

6 Endogenous Knowledge: Implications for Sustainable Development

Stephan Rist¹, Sébastien Boillat², Peter R.W. Gerritsen³, Flurina Schneider⁴, Sarah-Lan Mathez-Stiefel⁵, and Nelson Tapia⁶

Abstract

Endogenous knowledge has become an important component of bottom-up approaches to strengthening sustainable development processes. After reviewing the rise of the paradigm of endogenous development, we highlight how research within the framework of the Swiss National Centre of Competence in Research (NCCR) North-South has contributed to the advancement of this paradigm and its cognitive basis expressed in endogenous knowledge. We explore basic features of the ontological and epistemological foundations of endogenous knowledge and show how it differs from knowledge generated by the social and natural sciences. We reveal fundamental cognitive differences which make a dialogue between them seem almost impossible at first glance. However, considering that the philosophical positions underlying these ontological and epistemological differences are not necessarily definitive, there is potential ground for joint communicative inquiry by scientists and endogenous communities into these differences. The central question to be explored in such an inquiry concerns the possibilities and conditions under which mind can interact with matter. The resulting intra- and interontological dialogue is a starting point for co-creating elements for theories of cognition that reach beyond those presently formulated.

Keywords: Indigenous knowledge; endogenous development; epistemology; ontology; dialogues between knowledge systems.

6.1 Introduction

Endogenous knowledge, endogenous development, and endogenous rural development are concepts that have become part of the sustainability and rural development debates since the late 1990s (Ploeg 1994; Delgado and Ponce 2003). Endogenous development means giving priority to people's visions, values, and potentials of development, and thus implies a clear political choice: Instead of making people participate in externally defined development initiatives, outsiders are made to participate in people's projects (Posey 1999).

In conceptual terms, we acknowledge that *endogenous knowledge* is almost identical with *indigenous knowledge*. However, the difference we wish to make explicit by referring to *endogenous knowledge* is based on the following difficulties faced by the concept of indigenous knowledge in academic as well as in political terms:

1. A first complication of *indigenous knowledge* is related to its bonds with specific historical contexts, ethnic groups, and ethnic identities. The concept thus excludes the wide range of 'local' or 'traditional' forms of knowledge of non-indigenous people, for example mestizos (Rudel et al 2002), white farmers, or even European peasants living at the margins of heavily subsidised European rural areas (Iturra 1989), organic farmers in Europe (Aeberhard and Rist 2009), or conservationist farmers in Switzerland (Fry and Jurt 2000; Schneider et al 2010). These groups represent equally important areas of endogenous knowledge and significantly help to co-produce knowledge and institutions for more sustainable development (Pohl et al 2010).
2. A second complication is related to the controversial debates – conducted mainly in social anthropology – about whether indigenous people have stronger inclinations towards considering long-term ecological sustainability than other social groups (Agrawal 1995). We think that if the aim is to theoretically and practically link indigenous people and their knowledge to a negotiated form of sustainable development, it is not of fundamental importance to clarify in a conclusive way whether the 'ecologically noble' savage truly exists, or whether there is disciplinary evidence to support the idea that indigenous people – as many other groups of resource users – tend to destroy their natural resource base, for example due to political adaptation to power hierarchies. We rather

agree with the proposition made by Haller that it is much more important “instead to determine under what conditions people studied by social and cultural anthropologists are able to use resources in a sustainable manner, and under what conditions they do not” (Haller 2007, p 337).

3. A third difficulty is related to the fact that the notion of ‘indigenous’ people, values, and knowledge has become a rather powerful resource in the political arena, which indeed is an asset in the struggle for increasing the autonomy and level of self-determination of marginalised people. However, due to the specific ethnic and historical contexts from which this notion emerged, it implies a differentiation between indigenous people and other marginalised groups. This becomes especially important in African or Asian contexts where some native people regard themselves as ‘indigenous’, while others view themselves as being Hindi, Buddhists, or Moslems: The fact that the latter do not refer to themselves as ‘indigenous’ does not mean that their world view and the type of resource management they derive from it is less ‘indigenous’ than in the case of South or Central American ‘real’ indigenous groups (Balasubramanian and Nirmala Devi 2006; Millar et al 2006).

In order to avoid falling into these traps when linking sustainable development to the knowledge of groups of people who legitimise the existence of their knowledge and institutions governing land and resource use on the basis of other than Western world views, we prefer to refer to such knowledge in a different way. We follow Devisch and Crossman (2002), who propose to consider all forms of knowledge outside the dominant “Western technological scientific tradition” (p 97) as *endogenous knowledge*, defining it as

being a community-, site- and role-specific epistemology governing the structures and development of the cognitive life, values and practices shared by a particular community (often demarcated by its language) and its members, in relation to a specific life-world.
(Devisch and Crossman 2002, p 108)

Endogenous knowledge is deeply interrelated with farming practices and is both cause and effect of specific farmer strategies that are based on the co-evolution (or co-production) of nature and society (Ploeg 1994; Gerritsen 2002). Accordingly, endogenous knowledge is generally considered to contain a potential for strengthening sustainable development processes as part of bottom-up approaches (Ploeg and Long 1994; Posey 1999). Besides

good coverage of local ecological conditions (Orlove et al 2000; Barrera-Bassols and Zinck 2003; Toledo and Barrera-Bassols 2008), it promises more sustainable approaches to resource use based on long-standing traditions in common-pool resource management (Ostrom and Nagendra 2006). Endogenous knowledge is generally understood as a process of social construction carried out by a community that interacts on the basis of a shared world view, that is, symbolic representations, epistemology, norms and values, and practices (Mathez-Stiefel et al 2007); this process holds interesting cognitive and institutional potentials for balancing use and conservation of natural resources (Ellen and Harris 1999).

In such a view, the relationship between endogenous knowledge and scientific knowledge can no longer be defined according to the classical ideal of Enlightenment and its modern expressions such as scientism or technocracy. Scientific knowledge, instead of representing a universal product of the highest cognitive development of humanity that allows humanity to get rid of ‘indigenous beliefs’ expressed in idolatry, superstition, and ill-understood relations between nature and society, becomes just one – albeit important – form of knowledge among others. Such a repositioning of science is sustained by a shift in how science is perceived by society: While in the past the ‘Western techno-rational science’ was believed to be the source of all solutions, people nowadays rely on a ‘reflexive modernisation’ (Beck 1999), which assumes that science can be a solution as well as a cause of a problem.

As a consequence, it was acknowledged that sustainable development requires a type of knowledge production that can bridge scientific and other forms of knowledge. A good example is *Agenda 21* (United Nations 1992): adopted at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, it called for “the best scientific and traditional knowledge available” (Chapter 35.5) to be used in knowledge production for sustainable development, and demanded the development of “methods to link the findings of the established sciences with the indigenous knowledge of different cultures” (Chapter 35.7).

The present article shows, in a *first step*, how research conducted within the framework of the Swiss National Centre of Competence in Research (NCCR) North-South programme has contributed to understanding the internal constitution of endogenous knowledge. In a *second step* we synthesise main insights into how to interrelate endogenous and scientific knowl-

edge in the context of sustainable development. In a *third step* we explore how the interrelation of endogenous and scientific knowledge is linked to the emerging issues of co-production of knowledge and transdisciplinarity. The *fourth step* highlights the importance of the role that institutions can play in translating cognitive diversity into socioecological change towards more systematic consideration of the principles of sustainability in the context of concrete initiatives to improve livelihood strategies and shape the conditions in which they are carried out. In a *final step* we discuss main conclusions and future challenges.

6.2 The constitution of endogenous knowledge

Research conducted within the NCCR North-South shares an understanding of endogenous knowledge that emphasises its production in a community that is bound together by a common set of social practices based on the production and reproduction of norms, regulations, incentive structures, and sanctions (social institutions). These social practices are understood as expressions of specific values, which for their part are understood by people as rooted in their basic assumptions about what the world is composed of (ontology) and what one can know about it (epistemology).

Berkes (1999) proposes to consider *four main levels of analysis* to address endogenous or traditional ecological knowledge. The first level is the local and empirical knowledge of the environment – the ‘documented knowledge’ usually assessed by sciences using superficial surveys and taking it out of context. The second level concerns the practical applications of knowledge, including resource management systems, practices, tools, and techniques. The third level, often deeply intertwined with the second one, consists of the institutions, rules, norms, and social organisation of the community. The fourth level is the world view which shapes environmental perception and gives meaning to observation of the environment, connecting it to the social and spiritual world.

Research in Quechua and Aymara indigenous communities of Bolivia (Rist 2001; Boillat 2007) demonstrated that religious and spiritual beliefs and experiences play a fundamental role in the social construction of a knowledge system that is as coherent as possible and aims at linking practices, institutions, values, and basic beliefs. The importance of the religious and spiritual dimension does not impede adaptation and innovation but was

shown to provide valuable orientation in times of uncertainty in which traditional risk-reducing land use strategies lose their relevance, for example, due to changes in the climate, in value orientation, or in land tenure rights (Rist et al 2003). This is in line with results from work carried out in Africa by Haller (2002, 2007). A major insight is that this kind of religious and spiritual orientation helps in monitoring culturally defined nature–society relationships and in sanctioning deviational behaviour (Haller 2010); accordingly, religion and spirituality contribute to the process of structuring new environmental information and action, based on a social learning process (Rist et al 2007b).

This aspect can be illustrated using research carried out by Rist (2001) in Aymara communities in the altiplano part of the Department of Cochabamba, Bolivia. Results show that the shift from traditional beliefs in *Pachamama* – which in Aymara refers to the mother of the two life-giving universal forces of the male and the female (Medina 2006) – first to Catholic and later to evangelical beliefs led to an initially welcomed increase in spiritually diversified experiences. However, because traditional rituals, festivities, and forms of cooperation were at the same time banned as ‘diabolical’, the communities’ social coherence rapidly eroded, resulting in multiple fragmentations, tensions, and conflicts between competing groups within the communities. After a series of poor harvests caused by severe climatic conditions related to the El Niño phenomenon, people started to evaluate their new religious experiences against their former belief in *Pachamama*. The difficulties they were going through were interpreted as a sign of *Pachamama*, who was ‘getting angry’ with people because they were forgetting her. As a consequence, they started to engage in a collective process of reflection, which led to the conclusion that the problems they were faced with were to be understood as a consequence of their ‘illusion of a religious-spiritual’ experience that denied any synergies between *Pachamama* and Christian beliefs. Assuming that the Christian God had made everything on Earth, they said that he therefore must also have created *Pachamama*. In this way, the community recreated common ontological and epistemological ground, which allowed people to resume the tradition of performing rituals, festivities, and forms of cooperation rooted in the links between *Pachamama* and the human beings. This was not done in opposition to Christian beliefs, but by way of complementing them. Thus, these indigenous communities rebuilt the broken social networks and ties between the different religious groups, which in turn allowed collective action to be enhanced in such a manner that the communitarian institutions regulating the specific common-pool resource management regime started to work more satisfactorily. As a consequence, social

conflict or adverse climatic conditions, which had not ceased to exist, had much less impact on the well-being of the communities than before. How this recreation of common ontological and epistemological ground translated into a productive series of attempts to innovate and adapt traditional institutions of common-pool resource management regulating land use and land management has been described by Rist and colleagues (2003).

Research on the constitution of the life-worlds of Swiss farmers adopting or rejecting soil conservation measures showed that farmers' endogenous knowledge embraces abstract meanings in the everyday life-world, as well as symbolic meanings referring to other provinces of reality determined by different cognitive styles with their own inherent topical, motivational, and interpretational relevance. In the practical domain of everyday life, soil conservation measures are perceived in the context of daily farming routines. The resulting abstract meanings are complemented by symbolic meanings referring to the farmers' value systems, their personal and professional identities, and – a new insight – to their *aesthetic perception of agricultural plots and landscapes* (Schneider et al 2010). Similar results can be found in developing countries such as Mexico, as reported by Gerritsen and Martínez (2010) when describing blue agave production for the tequila industry.

6.3 Creating a relation between endogenous and scientific knowledge

Both scientific and endogenous forms of knowledge are considered to be the products of a social construction by communities that each share different epistemological, normative, eco-cognitive, and aesthetic foundations. In order to explore possibilities for a dialogue between these forms of knowledge, it is necessary to identify the main differences between them, as well as the conditions under which they relate to each other.

6.3.1 Endogenous and scientific ontologies and epistemologies: a comparison

Based on a synthesis of common elements of endogenous knowledge found in mainly rural communities of Africa, Central and South America, India, and Europe, the international CAPTURED⁷ network concluded that endogenous knowledge can be understood as the culturally and historically contextualised interactions between three main realms of life, namely the

social, material, and spiritual spheres of the world (Haverkort et al 2003; Tapia 2008). This means that every aspect of everyday life is understood as the dynamic outcome of the interactions of the beings comprised in the three domains of life. A legend is therefore not perceived as a product of the human mind (or subjectivity), but represents an existential, lived experience of someone who lived in a past temporal or spatial context (Rist et al 2004). For that same reason, a disease in humans, animals, or plants is not only understood in its material expression but also in terms of manifesting distortions of the relationships between entities belonging to the spiritual and social domains of life (including human beings). The role of the three domains of life in the endogenous Aymara world view is expressed by the left arrow in Figure 1.

Due to this holistic nature of endogenous world views, endogenous knowledge has to offer more than just explanations of *how* a certain phenomenon arises. For example, people with endogenous world views are not satisfied with knowing that a hailstorm is generated by condensation of humidity elevated to high altitudes in the atmosphere where it is cold, or that a violent conflict between humans is caused by competing interests over natural resources. They want to also know *why* the phenomenon in question happened to those affected at that specific moment. To know *why* something happens is important since this provides the basis for determining how to confront the event in an adequate way. In the case of a hailstorm, Aymara communities immediately mobilise their authorities to find out who has violently shed blood on the ground, an act that is interpreted as disrespect for the 'skin' of *Pachamama*, from which all life sprouts. Once identified, the community members responsible for the bloodshed have to perform a series of rituals in order to appease *Pachamama* (Berg 1990).

The natural sciences are rooted in a completely different world view. It is based on the assumption that natural laws exist independently from what human beings do in the spiritual or social domains of life. For this reason, the question of *why* a hailstorm affects a certain group of people at a certain moment cannot be answered by creating a relation between the three domains of life. It can only be explained by referring to factors inherent to the 'natural world' to which a hailstorm is bound by its (socially and politically determined) ontological and epistemological definitions. This materialist theory of cognition renders dialogues between scientists and people with endogenous world views practically impossible.

The essentially dualistic theories of cognition in the social sciences assume that besides a natural world (studied by the natural sciences) there is a social world (studied by the social sciences). The social world is either perceived as potentially existing alongside the natural world (realist positions), or both worlds are understood as social constructions by human beings, assuming that it is not possible – and of no further importance – to know to what degree the social world is or is not part of a reality (constructivist positions). Independently from the philosophical position, this dualism offers more space for dialogues with people holding endogenous views of the world, as it allows to explain phenomena in terms of interactions between the social and the natural worlds. However, given that the religious and spiritual domains of life are perceived as part of the subjective social world created by human beings, this dualist view has to deny the possibility of spiritual processes influencing processes outside of the social world. This aspect is depicted by the lightning icon in the right arrow in Figure 1.

6.3.2 Opportunities for bridging the differences

In this sense, scientific points of view maintain an ontological and epistemological vacuum in comparison to endogenous world views: While people with an endogenous world view are interested in knowing more about and experiencing the degree of reality and the type of interaction between the three domains of life, the natural sciences can offer experiences related to just one aspect (natural domain); the social sciences can offer explanations based on the acceptance of one ‘real’ domain of life (natural world) and a second domain of which one cannot be sure to what extent it constitutes reality (social world). For this reason, anthropological explanations, for example, do not deal with the question of the reality of spiritual, religious, or cultural processes; this implies that these explanations are limited to showing how these categories work themselves through processes within the social world, or how they influence human activities that articulate them through processes in the natural world. This understanding of the nature of scientific knowledge provides an entry point for the social sciences for acknowledging that endogenous knowledge is essentially long-standing, cumulative, and adaptive. It is often stored and organised in rituals and thus becomes relevant in managing landscapes (Haller et al 2008), or in the management of common-pool resources by fishermen, peasants, agro-pastoralists, or hunters and gatherers (Haller 2010). Although this entry point is highly relevant to valuing how endogenous knowledge contributes to sustainable development, it is still insufficient if we want to address more than just the charac-

teristics and institutions of endogenous knowledge and the relevance they have to sustainable development: It still ignores the existential conditions in which endogenous cognitive resources are created.

Action research on this question conducted with and in endogenous communities has shown that dialogues with the natural and social sciences can become much more fruitful for both sides if, in a first step, they lead all participants to become aware of the theories of cognition in which their own knowledge is rooted. This allows for the configuration of a space for communicative inquiry in which different ontological and epistemological positions are not seen as a final product of cultural histories, but as different ways of looking at phenomena which are relevant to members of both the scientific and the endogenous communities. A result of this type of communicative interaction between scientists and people from endogenous communities is that ontological differences can be transformed into a joint project of inquiry in which the central question concerns the possibilities and conditions under which mind can interact with matter (Rist and Dahdouh-Guebas 2006). It has been shown that such joint projects of inquiry provide fertile ground for an intra- and interontological dialogue in which no participant is obliged to give up their position; the only concession that each participant must make is that their own ontological and epistemological position regarding the mind–matter relationship is not a definitive answer, but a starting point and a specific position in a dialogue that aims to explore possibilities for co-creating elements of theories of cognition that reach beyond those presently formulated (Rist 2010). This is illustrated by the two interrelated arrows in the upper central part of Figure 1.

6.3.3 Endogenous and scientific social construction of knowledge: an example from the Andes

The main differences and similarities between scientific knowledge and Andean endogenous knowledge, and their implications for the conservation of ecosystem diversity – an important dimension of biodiversity conservation – have been identified by Boillat (2007). He presents an analysis of the main features of the social construction of ecosystems, considering (1) the scientific procedure (ecology) and (2) the procedure as found in two indigenous communities of Quechua people in the department of Cochabamba, Bolivia.

1. Contemporary ecology now widely recognises that ecosystems are an arbitrary abstraction of the complexity of nature. To become operational

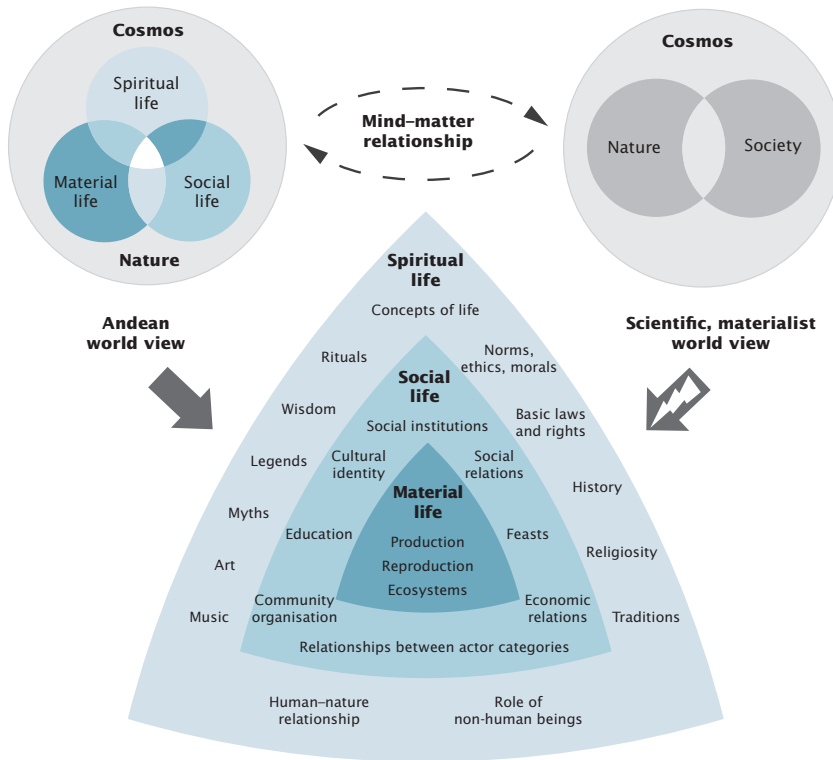


Fig. 1
Comparison of
key features of
Aymara and scienti-
fic ontologies.
(Adapted from
Rist and Dahdouh-
Guebas 2006)

units for conservation purposes, ecosystems must, however, be linked to discrete, mappable entities (Noss 1996). ‘Classical’ terrestrial ecology usually defines ecosystems through the recognition of plant communities, which can be defined according to the statistical similarity of their floristic composition (Braun-Blanquet 1964; Mueller-Dombois and Ellenberg 1974; Begon et al 1996) – a method which is widely used by conservation scientists in Bolivia. Application of this method to the area of two Quechua communities resulted in the mapping of 40 plant communities. Further analysis demonstrated that traditional agriculture plays a key role in shaping the high diversity of local ecosystems. In this case, the process of scientific knowledge construction consisted of first characterising the parts of a system (the plant species), followed by defining the whole (the plant community) and generalising the findings to the wider area (abstraction). Since the methods of ‘Western techno-rational science’ demand that observations remain independent of the observer,

thereby ensuring the replicability of the inquiry, only material interactions are registered. In this sense, ecosystems – from the point of view of scientific ecology – are a bridge between reductionist and holistic materialism (Golley 1993). This approach is consistent both with a *critical rationalist epistemology*, which states that there is an objective reality, which is complex and can be approached only through a set of abstract theories, and with a *dualist ontology*, which postulates that mind and matter exist as distinct entities, with mind observing matter through sensorial perception.

2. Regarding the social construction of environmental knowledge by the two Quechua communities, defining the vegetation type is not a central criterion for differentiating spatial units in the landscape. Rather, the landscape is divided into concrete places whose names have direct meaning in the local language; this is done in considerable detail and with quite precise spatial boundaries (Martínez 1989). Boillat collected 308 mappable toponyms that local people defined using a wide range of aspects related to topography, the presence of plant and animal species, rocks, and water, the sacredness of places, soil types, climate, infrastructure, history, and traditional ritual activities (Boillat 2007). Community members conceive of toponyms not as arbitrary, but as *self-revealed* names that are based on the evidence of some outstanding feature and that result from observation and daily interaction with the environment, but also from dreams, meditation, or even spiritual possession (for other areas in the Andes, see also Platt 1992). Moreover, all these places are believed to form part of a wider *community of living beings* with which people can establish direct contact, for example by performing a ritual to ‘ask the places for help’ in agricultural production. This process shows that endogenous knowledge construction first defines a whole (the place) and only in a second step characterises its parts (e.g. natural resources available at a place). Moreover, since observation is not the only method used to determine place names, knowledge is accepted to be observer-dependent in the context of a consensus about place names among the community members, which emerges informally from the collective experience of interacting in a common environment. Thus not only material interactions are acknowledged, but also social and spiritual ones. In this sense, the epistemology of Quechua endogenous knowledge can be interpreted as a *dialogue with a community of living beings*, based on the ontological assumption that there is *no fundamental separation* between material, social, and spiritual phenomena or between nature and culture. The result of this endogenous process of knowledge production is a genuine *cultural landscape*, which from

a scientific-ecological point of view holds high potentials for strengthening biological as well as cultural diversity in the area.

6.3.4 Endogenous knowledge: open to other forms of knowledge

Regarding the basic features of a dialogue between these two ways of constructing knowledge about the environment, this analysis clearly shows that in both cases, the cultural landscape is valued positively. However, in order to better grasp the potentials and constraints of such a dialogue, it is important to note that the reasons for this positive valuation are very different. As illustrated in Figure 2, the natural sciences, the social sciences, and Quechua endogenous knowledge all consider material, social, and spiritual aspects of the cultural landscape of the communities. While the natural sciences deal with material, observable phenomena, empirical social science focuses on social phenomena, without excluding the possibility of taking account of interactions with material phenomena. Philosophy and theology may consider spiritual phenomena, but usually in reference to sacred texts and individuals' written experiences of spirituality. Quechua endogenous knowledge focuses on the interdependencies of phenomena, aiming to trace their way through the material, social, and spiritual domains of life, which are not understood as separate from one another. From the Quechua com-

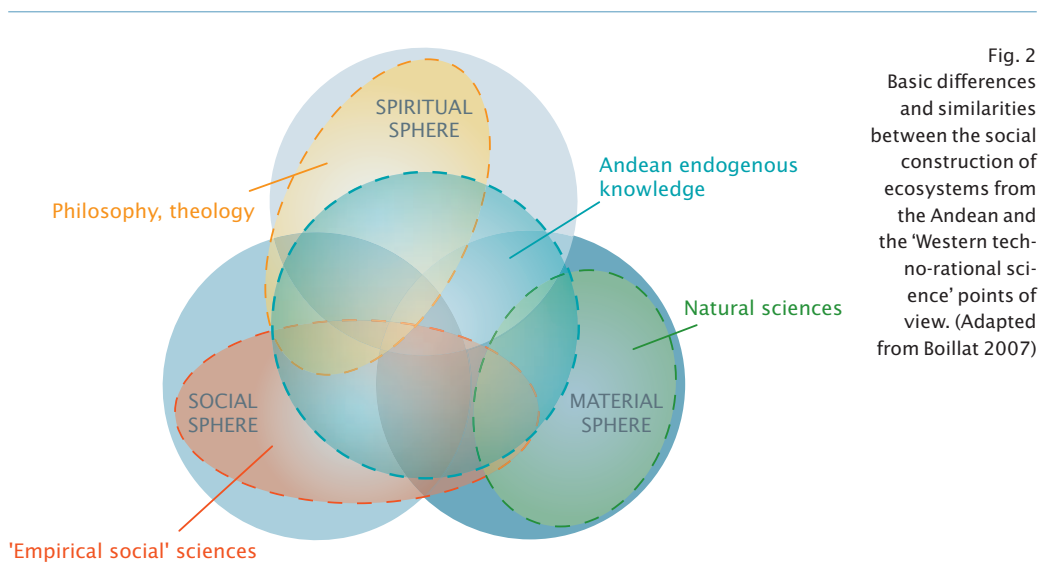


Fig. 2 Basic differences and similarities between the social construction of ecosystems from the Andean and the 'Western techno-rational science' points of view. (Adapted from Boillat 2007)

munities' point of view, it is thus clear that scientific knowledge about their environment can be seen as one *particular case* among the many possible ways of constructing knowledge. This leads to what Tax (1990, p 283) calls a paradox: Endogenous knowledge is "broader or more permissive" than scientific knowledge, and can more easily incorporate new knowledge into its system.

This may also account for the fact that people from endogenous communities often have little difficulty combining endogenous forms of knowledge with aspects or artefacts coming from a – supposedly – strongly contradictory world view. As long as scientific contributions can be seen as a particular case of reduction of the endogenous world view, a logical coherence between the two ontological systems and their epistemologies is maintained. This makes it possible to revert to the endogenous world view should the discontinuities with the exogenous elements become too severe (as was the case in the failed attempt to substitute traditional belief in *Pachamama* with Christian belief described above).

This particular relationship between endogenous and scientific world views is not just a 'cognitive game'. Indeed, it directly influences the decisions and actions of people in their daily lives. This can be illustrated using research carried out in rural contexts of Bolivia, Peru, and Switzerland (Mathez-Stiefel 2008, 2009; Aeberhard and Rist 2009). Mathez-Stiefel (2008, 2009) analysed the strategies that people in two Quechua regions of Bolivia and Peru adopt when they have to decide whether to use endogenous or biomedical (science-based) therapies to treat an illness. The research results show that the choices are not clear-cut in favour of one or the other system: Indigenous people integrate both systems within multiple therapeutic strategies, depending on the type of illness. This points to interontological reflection that considers different conceptions of health and illness. People will, for instance, first try to heal themselves based on endogenous knowledge, and only if this attempt is unsuccessful will they consult an external specialist. For serious, so-called cultural illnesses – caused, for example, by 'fright' (*susto*), 'bad air' (*mal viento*), or 'anger' (*colerina*) – they will typically go to a traditional healer; and only for serious injuries – caused, for example, by accidents – and to obtain vaccinations, contraceptives, and painkillers, will they go to the health care centre. Nevertheless, the research results show a clear preference for the endogenous medicinal system among Andean farmers, independently of their age, level of education, economic status, religion, or migration status. This preference cannot be explained by the financial

factor only; it rather highlights the incapacity of the biomedical system to incorporate endogenous knowledge and the underlying endogenous conceptions of health and illness in a way that is adequate to the complex life-world of indigenous people.

A similar situation helped to explain the ambiguous position of ‘Western techno-rational science’ within communities of organic farmers in Switzerland. The continuously growing and by now well-established societal recognition of an initially rather poorly received new trend is associated with the gradual loss of the priority of endogenous knowledge and the related philosophical background. The increasing tendency to value organic agriculture based on the epistemic principles of bio-ecological and generally quantitative socio-economic research has led to a gradual replacement of endogenous knowledge by scientific knowledge, reducing the potential for endogenous knowledge to spark further innovation based on cognitive diversity (Aeberhard and Rist 2009).

Analysis of social learning processes related to soil conservation in Switzerland demonstrated that considering the life-worlds of non-academic actors – in which the recombination of endogenous and scientific forms of knowledge generally occurs – is crucial for understanding why, for example, farmers, based on their endogenous knowledge, adopt or reject soil conservation measures. Schneider and colleagues (2010) showed that farmers interpret soil erosion and soil conservation measures against the background of their entire life-world. In doing so, farmers also consider abstract and symbolic meanings of soil conservation. Consequently, while soil conservation measures have to be feasible and practical in the everyday farming routine, they also have to match farmers’ aesthetic perceptions, their value systems, and their personal and professional identities. As a consequence, when adopting soil conservation measures such as no-tillage, farmers have to adapt not only the routines of their daily farming life, but also their perception of the aesthetics of cultivated land, their basic values, and their images of themselves. A major factor determining whether farmers adopted or rejected no-tillage was found to be the degree of coherence they were able to create between the abstract and symbolic meanings of this soil conservation measure. Accordingly, implementation of soil protection measures faces the challenge of facilitating interactions between farmers, experts, and scientists at a ‘deeper’ level, with an awareness of all significant dimensions that characterise the life-world concerned.

6.4 The role of institutions in bridging cognitive diversity

Getting involved in transdisciplinary dialogue between endogenous and scientific communities is much more than a challenging ‘intellectual journey’. As the research results outlined above have shown, a learning-oriented intra- and interontological and -epistemological dialogue helps to generate communicative action which first permits to clarify differences and envisage possible common ground for cooperation between the different epistemic communities. Following the action research approach, this process finally leads to the design and implementation of concrete actions aimed at changing present livelihood strategies and the conditions in which they are applied.

Insights gained from intra- and interontological and -epistemological dialogues frequently lead to a review of social institutions and are thus finally translated into a more sustainable development practice (Galvin 2004; Bottazzi 2008; Galvin and Haller 2008). As shown by the examples mentioned above, members of endogenous epistemic communities make considerable and time-consuming creative and social efforts to explore in an increasingly reflexive way the links between land use practices, institutions, and the cognitive foundations on which norms, regulations, and practices are based.

The results of such endogenous learning processes are translated into political claims for more room and consideration to be given to endogenous institutions in the context of common-pool resource governance, management of natural resources, shaping of economic relations, and design of strategies regarding health, education, and other public services. It is in this political struggle that scientific research into the potentials of endogenous institutions for more sustainable development plays an important supporting role. The results of such research provide a basis for creating alliances between academic and endogenous communities, thereby increasing their influence on both political decision-makers and policy processes. Such a focus on incorporating endogenous norms, rules, and the corresponding systems of incentives and sanctions into the governance of natural resources as part of cultural landscapes offers an opportunity for translating the long-standing and highly adapted knowledge of local people into collective action; this, in turn, provides a basis for reinforcing those parts of endogenous knowledge that appear promising with a view to further advancing people’s aspirations, and for innovating or complementing those parts that are considered inadequate to present situations.

Many social scientists regard the term “sustainability” as alien to endogenous communities (see Haller 2007). A closer look reveals, however, that at least certain fundamental elements of sustainability are part and parcel of endogenous knowledge. Rist (2002, 2010) shows that the notion of developing in a way that takes account of the needs of future generations is part of the vision of development held by Aymara indigenous communities in Bolivia. And more than that: Their vision actually goes beyond this notion, extending it to include past generations as well, based on the belief that the ancestors remain present now and in the future and wish to keep on living with the present and future generations. Accordingly, current development must allow present, future, and past generations to live well.

Aside from this, however, we agree with Haller (2007) that the integration of endogenous knowledge in development initiatives is much more productive if the strengthening and maintenance of cultural landscapes, and of the institutions and ethno-ecological knowledge that are shaping them, is based on attaching fundamental property rights to the natural resources, territories, and knowledge of endogenous communities. This implies that the strengthening of endogenous institutions cannot take place at the margins of existing power relationships. Instead, scientific work has to be re-focused on the context of institutions, away from emphasising the tendency of endogenous institutions being weakened by modernisation. We have to start (again) analysing how in the same processes we find signs of resistance against unilateral and imposed modernisation, with the aim of helping to link the political arena with the forces of resistance and alternative political projects undertaken by endogenous communities (García Linera 2006).

However, the fairly common strategy to call for greater consideration of endogenous institutions might fall short in the medium and long terms if we do not take into account that the meaning and internal legitimacy of endogenous institutions increasingly tends to be the product of a reflexive and collective process of learning on the part of the people shaping them. This means that besides creating room for endogenous institutions, efforts must also be made to create room for intensifying the exploration of links between the cognitive foundations of people belonging to endogenous communities, their institutions, and their social practices. We argue that engaging in the intra- and interontological and -epistemological dialogue described above is a promising step for complementing support in the political arena in such a way that the sources of endogenous knowledge and creativity can flow more easily into collective action aimed at changing structures and hierarchies.

6.5 Endogenous knowledge and co-production of knowledge as a pathway to sustainable development

In the previous sections we have highlighted the constitutive elements of endogenous knowledge and its differences from scientific knowledge, and have shown that institutions can play a fundamental role in bringing endogenous knowledge into the practice of sustainable development. However, we have not yet answered the question of how to conceptualise the process of interrelating the different forms of knowledge in the context of devising more sustainable development initiatives. Research undertaken within the framework of the NCCR North-South and elsewhere suggests that this process should be understood as based on interactive ways of producing knowledge (Schulser et al 2003; Pahl-Wostl and Hare 2004; Rist et al 2006; Ison et al 2007; Rist et al 2007a; Rist et al 2007b; Pohl 2008; Schneider et al 2009; Reed et al 2010) and on transdisciplinarity (Hurni and Wiesmann 2004; Max-Neef 2005; Hirsch Hadorn et al 2006; Wiesmann et al 2008).

Recent debates have followed two different ways of conceptualising co-production of knowledge. In the first, emphasis is placed on ‘boundary organisations’. These are understood as existing at the interface between the two fairly different social worlds of politics and science, having distinct lines of accountability to each of these two worlds and involving the participation of actors from both worlds, assisted by professional mediators (Guston 2001). Examples of boundary organisations include the United States Office of Technology Assessment (Cash et al 2006) or, to cite a more recent example, the Intergovernmental Panel on Climate Change (IPCC) (Forsyth 2004). The second type of conceptualisation of co-production of knowledge builds on ‘mode 2 knowledge production’ (Gibbons et al 1994; Nowotny et al 2001). This type of knowledge production is defined by the context in which it is applied, as well as by the heterogeneity of cognitive and social skills available in the problem-solving process as a result of the involvement of multiple actors.

A systematisation of experiences gained from action research projects aimed at knowledge co-production between scientists and key stakeholders for finding more sustainable ways of managing natural resources (Pohl et al 2010) has shown how the call for integrating scientific and endogenous forms of knowledge in sustainable development initiatives challenges the perception of a clear-cut boundary and division of labour between science and society, as well as the idea that science holds a monopoly over knowl-

edge production. Accordingly, we argue that the ‘mode 2 knowledge production’ pathway is better suited for conceptualising such integration of scientific and endogenous knowledge in sustainable development initiatives than the concept of ‘boundary organisations’.

In view of the importance of integrating endogenous knowledge into the processes of co-production of knowledge for sustainable development, the NCCR North-South carried out research aimed at highlighting the main features of initiatives that promote processes of joint and interactive knowledge production by scientific and non-scientific actors. Two basic questions were addressed: first, what are the basic types of interaction that emerge when actors representing endogenous and scientific forms of knowledge meet in platforms for the co-production of knowledge? And second, which roles do scientists play when they engage in processes of transdisciplinary knowledge co-production in the context of action research projects for furthering sustainable development initiatives?

Regarding the first question, it was shown that the co-production of knowledge is generally related to the establishment of social learning processes between the members of the epistemic communities involved (Rist et al 2006). Research on the basic features of such social learning processes revealed that co-production of knowledge implies fundamental changes in patterns of interaction, for example between farmers, extensionists, and policymakers. As these interactions generally take place in the context of face-to-face communication, the following question becomes an important issue in the theory and practice of co-production of knowledge: how can insights gained within relatively small groups of actors be enhanced in such a way as to promote collective learning processes in wider societal spaces? A study by Schneider and colleagues (2009) revealed that in the case of soil conservation initiatives in Switzerland this was achieved not directly by formalising new lines of institutionalised cooperation, but by establishing links in a ‘boundary space’, trying out new forms of collaboration aimed at social learning and co-production of knowledge. Gerritsen and Morales (2007) describe a platform for co-production of knowledge in western Mexico, in which dialogues and interchange of concrete experiences helped in scaling up localised endogenous knowledge.

Regarding the second question of how researchers deal with situations in the knowledge co-production process, it was shown that sustainability researchers face three challenges in the co-production of knowledge: (a) addressing power relations; (b) interrelating different perspectives on the issues at

stake; and (c) promoting a previously negotiated orientation towards sustainable development. Their responses to these challenges consist in assuming the roles of reflective scientists, intermediaries, and facilitators of a joint learning process (Pohl et al 2010).

6.6 Conclusions and outlook

This article summarises how NCCR North-South research has contributed to the advancement of the emerging paradigm of endogenous development and its cognitive basis expressed in endogenous knowledge. Some basic features of the ontological and epistemological foundations of endogenous knowledge and its differences from knowledge generated by the social and natural sciences were set out. Becoming aware of these differences was identified as a precondition for organising a meaningful dialogue between the endogenous and scientific epistemic communities. Given the fundamental cognitive differences, a dialogue seems almost impossible at first glance. However, considering that the philosophical positions underlying these ontological and epistemological differences are not necessarily definitive, there is potential ground for joint communicative inquiry by scientists and people from endogenous communities into these differences. In this context, the central question concerns the possibilities and conditions under which mind can interact with matter. This question has been shown to provide fertile ground for an intra- and interontological dialogue in which no participant is obliged to give up their position; the only concession that each participant must make is to acknowledge that their own ontological and epistemological position regarding the mind–matter relationship is not a definitive answer, but rather a starting point and a specific position in a dialogue that aims to explore possibilities for co-creating elements for theories of cognition that reach beyond those presently formulated.

This explicitly includes, on the one hand, the recognition that the social and natural sciences can learn from the dialogue with endogenous communities how to overcome the ontological and epistemological limitations that constrain a more systematic approach to the practice of endogenous development. On the other hand, such a learning-oriented dialogue implies the recognition that actors basing their actions on endogenous knowledge can benefit from the high degree of reflexivity which is brought into the dialogue by the natural and social sciences. Experience and research have shown that this is a need felt by people holding endogenous knowledge, because they

increasingly rely on a reflexive, rather than authoritative, legitimacy of their knowledge, values, and institutions.

The research results also demonstrate that a fundamental aspect allowing endogenous and scientific knowledge to be linked relates to the validation of the potentials that endogenous institutions have for sustainable development. On this basis, scientific work can help to enhance consideration of endogenous institutions in the political arena and create conditions in which endogenous communities can express their endogenous knowledge in terms of concrete norms, regulations, incentives, and sanctions in the context of concrete issues of sustainable development, for example related to common-pool resource governance, the management of territories and natural resources, practices in the fields of health care, education, social and political organisation, and the shaping of economic relationships.

In our view, the main challenges for further research include:

1. To deepen understanding of the constitution of endogenous development in areas other than resource management and health, for example with regard to endogenous forms of social organisation, new and old ‘moral economies’, religious and spiritual practices, or political organisation.
2. To further explore epistemological and ontological differences between endogenous and other forms of knowledge, not by comparing them to the general cognitive foundations of science (as done in this article), but by taking into account the diversity of theories of cognition within established and emerging strands of scientific thinking, for example the new a-dual ontology as proposed by Hans Peter Dürr (2007).
3. To better understand how endogenous and scientific knowledge interact within people’s life-worlds and how they relate to the generation of social and political movements calling for epistemological and ontological plurality, and to explore the potentials and risks this involves for societal organisation.
4. To deepen insights into how the enhancement of endogenous knowledge can be strengthened on the basis of learning-oriented and transdisciplinary approaches to sustainable development, and how these approaches relate to new and/or more comprehensive notions of development, as expressed in terms of ‘net growth of happiness’ in Bhutan or *vivir bien* (living right) in Bolivia, Ecuador, or Peru (Choquehuanca 2010).

Endnotes

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¹ Stephan Rist is Adjunct Professor of Human Geography at the University of Bern, Switzerland. He holds a PhD in sociology from the Technical University of Munich, Germany, specialising in rural indigenous people in Bolivia. He habilitated at the University of Bern with a thesis on natural resource governance, agrarian systems, and rural sociology in South America as well as Europe and Switzerland. Stephan Rist is Head of the Governance of Land and Natural Resources Cluster at the Centre for Development and Environment (CDE), University of Bern, and Co-leader of Research Project 13 of the Swiss National Centre of Competence in Research (NCCR) North-South on the transformation of agrarian systems. He also directs a research project entitled “Governance of Forest Multiple Outcomes in Bolivian Lowlands: Reconciling Livelihoods, Biodiversity Conservation and Carbon Sequestration” of the Swiss National Science Foundation’s Swiss Network for International Studies (SNIS) and participates in the Graduate School on Transcultural Management and Governance in Latin America (TransGELA), a joint venture of the University of St. Gallen (Centro Latinoamericano-Suizo), the Graduate Institute of International and Development Studies in Geneva, and the University of Bern (Centre for Development and Environment).

E-mail: stephan.rist@cde.unibe.ch

² Sébastien Boillat is an environmental scientist with a PhD in Human Geography from the University of Bern, Switzerland. He has field research experience in Latin America in ethnoecology, agroecology, and natural resource and ecosystem management. He currently holds a post-doctoral grant of the Swiss National Science Foundation (SNSF) for his work under Prof. Fikret Berkes at the Natural Resources Institute, University of Manitoba, Canada. As of March 2012 he will be Co-coordinator of a research project on land governance in Bolivia and Laos supported by the Swiss Network for International Studies (SNIS), at the Department of Geography, University of Geneva, Switzerland.

E-mail: sboillat@hotmail.com, boillat@cc.umanitoba.ca

³ Peter R. W. Gerritsen holds a PhD in sociology and currently works as a lecturer in rural sociology at the Department of Ecology and Natural Resources, Centro Universitario de la Costa Sur, University of Guadalajara, Mexico. He has specialised in research and action regarding peasant perceptions of natural resources and the social construction of biodiversity as an important part of endogenous development.

E-mail: petergerritsen@cucsur.udg.mx

⁴ Flurina Schneider holds a PhD in human geography from the University of Bern, Switzerland, and specialises in research on social learning processes and transdisciplinary knowledge production as an important dimension of sustainable agriculture in Switzerland and Europe. She is currently working as post-doctoral researcher and is in charge of the synthesis package of the MONTAN-AQUA project on “Approaching Water Stress in the Alps – Water Management Options in the Crans-Montana–Sierre Region (Valais)” of the Swiss National Science Foundation’s National Research Programme 61 on “Sustainable Water Management”.

E-mail: Flurina.Schneider@cde.unibe.ch

⁵ Sarah-Lan Mathez-Stiefel is an anthropologist and ethnobiologist with extensive working experience in Latin America as well as Eastern and Southern Africa. She works for the Centre for Development and Environment (CDE), University of Bern, Switzerland, as an advisor for the BioAndes programme in Bolivia, Peru, and Ecuador. In addition, she lectures at Agroecología Universidad de Cochabamba (AGRUCO) in Bolivia, and is Executive Director of A Rocha Peru, a Christian NGO that engages in scientific research, environmental education, and community-based conservation projects. She is currently concluding her PhD research on the transformations of local medicinal knowledge in the Andes.

E-mail: sarah-lan.stiefel@cde.unibe.ch

⁶ Nelson Tapia holds a PhD from the Institute of Sociology and Peasant Studies (ISEC) of the University of Cordoba, Spain, and is academic coordinator of Agroecología Universidad de Cochabamba (AGRUCO), Universidad Mayor de San Simón (UMSS) in Bolivia. He specialises in indigenous agriculture, natural resource management, and the establishment of endogenous sustainable development in South America.

E-mail: nelsontapia@agruco.org

⁷ The Capacity and Theory Building for Universities and Research Centres in Endogenous Development (CAPTURED) network is a programme funded by the Dutch Directorate-General for International Cooperation (DGIS) for the 2008–2012 period that brings together 16 universities or university institutions from Africa, Latin America, Asia, and Europe – among them the Centre for Development and Environment (CDE) of the University of Bern, Switzerland. For more details, go to: <http://www.captured-edu.org/>

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