, body and matter.

In such a view, it becomes evident that a dialogue between different ontological communities that takes the premises of interculturality seriously should be based on re-formulating the materialist and dualist ontological answers in terms of possible stances regarding a commonly shared, not yet definitively answered common question, which puts in the centre of the debates a hypothesis of a mind-matter interrelationship. This would allow all three parties to critically revise their own and other experiences, views and knowledge taken for granted from within the perspective of a joint and societally based process of searching for an answer to the hypothesis of a mind-matter relationship, and the consequences arising from this for a concept of life and the implications this would have for the kind of development which should be envisaged.

This means that the encounter of social and natural sciences with endogenous knowledge constitutes an interface of three different ontologies.

Dialogue between 'ontological communities' in view of endogenous development

The above sections provide good evidence for stating that the vagueness, arbitrariness and intentional or unintentional misinterpretations of sustainable and/or endogenous development could be overcome by defining a corresponding ontology. This should go beyond the highly abstract statements expressed as 'considering the needs of present and future generations' or 'putting local resources and capacities into the centre of the process of development' by conceptually differentiating what it means in regard to specific notions on humans, society, social interaction, nature, space and time.

In order to make more explicit what this means, it is useful to consider the following four basic features which are related to what Poli called an 'ontology for knowledge organisation' (1996). First, 'An ontology is not a catalogue of the world, a taxonomy... an ontology is the general framework (=structure) within which catalogues, taxonomies, terminologies may be given suitable organisation' (ibid.:313).

Second, 'An ontology is not reducible to pure cognitive analysis (in philosophical terms, it is not an epistemology or a theory of knowledge).' (ibid.:313). Third, 'There is nothing to prevent the existence of several ontologies, in the plural. In this case too, ontological study is useful because, at the very least, it renders the top categories explicit and therefore enables verification of whether there are reasonable translation strategies and of which categorisation can serve best to achieve certain objectives' (ibid.:314). Fourth, 'Reality is organized into diverse levels and there are highly sophisticated interdependencies among these levels and within them.'(ibid.:314)

Understanding an ontology as a general framework within which the basic items of sustainable or endogenous development can be organised and taking account of the existence of actor specific ontologies which could represent diverse, but interrelated levels of reality, sets the stage for a dialogue between 'ontological communities'. Meenaghan and Gibbons (2000) describe ontological communities as groups of people who have a common heritage, such as religion, language, ethnicity, or culture and affirm their own strong identity within the context of larger, more complex modern communities.

Regarding the conditions and features of an ontology of sustainable and endogenous development, the findings presented in this paper allow us to identify the following, indeed preliminary, items. A first fundamental feature is the societal and process-related character of an ontology of sustainable and endogenous development. The definition of the key concepts of an ontology for endogenous development cannot be left to one or several scientific disciplines alone. The generally well-developed theories of objects of the different scientific disciplines constitute a necessary, but not sufficient condition for the development of an ontology of endogenous development. Understanding the construction of a theory of objects for endogenous development as part of a dialogue between different ontological communities means integrating non-scientific actors into the corresponding process. As the examination of the interaction between University and Aymara communities has demonstrated, ethnosciences represent especially appropriate means for such a purpose, as they allow us to reveal ontological commonalities and differences between the different communities involved.

As the example of the different patterns of interpretation of plant and plant growths shows, the definition of an adequate relation between local or endogenous and scientific knowledge cannot be limited only to an *intercultural* dimension: without an *intracultural* effort of the parties involved, aiming at coming to higher levels of reflexivity and leading to more clarity about the ontological foundations of their own forms of knowledge, a dialogue on equal conditions would be difficult to achieve. Through this, the ontological communities would be able to make more explicit the lines of interdependencies that draw the different types of knowledge related to the patterns of action (practice) together, of orientation (norms and values) and of interpretation (worldviews).

As a consequence, the intercultural dialogue is more likely to become productive, because it embraces the three fundamental types of knowledge that are characteristic of the different ontological communities, avoiding through this the biases resulting from fragmented and partially unreflecting communication. Ethnosciences can play a triple role in the establishment of a dialogue between different 'ontological communities' oriented in sustainable development. First, it helps

to create awareness within the scientific community of the importance of the ontological aspects, permitting a visualisation of how they are related to the actor-specific patterns of interpretation, orientation and action of scientific as well as non-scientific stakeholders. Secondly, through this ethnoscience contribute to the preparation of the ground to show to what extent the supposedly more 'concrete' issues related to agriculture, livestock keeping or forestry for instance are interdependent with the underlying ontological foundations. This means that ethnoscience can, thirdly, serve as a steppingstone towards engaging in broader societal processes concerning the definition of an ontology of endogenous development which is acceptable for at least the majority of the actors concerned, allowing better guidance of the processes of policy making and implementation.

Moreover, striving to define elements for an ontology of endogenous development as a result of intra- and intercultural dialogue means accepting that, instead of a generalised 'objective' truth claim, the ontological communities have to interact on the basis of intersubjective validation. In terms of social interaction this implies a shift from strategic to communicative action as a more adequate form of interaction for jointly defining aspects of an ontology of endogenous development. This means that scientific work has to adopt a multicultural perspective, which implies making an effort understand the 'others' in order to 'open up the possibility of learning about others and ourselves, of questioning and borrowing, of connecting with them, all to the end of altering and enlarging ourselves and them' (Fay, 1996:245).

The findings of the reflections presented so far, allow us to state that the crucial contents of an ontology of endogenous development are related to the concepts of nature, humans, society, social interaction, space and time. The comparison of the three ontologies meeting at the interface of natural and social science and endogenous knowledge showed that the specific differences between the notions of humans, society, social interaction, nature, space and time are closely related to different positions in regard to the underlying understandings of mind, body and matter and the ways in which they are interrelated. The current ontological incompatibilities between materialist, dualist and endogenous views could be overcome when they relate in more equal conditions. This could be achieved on the basis of a jointly shared question, which takes account of the whole range of ontological positions. A question, which could be shared, at least by the three ontological positions presented here, would be the one addressing the relation between mind, body and matter.

If such a question were considered a common issue of the different ontological communities, the materialist, dualist and endogenous views, instead of contradicting each other, could agree on the hypotheses which reflect different levels of 'reality' and experiences and which are related to a jointly shared and indeed not yet fully answered question. Organising such a multi-ontological process of communication around a commonly shared question would prevent the different ontological communities from falling into the trap of fundamentalism because even if they are different, they further develop their thinking in a process of permanent interaction with other ontological communities, which would strengthen attitudes of openness, dialogue and joint learning.

From a North-South perspective, the present paper allows us to conclude that endogenous forms of knowledge and approaches to development in 'Western' cultures share almost the same destiny as endogenous or indigenous forms of

knowledge in Southern countries. Due to the ontological, and by implication also epistemological, hegemony of orthodox sciences, other forms of knowledge and the corresponding ontologies and epistemologies hold a weak position in the societal process of knowledge production for development. Building alliances and networks for mutual learning between North and South becomes therefore particularly important. Southern groups engaged in the development of endogenous forms of knowledge have significantly deepened the intra-cultural dialogue aiming at the clarification of the underlying ontological and epistemological foundations and contrasting them with those underpinned to sciences (Balusubramanian, 2005; Escobar, 2005; Millar, 2005).

Learning from them how to overcome the ontological hegemony of orthodox sciences, through an intra- and inter-cultural dialogue represents a contribution to the enhancement of Western culture based forms of endogenous development. The approaches developed in the South represent interesting pathways that allow us to overcome the justification of Western forms of endogenous knowledge mainly in terms of the outcomes of their underlying ontologies, e.g. in the form of organic foods, medicines, alternative forms of social and economic organisation.

In order to further break ground for endogenous development it will be of paramount importance that the ontological foundations of these endogenous practices become more visible within the intra- and inter-ontological dialogue which has to be established with the orthodox sciences. As a consequence, people and institutions related to endogenous development rather than focussing on the evaluation based on orthodox sciences should make efforts to develop concepts and methodologies based on their own ontological assumptions (see papers in this book by Baars, Davis, Kieft, Rist, Zajonc and Zürcher).

The background outlined above allows us also to state that the role of science in the process of endogenous development has to be completely re-thought. Instead of being an instance for the validation of other forms of knowledge, science takes a role as one partner within a process of co-production of knowledge between different ontological communities. Rather than being a major source of concrete solutions, science promotes the establishment of social spaces where different ontological communities meet in order to constantly re-shape their relationships between them in view of jointly producing the knowledge they require for the realisation of their life-projects. In such a context science rather than being the main source of solutions, contributes by introducing sufficient levels of reflexivity into the learning processes of the actors involved in the co-production of knowledge for endogenous development (Dürr, 2005; Röling, 2005).

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