

Perspective

Collaborative, situated, and critical methodologies in transdisciplinary agroecologies for life sustainability

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Abstract

Collaborative, situated, and critical methodologies (CSCM) foster processes that provide dialogic and experiential working tools for emerging transdisciplinary agroecologies (TA). CSCM emphasize how local knowledge and practice (praxis) contribute to ensuring care for the common and the personal, safeguarding regenerative processes, actively protecting native seeds, and interweaving biodiverse life systems that support the multifunctional networks of agriculture. This work aimed to understand a selection of collaborative methodologies related to transdisciplinary agroecological processes. We identify these groups: 1. Agroecologies, 2. Popular and own pedagogies, 3. Engaged and transformative pedagogies, 4. Assessment of agroecological sustainability and incidence in public policy, and 5. Participatory marketing and guarantee mechanisms or systems. The CSCM contribute to understanding the relationships, times, meanings, and identities and the heterogeneity of context of each community. Thus, CSCM are essential positions and tools to strengthen the openness and respect required by intercultural spaces of praxis and shared dialogues between different epistemic communities while nourishing TA. TA are complexes of relationships and practices between humans and the diversity of life, and they delve into epistemological, ethical, ontological positions and heterogeneous praxis. These diverse methodological paths characterize the interactions that arise from the heterogeneity of knowledge, experience, and wisdom of interacting epistemic communities crossed by power relations. The shifts in positions and research journeys toward epistemological and environmental justice among biocultural diversities developed by the revised CSCM provide the tools to continue articulating processes, designs, and forms of organization of life networks converging with TA.

Keywords Experiential learning and knowledge · Ancestral epistemologies · Dialogues of knowledge · Ethics of care · Spirituality

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1 Introduction

Peasant networks, native peoples, and small-scale producers are the primary custodians of biocultural diversity [1, 2]. Based on agrobiodiversity, organization, and care work, they produce about 70% of the food consumed worldwide [3]. They strengthen the heterogeneity, multifunctionality, and resilience of food systems through integrative and adaptive management¹ [1, 4]. They also articulate peasant balances that embody the art of farming [5] and situated forms of collective and social organization [6].

Traditional agroecosystems, peasant livelihoods, the agrobiodiversity they support, and related local ecological knowledge are under threat [7–9]. Capitalism, colonialism, patriarchy and anthropocentrism are the main epistemological, ethical, and methodological origins of the current environmental and social catastrophe we are experiencing. [10]. The dependence of agriculture on oil, the dispossession of land, the erosion of plant genetic resources [11], and the violation of rights to land, territories, seeds, water, and self-determination aggravate this situation. In this way, culturally adequate food, the environment, and people's well-being are also affected [12, 13]. The verticality and decontextualization of conventional rural extension methods reproduce these inequalities [14]. A few powerful people are driving the transgression and overloading of current planetary boundaries through the degradation of local agroecosystems, the homogenization and external input dependence of agro-industrial systems, corporate diets, and the expansion of extensive and intensive uses of agriculture [15]. Theories of land systems and use change [16, 17], political ecology [18], ecofeminism [19], or critical agrarian studies [20] show how the global disruptions and their trans-scale ecological and social impacts are closely linked to the extensive and intensive changes in the use of land and forests structured by agro-extractive models [21].

In this context and to mobilize change, intergovernmental platforms such as the IPES-Food (International Panel of Experts on Sustainable Food Systems) argue that the knowledge and practices of farmers, peasants, and local indigenous peoples are fundamental to the transformation of food systems, research agendas, and the development of hegemonic policies [22–24]. Local communities articulate traditional and emerging knowledge based on principles of sustainability or continuous use that consider long-term production-reproduction processes [25], through multiple resource management [26], sedimentation management through terraces or modifications in the upper layers of soils that allow integral relationships at different spatial and temporal scales [27]. Therefore, the epistemological and methodological basis of agroecologies as sciences, practices, and social movement open the possibility of constructing engaged knowledge and shared practices, both from the ecological principles of agroecologies [28], and from inter- and transdisciplinary collaborations that recognize the incomplete and open nature of knowledge and practices in dialectical horizontality [29].

A growing number of situated and critical methodologies from local pedagogies, communitarian feminisms, agroecologies, and transdisciplinary research are transforming conventional epistemological stances, principles, processes, and methodologies in the context of the global systemic crisis and the defense and care of life [30–32]. For example, feminist epistemologists have proposed that methodologies are theories and analyses of research procedures within epistemic frameworks permeated by power relations [33]. Therefore, methodologies must be grounded on the ethics of reciprocity, collaboration, and mutual support that sustain our life assemblages. Different ways of stitching knowledge involve practices, relationships, and necessary transformations of conceptual frameworks and research processes [34]. Through time and shared work in everyday spaces and activities or through individual and collective responsibilities that place care at the center of interactions [35, 36].

Previous work suggests that some methodologies have collaborative, situated, and critical characteristics and provide tools to strengthen processes and networks in search of political-epistemic and socio-ecological justice [37–39]. These methodologies contribute to a practical and collective awareness and sensitization to understand, listen, and collaborate with diverse experiences, knowledge, actions and emotions, intuitions, spiritualities, and affectivities silenced by conventional sciences and modern epistemology [31].

The ontological and epistemological disputes for the construction of sustainable territories make visible the political dimension and the needs and challenges of emerging transdisciplinary agroecologies (TA) [40, 41]. The construction of sustainability implies co-responsibilities, societal horizons, and unavoidable ethical-political implications because the capacity to decide on the meaning of sociality constructed in everyday life can continue to privilege some experiences

¹ Some of the systems that make up the world's agricultural heritage are: agroecosystems of terraces, ridges or high fields such as the Mesoamerican chinampas and the *waru-waru* of the Andean region, various polyculture systems such as Mesoamerican milpa [163–165], and diverse agroforestry systems, such as traditional shaded coffee systems or edible agroforest, such as *Kuojtakiloyan* [64]; or old water management and irrigation systems [166].

and perspectives over others, especially those historically marginalized. The example of native peoples [42] and the experiential knowledge of peasants are explicit situations, especially the knowledge, wisdom, and practices of women [43, 44]. The situated and committed interactions promoted by TAs take into account the political and ethical dimension in the construction of sustainability by assuming that their search is inherently a political activity carried out in contexts where diverse interests and power asymmetries prevail [45].

The general question of this study is how precedent transdisciplinary methodologies, pedagogies and practices related to agroecologies contribute to the construction of collaborative and situated processes for the sustainability of life. The aim is to understand the origins, contributions, and challenges of CSCM arising from interactions between local communities and academic collaborators, how they foster horizontal processes, and changes in epistemological stances, methodologies, and research processes towards transdisciplinary agroecologies.

2 Methodology

A systematic literature review focusing on Mexican and Latin American studies and experiences with collaborative methodologies, transdisciplinary processes, and local pedagogies was conducted by searching in Google Scholar, EBSCO, and Science Direct databases, in journals specialized in sustainability, agroecology, and transdisciplinarity such as *Sustainable Food Systems*; *Agroecology, and Sustainable Food Systems*; *Revista Brasileira de Agroecologia*; *Journal of Peasant Studies*; *Leisa Revista de Agroecología*; *Futures*; *Desenvolvimento e Meio Ambiente*; *Agriculture and Human Values*; *Frontiers in Sustainability*; *Frontiers in Sustainable Food Systems*; and *Sustainability*. We also reviewed the information in catalogs available online from research centers and networks such as SOCLA (Latin American Scientific Society of Agroecology); STEPS Centre Pathways to Sustainability; td-net (Network for Transdisciplinary Research); CAWR (Centre for Agroecology, Water & Resilience); Stockholm Resilience Centre; and CIRET (Centre International de Recherches et Etudes Transdisciplinaires).

Table 1 shows the keywords we used to search in titles and body text, and in two languages, Spanish and English. From January 2020 until June 2023, we systematically reviewed these topics, focusing on Mexican or Latin American experiences and publications carried out between 1990 and 2020. Our group excluded the experiences or projects focused only on the academic groups. Only books, articles, and cases used outside this date range were specific literature that the reviewer and colleagues highlighted as relevant historical and social references.

Our working group selected 167 books, articles, and online sites that specifically address political-epistemic and ontological discussions of their methodologies and transdisciplinary processes. The selected texts were integrated into a project and qualitatively analyzed [46] using Atlas Ti version 9 software [47]. The qualitative method was a thematic analysis from an abductive perspective [48]. This process involved the creation of deductive (theoretical) codes resulting from the initial keywords in the literature review and the inductive or hybrid coding and construction of categories from the careful reading of the set of documents and experiences [48, 49]. Next, the central categories were constructed, and the abductive codes were specified, outlining and defining the central themes in relation to the research question and objective (see Table 1).

The main figures of this work were also constructed with the use of the main categories of methodologies considered most relevant according to the criteria: (i) they were used in agroecological processes or studies; (ii) they complied

Table 1 Research codification

Deductive	Spanish keywords: transdiscipliniedad, sostenibilidad, campesinado, metodologías colaborativas. English keywords: transdisciplinarity, sustainability, peasantry, collaborative methodologies
Inductive	Spanish keywords: pluralismo metodológico, métodos transdisciplinarios, investigación colaborativa o transdisciplinaria, followed by the words: conocimiento local, conocimiento ecológico tradicional, agricultura ancestral, agricultura campesina sostenible, conocimiento ecológico local, agroecologías, agroecologías transdisciplinarias, diálogos de saberes. English keywords: methodological pluralism, transdisciplinary methods, transdisciplinary or collaborative research, followed by the words: local knowledge, traditional ecological knowledge, ancestral agriculture, sustainable peasant agriculture, local ecological knowledge, agroecologies, transdisciplinary agroecologies, dialogues of knowledge.
Abductive	Processes, knowledge, communities, local, methodologies, peoples, practices, peasants, political, networks, principles, collaborative, social, learning, social, work, values, diversity, collective, mutual, learning, system, mutual, living

with the defined time scale; (iii) they articulate dialogue or intercultural pedagogies. That is how they were grouped. In Appendix 1 (Online Resource 1), we integrate a list of the reviewed experiences and references using collaborative methodologies, strengthening local pedagogies, and constructing transdisciplinary processes by author, academic community, or online-site to identify: 1. information sources, 2. location, 3. field of emergence, and 4. Origin of initiative or community-building.

3 Results

3.1 Transformative processes and experiences from CSCM

Collaborative methodologies emphasize the importance of: (1) Collaborating, which means working with other people to accomplish a task [38], seeking and promoting transformations in their own and shared lives [50]; (2) learning by doing, experiential learning [51], or transformative learning [52]; (3) strengthening the experiential or embodied knowledge of local communities [53]; and (4) supporting local organizing processes and their own social and organizational horizons that emerge from the dignified life of each community, that is, inhabited and named by each situated form of living well and collectively [54, 55].

The *praxis* and knowledge dialogues of CSCM are processes and spaces where people with different cosmovisions (e.g., local communities, scientists, policy makers) come together in dialogue [56]. The centrality and importance of dialogue, listening, and sharing practices are embodied questions from local communities and native peoples organized through collective processes [57], such as participatory democracy in assemblies, systems of self-governance or communal responsibility, or the construction of daily interactions between people and other life forms in territories based on principles such as permanence, regeneration, and mutual support [58, 59].

Figure 1 presents five groups of collaborative methodologies that we identified with the literature reviewed and the cases analyzed as having a higher impact on agroecological or transdisciplinary processes. We identified these groups of collaborative methodologies with the literature reviewed and the cases analyzed and through the qualitative methodology of adductive thematic analysis cited in the Methodology section. Each group of experiences connects and operationalizes through collaborative methodologies, or transdisciplinary processes between biocultural diversities in intercultural contexts, promoting rooted agroecological and pedagogical processes and making visible a diversity of social horizons, values, principles, and strategies from below. The groups are: 1. agroecologies, a set of experiences and methodologies focused on agroecological designs and management for territorialized or community-based processes; 2. popular and own pedagogies, a group of local or communitarian initiatives to strengthen local identities, values, principles, livelihoods through contextualized pedagogical processes, 3. engaged and transformative pedagogies, this group integrates different academic methodologies and more experiential and contextualized ways of learning aimed at transforming processes and territories in dialogue with local communities; 4. evaluation of agroecological sustainability and incidence in public policies, a group of collaborative methodologies developed from international organizations, forums and platforms to promote community-based appropriation and metrics to scale agroecological territorializations and to transform public policies; and 5. participatory marketing and guarantee mechanisms or systems, this group of methodologies emerged as tools to strengthen social organization, local and regional markets creating self-organized networks to counterbalance volatile market forces and dependency mechanisms. We have distinguished between 2 and 3 to differentiate the processes that emerge from native people and grassroots social movements from those pedagogical initiatives that emerge from academic communities working together to construct transformative and committed knowledge and practices. By differentiating between group 1. Agroecologies, and group 4. Agroecological sustainability assessment and incidence in public policy, we highlight the social, political, pedagogical, or economic processes that form part of agroecological processes, as opposed to more technical and quantitative approaches of agroecological sustainability assessment. We include incidence in public policy in group 4, because institutional and public policy forums tend to focus on evaluation, numbers and outcomes, rather than the rest of the social interactions that integrate agroecological processes

In Latin America, one of the roots of collaborative methodologies and transdisciplinary processes lies in the emergence of interdisciplinary and transdisciplinary approaches that mobilize epistemological transformations of scientific communities. These epistemological shifts aim to build dialectical critical processes with local communities to address and understand the interactions between societies and environments. Ethnobotany, for example, highlights the relevance of local knowledge and the importance of constructing different methodological approaches to decolonize interactions

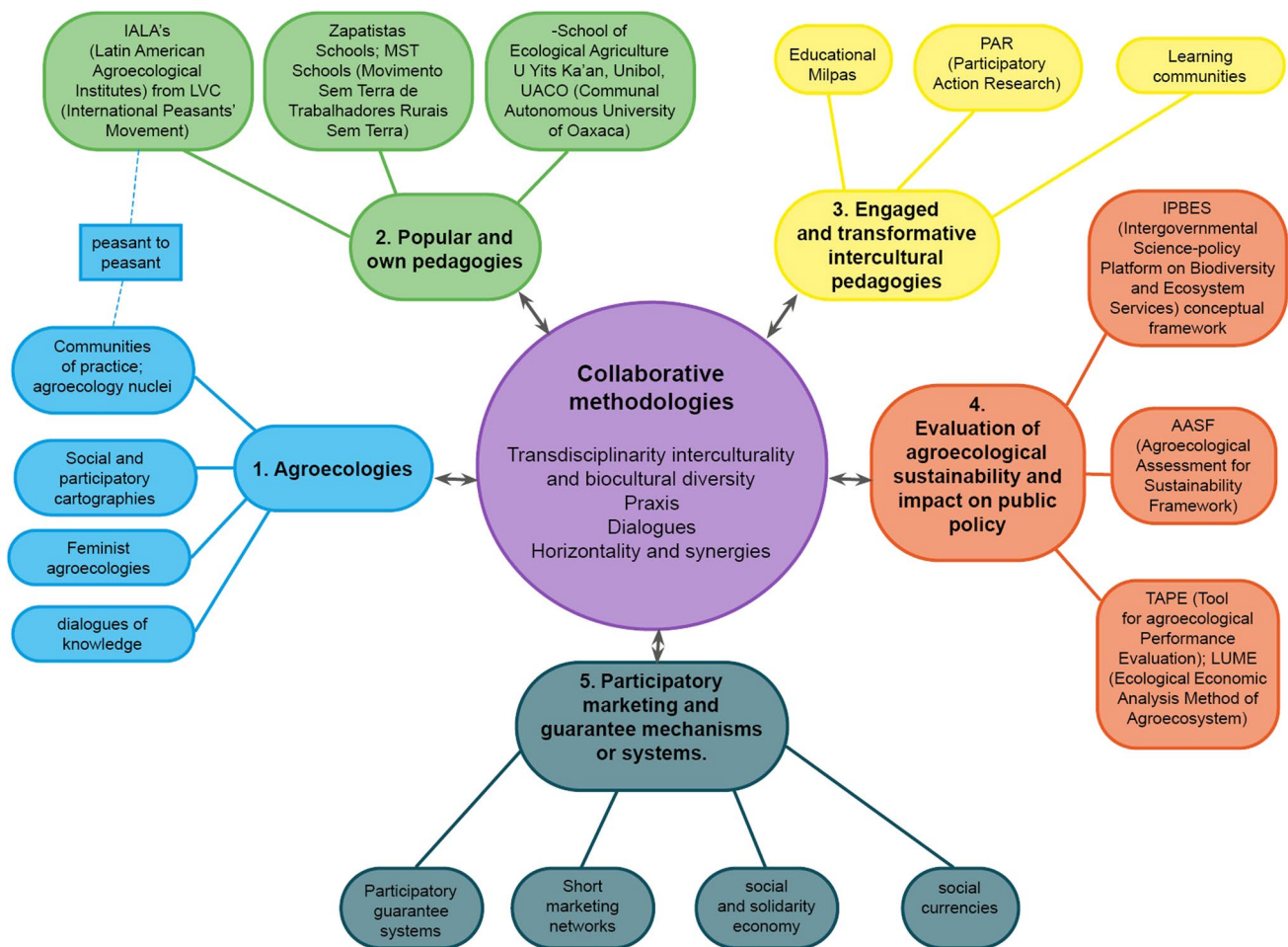


Fig. 1 Five groups of collaborative methodologies. These are: 1. Agroecologies (blue), 2. Popular and own pedagogies (green), 3. Engaged and transformative pedagogies (yellow), 4. Assessment of agroecological sustainability and incidence in public policies (orange), and 5. Participatory marketing and guarantee mechanisms or systems (gray). We have distinguished between 2 and 3 to differentiate the processes that emerge from native people and grassroots social movements from those pedagogical initiatives that emerge from academic fields. Each group of experiences connects and operationalizes (purple) through collaborative methodologies and transdisciplinary processes between biocultural diversities in intercultural contexts, promoting rooted agroecological processes and making visible a diversity of social horizons, values, principles, and strategies from below

between scientific and local knowledge systems [60–62]. Other fields that have emerged with epistemological and/or methodological shifts include agroecology [63]; ethnoecology [64]; ethnoagroforestry and ‘agri-silvoculturiety’ [65–68]; cultural ecology [69]; reflective ethnography [70]; committed anthropology and ethnography [71]; militant legal anthropology [72]; and the ethnosciences of nature [73]. These emerging fields question the role of “object of study”, the “informant”, or the passive subject ascribed to the interlocutors by orthodox disciplinary practices and through conventional methodologies that reproduce mechanisms of power and subordination to different knowledge systems [74].

Other roots include the processes of emancipatory popular education proposed by Paulo Freire in Brazil in the 1960’s [75]; the Participatory Action-Research (PAR) approach of the sociologist Orlando Fals-Borda in the Colombian Pacific [76]; the emergence of the University Agroecology of Cochabamba in Bolivia (1985) as an experimental project of the Universidad Mayor de San Simón (UMSS) from a perspective of sustainable endogenous development [77]; the work with native peoples of the Andes of the Andean Project of Peasant Technologies [78]; or in Mexico the experiences of the Oral Tradition Workshop of the Nahuatl communities of San Miguel Tzinacapan in the northern highlands of Puebla [79], and the Vicente Guerrero Group (GVG for its acronym in Spanish) in Españita, Tlaxcala. It is a civil association that advises and trains social, peasant, and self-governing organizations, and promotes sustainable agriculture and the integral use of resources with appropriate technologies through knowledge dialogues to strengthen local identities and peasant knowledge [80].

Emerging from situated needs and problems and responding to diverse contexts, local pedagogies are the *U Yits Ka'an* School of Organic Agriculture, in Maní, Yucatán a multidisciplinary and liberating educational project focused on agroecology with sub-quarters in Peto, Maní, Valladolid and Chunchuhub on the Yucatán Peninsula where peasants from the Mayan region, academics and priests meet to promote good living, food sovereignty and ecological awareness among the Mayan peasant families. The *Kaltaixpetaniloan* (House where the Spirit Opens, in Nahuatl), an indigenous training center of the *Tosepan Titataniske* cooperative. This regional organization was created in 1977 to address the lack of basic products and commercial intermediaries. It currently brings together 5,800 *Maseuales* and *Tutunaku* members from the northeastern mountains of Puebla to strengthen their production and marketing networks. The training center is the axis of technical and administrative training in context, to promote dignified rural livelihoods and deepen environmental, ethnocultural and gender awareness for good community life [81]. The common ground of these initiatives is the beginning and foundation of the centrality and importance of local communities and indigenous peoples' knowledge and pedagogies. They also highlight the political dimension of the shared practice of interactions between scientific and local communities, and the importance of their own values, principles, forms of organization, and social horizons.

These roots and processes have mobilized transformations in each of the communities involved. However, inequalities and mechanisms of power and subordination continue to operate in academic communities through stigmatization of the indigenous knowledge; the assimilation, integration, and hybridization of this knowledge into scientific disciplines; the selective expropriation of indigenous knowledge for the benefit of science and corporate interests, such as biopiracy; the validation of only hegemonic canons; and coloniality operating in the acts of naming and translation [37]. For this reason, it is essential to recognize the constructed interactions, shared realities, and the epistemological, ethical, and political implications that cross collaborative and transdisciplinary methodologies, especially in agroecological and pedagogical processes towards multiple struggles from below defending territories of life, food sovereignty, and people's rights². After outlining of academic and social origins of collaborative methodologies and transdisciplinary processes, we delve into the analysis of CSCM examples.

3.2 Some examples of collaborative, situated, and critical methodologies

Collaborative, Situated, and Critical Methodologies (CSCM) share the following characteristics: (1) Collaborative, emphasizing the importance of shared actions linked to the reflections, experiences, and affectivities that are present in the daily activities of each territory and the importance of sharing to 'make community' [82]. (2) Situated, echoing both feminist critiques of the patriarchal and biased underpinning of objectivity, "objectivism" and scientific neutrality in modern epistemology and sciences [83, 84], and the "ethno" turn in the sciences [85]. They pose knowledge, including scientific knowledge, as a social construction that historically emerges from contextualized and unbalanced negotiations [86]. They understand knowers not as abstract (male) subjects revealing universal knowledge, but as bodies intersected by hierarchical dichotomies and power relations. Embedded knowledges located in a specific historical and geographical context, from which scientists and local communities can co-create alternative ways of constructing holistic, conflicting, and complex knowledges [40, 87]. Finally, they understand subjects of knowledge as active agents who adapt and create meanings and practical wisdom from their complexities and contradictions [88]. (3) Critical, which seeks to make visible the structural unsustainability and inequality that the capitalist *ethos* reproduces through networks of power. These networks constitute the hegemonic regimes or systems, such as the corporate food regime³, which need to be challenged and transformed [89, 90].

The CSCM account for the processes of destruction of the material bases of reproduction of the common that promote the *ethos* and hegemonic systems and underline the limits of reductionist, anthropocentric, and modern forms

² For example, the political, ecological, and social implications of Mexico's subscription to the International Convention for the Protection of New Varieties of Plants (UPOV 91) as part of the binding agreements of United States-Mexico-Canada Agreement (USMCA), which opens the possibility of criminalizing the ancestral practices of protection and exchange of native seeds to act for the benefit of corporate actors through breeder's rights [167].

³ Some of the drastic social, economic and political changes emerging in the current corporate food regime are corporate concentration in key sectors of the global agri-food systems through vertical and horizontal integration processes, excessive financial speculation that promotes over-exploitation dynamics and encourages dependence on external inputs based on hydrocarbons, whose access and price depend on monopolies dominated by corporate interests [22], economic liberalization and privatization of genetic diversity through FTAs (Free Trade Agreements) and structural adjustment plans, land grabbing, and unequal competitions between small and medium farmers with large subsidized producers [12].

of cognition [34]. They also emphasize the importance of mutual recognition of local knowledge, actions, feelings, and times to strengthen the social, cultural, ecological, ethical, and aesthetic senses and networks of each territory in its own collective, cyclical, and rooted logics [3].

Another important epistemological and methodological shift promoted by CSCM and TA is the construction of principles for collaboration among different communities or groups. For example, the Agroecology Assessment Framework for Sustainability (AASF) program synthesized the following principles for strengthening agroecology as part of their AASF: holistic frameworks, relational values, participatory processes, and democratic debates [90]. Giraldo and Rosset [91] proposed the following social principles for building emancipatory agroecologies: challenge and transform structures; strengthen organicity and collective processes; build horizontal, not hierarchical processes; train to struggle and transform; and act from culture and spirituality, not from productivism. The ethical principles of community-based participatory research are mutual respect, equity and inclusion, democratic participation, active learning, making a difference, collective action, and personal integrity [92]. Pohl and Hirsch [93] emphasize the following principles for designing transdisciplinary processes: reducing complexity, achieving effectiveness through contextualization, achieving integration through open encounters, and developing reflexivity through recursive methods. Norström *et al.* [94] emphasize contextualization, pluralism, interactions, and goal-oriented processes as principles for co-producing knowledge. The *Fogata Kejsitani* collective, in dialogue with the University of Guadalajara established these four principles for collaborating with the community of Cherán, Michoacán: non-commodification, communitarianism, openness, and self-determination [82].

Figure 2 integrates four CSCM that our research group identified as examples that promote horizontality and synergies between local communities, and/or native people, and scientific groups for transdisciplinary processes and territorialized agroecological areas of transformation.

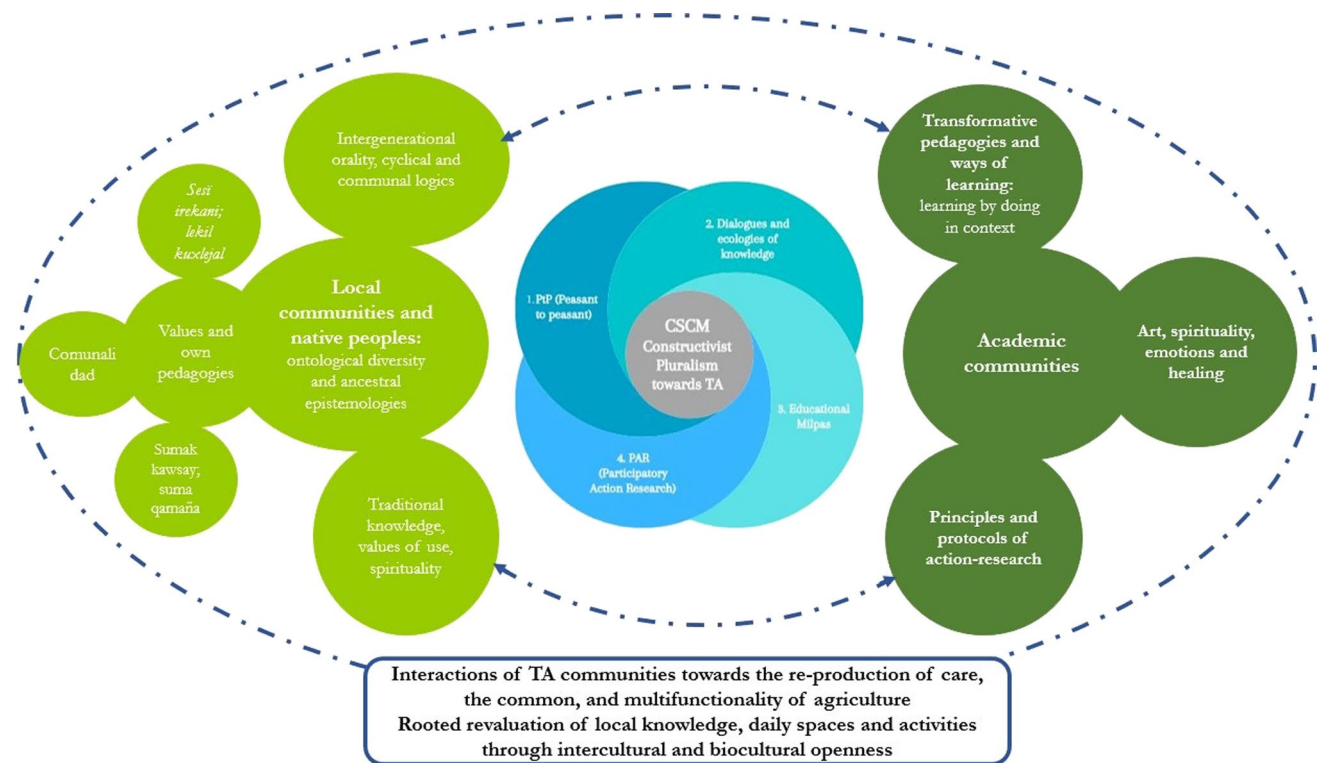


Fig. 2 Scheme of community interactions from of CSCM (Collaborative, Situated, Critical Methodologies) towards Transdisciplinary Agroecologies (TA). At the center are four collaborative and constructivist methodologies that promote horizontality between local communities, native peoples, and academic groups. These methodologies are built on pluralism and allow for dialogue and *praxis* with bidirectional feedback represented by the dotted lines ending in arrows. In light green, the ontological and epistemological differences that local communities bring to agroecological processes from their values, pedagogies, and forms of organization, such as the pedagogy of work or *comunalidad*; or their own social horizons of good collective living such as *sesí irekani* for *P'urhepecha* communities. In dark green, we place the pedagogical and research processes that academic communities create from transformative and committed methodologies, and/or pedagogies that include corporeality, practices, feelings, situated and decolonizing knowledge in context

3.2.1 Peasant to Peasant (PtP) methodology

PtP processes began in severely eroded cropping systems in Chimaltenango, Guatemala. In the 1970s, agronomist Marcos Orozco, an employee of the American NGO Neighbors of the World, shared his results of drawing contour lines, building terraces and applying organic fertilizers to improve corn and bean production. Returning to popular education and liberation theology, he began to train Spanish-speaking *Kaqchikel* peasants as extension workers to further disseminate these practices and technologies appropriate to the territories. This allowed him to overcome language barriers and the suspicion that his agroecological practices aroused in local communities. The peasants welcomed the significant improvements in their farms since it was an alternative productive path that allowed them to escape the vicious cycle of credit and debt in which the hegemonic development policies trapped them through the purchase and dependence on hybrid seeds and synthetic fertilizers [14]. With this methodology, peasants share with other families the agroecological practices that have worked on their plots, what they consist of, how they are carried out or what results they have had to learn from them, based on the needs identified [95, 96]. The *Kaqchikel* communities began experimenting on their lands with good results. They formed a cooperative with more than 9,000 members, but it was disbanded. They continued to exchange and share their knowledge with other farmers, spreading these practices throughout the region and the planet. Today, this methodology is still in use and has spread throughout Latin America. Exchanges and learning networks have already expanded through the dialogues on soil conservation practices with other countries such as Mexico, Honduras, Panama, Nicaragua, and Costa Rica. Local forms of mutual support such as the *kuchubal* in Guatemala strengthened PtP, with community work organized from family ties through an 'ejido-school-playground' strategy implemented by the promoters who worked through the GVG to establish school gardens, communal gardens, and sustainable agriculture projects in the municipality of Españita, in Tlaxcala, Mexico [80].

PtP was compatible with other methodologies, such as Roland Bunch's people-based agricultural development or the basic needs methodology of the United Nations Development programs in Central America [14]. Based on these historical processes, today Abreu has identified five principles of the PtP methodology. 1. Start step by step and on a small scale; 2. Limit the introduction of technologies; 3. Share results when they are visible; 4. Experiment on a small scale; and 5. Develop a multiplier effect through sharing [97].

The PtP methodology is constantly being adapted and transformed by rural feminisms as a tool to make visible the gendered division of labor and the value of women's work in the field from an ecofeminist perspective of life sustainability. For example, through the *Cadernetas Agroecológicas*, a project of women, youth, and traditional communities from the semiarid region of Northeastern Brazil: Piauí, Ceará, Paraíba, Sergipe, Bahia, and Distrito Federal. This project became a political pedagogical tool for the training of women contributing to the implementation of the *Programa de Aquisição de Alimentos (PAA)* and the *Programa Nacional de Alimentação Escolar (PNAE)* by monitoring and making visible women's contributions to production, making them become aware of the importance of their daily work. The *Caderneta Agroecológica* is an everyday register organized in a four-column table to organize information about women's production by recording what was sold, donated, exchanged, or consumed in their domain spaces [98].

Today, the PtP methodology operates as a political-pedagogical tool that strengthens the training, self-organization processes, and capacities of militant cadres of grassroots social movements such as the International's Peasant Movement (LVC for its Spanish acronym) through the Latin American Institutes of Agroecology (IALA's) (LVC 2013); MST of Ceará, Brazil in alliance with *El Colegio de la Frontera Sur (Ecosur)* and the *Universidade Estadual do Ceará (UEC)* [99]; or the National Association of Small Producers of Cuba, which has been escalating agroecological territorialization processes in Cuba through the Agroecological Movement from Peasant to Peasant (MACAC) since 2001 [100, 101]. In other words, the PtP methodology serves as a political-militant training tool that starts from the defense of different systems of knowledge, livelihoods, and peasant rationalities [100]. Based on the above, the PtP methodology can function as a dispositive that activates political resonances of decolonizing transformations of the webs of life of counter-hegemonic rural worlds built by peasant networks [102].

3.2.2 Dialogues and ecologies of knowledge

The dialogues of knowledge take place in the *rational* dimension and include the symbolic and spiritual experiences of ontological diversities [59]. Native peoples with Mesoamerican and *Abya Yala* roots have firmly adopted this methodology to build a dialogue among peers within the LVC, making visible the limits and disconnections of modern scientific knowledge's fragmentation and disciplinary specialization. In contrast, they emphasize the relevance of an experiential,

dynamic, holistic, processual, and contextualized understanding that embodies the diverse ways of life that integrate this international peasant organization [103].

On the other hand, inter-scientific dialogues have informed transdisciplinary processes of applied research on sustainable endogenous development and food sustainability [16]. These dialogues seek to influence the formulation, design, and implementation of public education policies, and agricultural and forestry development, promoting participatory research processes that revalue local knowledge systems and practices [104]. A distinction is made because the ecologies of knowledge allow dialogues between marginalized or subaltern epistemologies with an assumed decolonizing and transformative political component in defense of self-determination rights, and territorial autonomy, exploring alternative paths to development [105]. Therefore, it allows methodologies and artistic expressions, music, theater, painting, dance, or popular pedagogy [106].

3.2.3 Educational *milpas*

The Inductive Intercultural Method (IIM) emerged from the Union of Teachers of the New Education for Mexico and Independent Educators (UNEM/EI, for its acronym in Spanish) of Chiapas, which articulated with other activists and scholars to form the Network of Inductive Intercultural Education (REIN, for its acronym in Spanish). It is based on a situated, praxeological, and processual conception of emancipatory interlearning that echoes the positions and demands made by people of Mayan roots placed through the Zapatista movement [107]. The project 'Educational Milpas for Good Living' began in Chiapas, Oaxaca, Puebla, and Michoacán to create a methodology with cultural relevance for the formal and informal pedagogical processes of children from indigenous communities. Through this methodology the training processes start from the living classrooms and the pedagogy of work that is lived in daily practices, such as going to the forest or the milpa and participating in the assembly, festivities, rituals, or games. These daily activities strengthen the sense of community by reinforcing the orality, experientiality, and the dynamism characteristic of the native peoples. Some of the methods used are 1. Documentation of the agricultural, social, and climatic cycle that integrates the epistemic matrix of each community through socionatural calendars, 2. Living maps, a method of community cartography, often intergenerational, resulting from collaborative work on a specific theme to strengthen geographies and senses, as well as mutual trust among people in the community, 3. Photovoices, a technique that combines photography with narrative to record and reflect collectively on the transformations of the territory and inhabited times [108]. These methods are essential tools to know and connect with the social networks of each territory, because they start from analysis, reflection, and collective communication through intra and intergenerational learning by giving voice and creating from the actions, experiences, feelings, and knowledge of the community. In this way, the people who participate strengthen the processes of reappropriation of the community roots. Because the inhabited territory emerges as a living network that is represented and interpreted from within, by incorporating the networks of social, political, economic, productive, philosophical, axiological, and spiritual relations that shape its meanings, as well as identifying the conflicts, alliances, violence, problems, and threats that cross them [109].

3.2.4 PAR (participatory action research)

Orlando Fals Borda proposes an epistemic dialogue with phenomenological and poststructuralist currents and dialectical dialogue with Afro descendant and peasant communities of the Colombian Pacific. Starting from the critical analyses of historical materialism, he emphasizes that the production of knowledge is socially, politically, economically, historically, and culturally conditioned [110]. According to his vision, the foundations of modern epistemology are created by dichotomies of body/mind or culture/nature, which normalize the domain of nature and deepen structural inequality, overexploitation of natural resources and labor force. Modern epistemology underpins the hegemonic models of science and knowledge production [111]. By dominating truth and knowledge, reductionist science disqualifies, discards, or silences knowledge that emerges in other ways of life and worldviews, such as peasant knowledge, or relational ontologies that interweave relations of interdependence and reciprocity between humans and their natural environments [112].

Given the crisis of legitimacy of education and scientific knowledge, Fals-Borda recognized the importance of building localized and contextualized knowledge. For example, his context is the problem of land use and tenure and the need for agrarian reform in Colombia. He also emphasized the need to change the processes of subordination that mainstream of science operates against popular knowledge and ways of life [112]. For this reason, he listened to and echoed the peoples of the Americas, Africa, and Asia, emphasizing the importance and value of their knowledge and understanding its cognitive structure, language, and syntax [76].

PAR works based on a dialectical commitment to understand the problems and needs of local communities through collective practices that seek to transform the realities in which they participate as active subjects. In this way, the contexts are known through direct dialogue with the actors to learn the 'know-how' of experiential knowledge that has allowed them to survive, interpret, create, or work. The above requires a constant practice of humility as an attitude, attentive listening, and dialogue to build more horizontal relationships between local and academic communities. The research team assumes the co-responsibility of articulating knowledge that combines the analysis of specific situations with general dynamics: the connection of the community with the regional, national, or global situation, taking advantage of the constant connection or feedback between theory and practice. To this end, facts are analyzed, problems are conceptualized, and actions are planned and carried out to transform the social relations from which they originate. PAR creates an enriched return of scientific knowledge, which is why we speak of spiral knowledge. This return results from multiple feedback processes that are increasingly organized and systematized. Therefore, collective creativity helps to invent ways to give this information back to the communities in a simple and clear way.

One of the proposals that take up the principles and processes of PAR are the laboratories for life (Lab-Vida). This methodology is based on a constructivist approach focused on school gardens and experiential learning, which is the result of a training diploma among teachers from different Latin American countries who seek to strengthen networks and exchanges to spread the relevance of agroecology and food sovereignty through the revaluation of local agri-food systems [113, 114].

The PAR phases are: 1. Identifying a problem, question, or pain; 2. Planning actions to be taken; 3. Implementing the actions agreed upon to make an initial diagnosis; 4. Reflecting individually and collectively on the matter; and 5. Observing and recording the processes and effects generated by these collective *praxis* or reflections in relation to the collective action [115]. The network of teachers also seeks to activate the links between the schools and the different families, who are often also peasants, to improve nutrition and generate bottom-up initiatives in favor of fairer and healthier food systems [116]. They face important challenges to give continuity to the dialogues of the emerging learning communities. For this reason, they have been articulated through the Chiapas Network of Educational Gardens (RCHE) and the International Network of Educational Gardens (RIHE) to maintain and deepen exchanges with greater impact [117, 118].

4 Discussion

CSCM are identified as built from collective, recursive, and self-managed processes through experiential learning or synergies of active listening and mutual respect. The CSCM analyzed accounts for the political dimension that crosses the construction of sustainability of TAs in contexts of dispute and defense of territories. In this sense, we emphasized the political dimension that runs through the decisions on sociality built in each context, also permeates the interactions between academic and local communities. Therefore, CSCM are tools for TAs to reposition the centrality and importance of native peoples and local communities. In addition, the production of the common [119], care [40], and the multifunctionality of agriculture [120], can be repositioned at the center of collaborative networks. The notion of production of the common emphasizes the political relevance of multiple daily practices of production, sustenance, and regeneration of the community [121]. Care and multifunctionality are the links of the community's self-regulated interdependencies of the socio-ecological networks of each territory. These assemblages of life are built through repeated and continuously rooted activities that contribute to reproducing the material and symbolic bases of sustainability. Together, care, multifunctionality, and the production and reproduction of the common can strengthen social organization processes towards more just, sustainable, and diversified agroecological systems as forms of dignified life and rootedness in the territories [22].

As we have argued above, agroecological and transdisciplinary approaches and CSCM converge on the importance of building bonds of mutual trust, co-responsibility, and research protocols that establish the principles and values that underpin their collaborative processes.

Transdisciplinarity is an attitude and position of openness that starts from the construction of knowledge between and beyond different scientific disciplines [29, 122], it fosters dialogues between modern Western sciences and other knowledge systems such as local knowledge [123], the knowledge of peasant networks [60], or the traditional ecological knowledge of diverse native peoples [76]. Some transdisciplinary experiences seek to build inter-scientific communities [104]; to understand and influence societally relevant problems through mutual learning processes [124]; to promote intercultural knowledge dialogues in collaborative research [125, 126]; to co-produce knowledge in search of integration

[94, 127]; or to create new syntheses of each knowledge system through mutual appropriation that transform daily life [50].

Previous transdisciplinary processes and collaborative methodologies open gaps to challenge, decolonize, and transform conventional methods and methodologies, reductionist knowledge systems and hegemonic agri-food systems focused on capital accumulation [128–130]. They seek changes through *praxis* and dialogues grounded in transdisciplinarity [131], the epistemology of complexity [132], epistemic and methodological pluralism [133], feminist agroecologies [134, 135], and emancipatory agroecologies [136]. These approaches recognize the ethics of care [35] and the importance of spirituality [137]. In other words, there are multiple ways of knowing and doing [138]. They grasp the seriousness of understanding the relationships, times, meanings, and identities of each community and territory [139, 140]. They also emphasize the relevance of embodied and experiential knowledge of native people or local and peasant communities [25, 141], and the centrality of common sense and emotions in cognitive processes [142].

Our review found that transdisciplinarity integrates a diversity of methodologies and research paths based on recursive processes that enable critical, dialogic, and dialectical community interactions [see Fig. 1. The iterative PAR cycle, [139]. TAs start from the importance of ontological diversity, and epistemological and methodological pluralism based on mutual care, openness, and respect, which puts scientific knowledge and disciplines in dialogue with other knowledge systems and lived experiences [143]. They allow the construction of shared experiences in spaces of collaborative interculturality, not without tensions [82, 108, 139, 144, 145] due to hegemonic mechanisms that limit full political receptivity to organizational forms, values, principles, and social horizons of relational ontologies [56].

We propose the following epistemological stances and methodological considerations for the knowledge generation processes of TA. The categories of analysis from transdisciplinary research referred to in this study were: (1) contextual dependencies, (2) societal impacts, (3) innovative formats and methods, and (4) scientific impacts [146]. We also consider the seven ways in which the *Agroecology Now*⁴ group sees its contributions to transformative processes in collaboration with various networks: (1) co-designing research and learning processes, (2) engaging with social movements as critical friends, (3) working with and directly supporting practice and social movements, (4) organizing and systematizing evidence, (5) amplifying grassroots voices, (6) helping to shape discourses and narratives and (7) participating in and informing policy processes [131]. Epistemological stances and methodological considerations of TA emphasize the importance of:

1. **Contextualization.** In the Mesoamerican region and the American Territory that the *Cuna* people call *Abya Yala*, part of the recognition of the political-epistemic violence and structural injustices that native peoples and local communities have historically inhabited [111], especially from the intersectionality embodied by different women in different geographies [71]. This violence and injustice began with the colonial matrix of being, power, and knowledge that imposed the invasion processes on the Americas and continued with colonization, articulating various forms of internal colonialism in today's nation-states [147, 148]. It also implies constructing knowledge that is useful for each context and community's needs, starting from its own forms of organization, values, pedagogies, and social horizons.
2. **Cognitive openness in interaction with diverse native peoples' ways of being, knowing, and doing.** For ancestral epistemologies, emotions, practices, feelings, and the processes of becoming a person in a community are central. Likewise, for relational ontologies, reason, sensations, emotions, and intuitions that connect people to the sacred and shared. For this reason, they are inhabited by the concept of *senti-pensar* [149], and *corazonar* [150], as different ways of knowing that emphasize the importance of common sense, intuition, feelings, senses, corporeality, and interdependence in relation to the cycles or processes of Mother Earth and the entrenched networks of life that integrate her. Quoting Sartorello and Bertely, on the ways of living and knowing of the *Tzotzil* people:

“The milperas and the milperos *tzotziles*, point to the following dimensions that compose us as integrated beings: the heart, the head, the way of thinking, the interconnection with the environment, with spirituality and the extremities. They add that to value the learning that is generated in an activity for the good life. “What really matters is the change of the person, what he does with his heart so that he lives like his ancestors. They explain that this change is reflected in work, guides the limbs and acts that allow us to do things, and reflects this whole process” [108:44]

⁴ Agroecology Now is an academic group linked to diverse local communities that has deepened reflections and agroecological domains of transformation through transdisciplinary stances and processes.

The ontological diversities and cultures of the Americas embody wisdoms that are connected through the spirituality that inhabits the living cultures native people. We understand spirituality as defined in the 'First Summit of Indigenous Women of Americas, as related to the cosmic vision of life, in which beings are interrelated and complementary in their existence, as well as related to the sense of community in search of balance and harmony with ourselves and the others. The practices of ancestral spirituality are now being recovered from processes of decolonization that situate the struggles of native rural women for social justice. These struggles recall the principle of cosmic complementary and reciprocal duality that the spiritualities of native peoples inhabited between the feminine and the masculine, both fundamental to the creation of the cosmos, its regeneration, and its sustenance [151]. On the other hand, ontological diversity links people to the non-reductionist dwelling that peasant networks and native peoples maintain through rituals and festivities with which they reestablish their social and ecological connections with the sacred and the immaterial mediated through values such as stewardship, respect, or care [152–156].

- 3. Understand the simultaneous and cyclical temporalities that emerge from ontological diversities.** Native peoples' times of are articulated with the agricultural cycles, festive, spiritual and ritual practices. They design and manage diverse agroecosystems through interconnected scales and seasons. The daily practices of regeneration required by the social and ecological networks of life in the territories are pillars of continuity and care necessary to work on paths of dignified living in the long term [81]. These are small activities and meanings in the daily life of inhabited spaces such as the *milpa* and the mountains, or the celebrations that summon and organize collective meanings to renew current community commitments that link them with future generations and the territories of life they care [157].
- 4. Community organizational logics and processes, as well as their values from the diversity of dignified life built in local communities and native peoples.** The different established values of use have made possible their resistance to the capitalist *ethos* that continues to haunt their territories, cultures, languages, identities, and social senses to this day [49, 158]. For example, the *Zapotec* and the *Mixtec* or *Ñuu savi* communality based on the principles of work, respect, and reciprocity [159]; the *Kaqchikel Mayan* practice called *kuchubal* to form a mutual aid group [14]; or the *jaroperakua* or mutual aid of the *P'urhépecha* communities a form of collective work mediated through community service that involves each person, family, neighborhood, and community [54].

4.1 TA challenges in creating intercultural learning spaces

CSCM are important working tools for TA to continue to emphasize the importance of corporeality and to nurture the awareness and sensitization of being present, listening, learning, and sharing with diverse biocultural practices and knowledge.

CSCM and TA emphasize the importance of embodied, experiential knowledge, passions, pains, desires, and hopes that are excluded from conventional epistemological positions and methodologies. Therefore, CSCM help to transform epistemological positions, as well as conventional research principles and processes, by starting from a broad valuation of native peoples, peasant networks and local communities' knowledge and *praxis*, by promoting shared relationships and practices, and the ideas, projects and emotions they mobilize, the bonds of trust required to work with communities, to learn and create shared meanings, to nurture relational values that take into account the interdependencies between humans and non-humans, and to promote self-regulated socio-ecological processes that are re-centered, for example, in the care, the production of the commons and the multifunctionality of agriculture.

They do so by situating the politics and relevance for sustainability of each of these spaces and daily interactions for the care of life, and to underline the relevance of local forms of organization from based on their own principles, values and pedagogies, such as communality or mutual aid, towards their own social horizons focused on collective well living that has a variety of concrete expressions [2] such as *sesi irekani* from *P'urhépecha* communities [54], *lekil kuxlejal* from *tsejal* communities [95]; *sumak kawsay* for *Kichwa* peoples, or *suma qamaña* for the *Aymara* communities in the Andean region [78]. CSCM towards TA aims to bring all this invisible knowledge into dialogue through contextualized intercultural interactions and processes, starting from the importance of supporting local organizational processes and their own social horizons that emerge from the singularity of each way of dignified collective life.

Transdisciplinarity and the critical political-epistemic standpoints from which it emerges are key to challenging hegemonic discourses and practices not only in corporate and institutional contexts, but also in scientific practices. TA are complexes of relational and applied knowledge between people and life diversity. TA are necessarily situated and committed because they assume and dimension that the construction of sustainability is an inherently political activity that

is carried out in asymmetrical contexts of dispute. For this reason, it seeks to stop the reproduction of these inequalities, mechanisms of power and subordination that continue to operate in the construction of knowledge and in research processes aimed at transforming them, by constructing attitudes and interactions that strengthen openness and respect, promoting the proliferation of intercultural learning processes.

TA using CSCM contribute to understanding the relationships, times, meanings and identities of each community and the heterogeneity of each context. This is relevant because, the verticality and decontextualization of conventional methodologies and forms of knowledge production reproduce inequalities. In this sense, both CSCM and TA are important tools for making visible the roots of the current interconnected crises, and the limits of the solutions and hegemonic paths they propose. On the other hand, they situate the importance of the knowledge, experiences, values, ways of life, of knowing and being of local communities and native peoples who daily uphold the principles of long-term reproductive care, of permanence, regeneration and mutual support necessary for the sustainability of territories of life.

The use of CSCM from TA stances and processes is critical to challenge conventional practices, methodologies, and narratives that legitimize existing power imbalances and undermine transformative local actions and meanings in search of long-term solutions. For example, regenerative agriculture and nature-based solutions are frameworks and discourses that deliberately omit the political dimension and power asymmetries in the governance processes of the global agri-food system, in contrast to the disputes and struggles from below articulated by social movements and processes in defense of livelihoods, use values and territories [160, 161]. Native peoples and peasant networks help regulate local water cycles, increase resilience to extreme hydrometeorological events, improve the microclimate of neighboring fields, provide habitat for beneficial fauna (pollination, biological control), improve the capture and storage of nutrients, and cultivate agro-landscapes that sequester carbon. Moving away the link between sustainable territories and collective-communitarian practices and forms of organization, it is important to reappropriate this coopted term, and at the same time situate the central role of native peoples and peasant networks in these daily reproductive activities and forms of care to defend the webs of life in each territory.

To build conditions for the future and seek long-term solutions peasant networks, biocultural diversity, and agroecology are key operational networks and pathways for various grassroots social movements, international organizations, and panels of experts [162, 163] such as: International Peasant Organization (LVC), ANAP, MST, International Panel of Experts on Sustainable Food Systems (IPES-Food), Intergovernmental Science-Policy-Platform on Biodiversity and Ecosystem Services (IPBES), High Level Panel of Experts, (HLPE) and the Civil Society and Indigenous Peoples' Mechanism (CSIPM) of the UN Committee on World Food Security (CFS). In science-policy interfaces, areas of decision-making, funding, public policy formulation, and research and development agendas, Western science and information in English language continue to be privileged, overlooking a wide diversity of experiences, knowledge, values, principles, organizational forms, or social horizons that are not considered or heard [60]. These prevailing imbalances of knowledge power make visible the need for situated communication for TAs, which can create different and more accessible ways of socializing knowledge without domination and through the non-hierarchical differences between communities. From these collaborative networks, we can continue to make visible how situated agroecological processes can contribute to breaking cycles of on agro-industrial inputs, reducing production costs and farmers' debt, strengthening local and regional autonomy, shortening marketing, and exchange cycles, and strengthening control over the means of production and relational networks that sustain territories of life.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Competing interests The authors declare no competing interests.

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References

1. Rist S, et al. Variety is the source of life: agrobiodiversity benefits, challenges, and needs. Swiss Academy of Sciences. 2020. <https://doi.org/10.5281/zenodo.3568133>.
2. Boege E. Acerca del concepto de diversidad y patrimonio biocultural de los pueblos originarios y comunidad equiparable. Construyendo territorios de vida con autonomía y libre determinación. 1st ed. México D. F.: Eckart Boege-BUAP-INAH. 2021.
3. Shiva V, et al. Two paths to the future. Fake knowledge, fake food, fake economies vs real knowledge, real food, real economies. Which future of food and farming will you sow? In: Shiva V, et al., editors. The future of food. Farming with nature, cultivating the future. Roma: Navdanya International; 2020. p. 1–30.
4. Dale V, Kline K, López-Ridaura S, et al. Towards more sustainable agricultural landscapes: lessons from Northwestern Mexico and the Western Highlands of Guatemala. *Futures*. 2020. <https://doi.org/10.1016/j.futures.2020.102647>.
5. Van der Ploeg JD. El campesinado y el arte de la agricultura. Un manifiesto chayanoviano. 1st ed. Zacatecas: Universidad Autónoma de Zacatecas. Red Internacional de Migración y Desarrollo; Mexico City: Miguel Ángel Porrúa; 2015.
6. Rosset P, Altieri M. Agroecología. Ciencia y política. 1st ed. Barcelona: Icaria; 2018.
7. FAO. The White/Whipala paper on Indigenous Peoples' food systems. Roma: FAO; 2021. <https://doi.org/10.4060/cb4932en>.
8. FAO, Alliance of Biodiversity International and CIAT. Indigenous Peoples' food systems: insights on sustainability and resilience in the front line of climate change. Roma: FAO; 2021. <https://doi.org/10.4060/cb5131en>.
9. Scoones I. Sustainable rural livelihoods: a framework for analysis. 1998. <https://tinyurl.com/2p8ymk8k>. Accessed 17 Feb 2021.
10. Perfecto I, Vandermeer J, Wright A. Nature's matrix. Linking agriculture, conservation, and food sovereignty. 1st ed. London: Earthscan AS-PTA; 2009.
11. Harlan J. Our vanishing genetic resources. *AAAS*. 1985. <https://www.jstor.org/stable/1740174>.
12. Fakhri M. Critical perspective on food systems, food crises and the future to the right to food. A/HRC/43/44. 2020. <https://digitallibrary.un.org/record/3864100?ln=es&v=pdf>. Accessed 18 Mar 2021.
13. Borras S, Seufert P, Backes S, et al. Land grabbing and human rights: the involvement of European corporate and financial entities in land grabbing outside the European Union. Belgium: European Parliament; 2016.
14. Holt-Giménez Eric. Campesino a campesino: Voces de Latinoamérica Movimiento Campesino para la Agricultura Sustentable. 1st ed. Managua: SIMAS; 2008.
15. Steffen W, Richardson K, Rockström J, et al. Planetary boundaries: guiding human development on a changing planet. *Science*. 2015. <https://doi.org/10.1126/science.1259855>.
16. Jacobi J, Mukhovi S, Llanque A, et al. A new understanding and evaluation of food sustainability in six different food systems in Kenya and Bolivia. *Nature*. 2020. <https://doi.org/10.1038/s41598-020-76284-y>.
17. Meyfroidt P, et al. Middle-range theories of land system change. *Glob Environ Change*. 2018. <https://doi.org/10.1016/j.gloenvcha.2018.08.006>.
18. Bezner R, Nyantakyi-Frimpong H, et al. Knowledge politics in participatory climate change adaptation research on agroecology in Malawi. *Renew Agric Food Syst*. 2018. <https://doi.org/10.1017/S1742170518000017>.
19. Mies M, Bennholdt-Thomsen V. The subsistence perspective: beyond the globalized economy. 1st ed. New York: Zed books; 1999.
20. McMichael P. Regímenes alimentarios y cuestiones agrarias. 1st ed. Zac.: UAZ-Red Internacional de Migración y Desarrollo; México D. F.: Miguel Ángel Porrúa; 2015.
21. Ye J, Van Der Ploeg JD, Schneider S, Shanin T. The incursions of extractivism: moving from dispersed places to global capitalism. *J Peasant Stud*. 2019. <https://doi.org/10.1080/03066150.2018.1559834>.
22. IPES-Food. From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems. In: International Panel of Experts on Sustainable Food systems. 2016. <https://tinyurl.com/2addw5wb>. Accessed 27 Apr 2020.
23. Herren H, Haerlin B. IAASTD+10. Transformation of our food systems. The making of a paradigm shift. 1st ed. Berlin: Foundation on Future Farming- Biovision; 2021.
24. HLPE. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. HLPE Report 14. 2019.
25. Berkes Fikret. Sacred ecology. 2nd ed. NY: Routledge; 2008.
26. Blancas J, Casas A, Rangel-Landa S, Moreno-Calles Al, et al. Plant management in the Tehuacán-Cuicatlán Valley, Mexico. *Eco Bot*. 2010. <https://doi.org/10.1007/s12231-010-9133-0>.

27. Bocco G, Winklerprins A. General principles behind traditional environmental knowledge: the local dimension in land management. *Geogr J*. 2015. <https://doi.org/10.1111/geoj.12147>.
28. Norgaard R, Sikor T, et al. The methodology and practice of agroecology. In: Altieri M, et al., editors. *Agroecology. The science of sustainable agriculture*. Boca Ratón: CRC Press Taylor & Francis Group; 2018. p. 21–39.
29. Nicolescu B. Methodology of transdisciplinarity levels of reality, logic of the third included and complexity. *Transdiscipl J Eng Sci*. 2010. <https://doi.org/10.22545/2010/0009>.
30. Lönnqvist L, Mier y Terán M, Tzec N, Bravo Y. coords. *Morral de experiencias para la seguridad y soberanía alimentarias*. 1st ed. Mexico: Ecosur CAN; 2018.
31. Harcourt W, et al editors. *Feminist methodologies. Experiments, collaborations, and reflections*. Cham: Palgrave MacMillan; 2022.
32. Sellberg M, Cockburn J, Holden P, Lam D. Towards a caring transdisciplinary research practice: navigating science, society, and self. *Ecosyst People*. 2021. <https://doi.org/10.1080/26395916.2021.1931452>.
33. Harding S. ¿Existe un método feminista?. 1987. <http://tinyurl.com/2j5vk4pn>. Accessed 23 Oct 2022.
34. Tsing A. *La seta del fin del mundo. Sobre la posibilidad de vida en las ruinas capitalistas*. 1st ed. Madrid: Capitán Swing Libros S.L.; 2021.
35. Cadaval M, et al. Methodologies for collaborative, respectful and caring research: conversations with professional indigenous women from Mexico. In: Harcourt W, et al., editors. *Feminist methodologies. Experiments, collaborations, and reflections*. Cham: Palgrave MacMillan; 2022. p. 139–61.
36. EMAS. Género, desarrollo y ecofeminismo. In: *Semillas feministas*. 2020. <https://www.flipsnack.com/BCFEFBA7C6F/emas-6to-n-mero.html>. Accessed. 14 Nov 2021.
37. Pérez M, Argueta A. *Etnociencias, interculturalidad y diálogo de saberes. Investigación colaborativa y descolonización del pensamiento*. 1st ed. Mexico: Juan Pablos Editor; 2019.
38. Leyva X, Speed S. Hacia la investigación descolonizada: nuestra experiencia de co-labor. In: Leyva, Xochitl et al. *Prácticas otras de conocimiento (s): entre crisis, entre guerras, T. I., Bs. As.: CLACSO; Chis.: Coop Ed Retos; Lima: PDTG; Copenhagen: IWGIA; La Habana: Talleres Paradigmas Emancipatorios-Galfisa; Coimbra: Proyecto ALICE, Gdl.: Taller Ed La Casa del Mago*. 2018; 451–480.
39. Paño P, Rébola R, Suárez M. *Procesos y Metodologías Participativas. Reflexiones y experiencias para la transformación social*, 1 edn. Uruguay: CLACSO-UDELAR; 2019.
40. Pérez A. *Subversión feminista de la economía. Sobre el conflicto capital-vida*. 4th ed. Madrid: Traficantes de sueños; 2019.
41. Tyrntania L. *La sustentabilidad es de quien la trabaja. Cultura y representaciones sociales*. 2016. <https://tinyurl.com/2p8v2hfy>. Accessed 16 Mar 2021.
42. Cumes A. *Esencialismo estratégicos' y discursos de descolonización*. In: Millán M, editor. coord. *Más allá del feminismo: caminos para andar*. Mexico: Red de Feminismos descoloniales; 2014. p. 61–86.
43. Montecinos C. *Semillas y soberanía: un camino imprescindible de la mano de los pueblos*. In: Lizárraga P, Vicente C, editors. coords. *La revolución de una semilla. Buenos Aires: El colectivo y Fundación Rosa Luxemburgo Cono Sur*; 2021. p. 51–8.
44. Lemke S, Claeys P. Absent voices: women and youth in communal land governance. *Reflections on methods and process from exploratory research in West and East Africa. Land*. 2020. <https://doi.org/10.3390/land9080266>.
45. Clark W, Harley A. Sustainability science: toward a synthesis. *Ann Rev Environ Resour*. 2020. <https://doi.org/10.1146/annurev-envir-on-012420-043621>.
46. Martínez M. *Ciencia y arte en la metodología cualitativa*. 1st ed. Mexico: Trillas; 2004.
47. ATLAS. *Ti Scientific Software Development GmbH. ATLAS. Ti Windows V. 23.2.1*.
48. Krippendorff KH. *Content analysis: an introduction to its methodology*. 2nd ed. Pennsylvania: Sage Publications; 2004.
49. Swain JA. Hybrid approach to thematic analysis in qualitative research using a practical example. *A hybrid approach to thematic analysis in qualitative research using a practical example*. New York: SAGE Pub Ltd.; 2018. <https://doi.org/10.4135/9781526435477>.
50. De la Fuente-Garnica P, Gutiérrez-Navarro A. *Diálogo de saberes: de la agrobiodiversidad útil hacia la construcción de conocimiento medicinal. Agrociencia Uruguay*. 2022. <https://doi.org/10.31285/agro.26.966>.
51. Francis C, et al. Learning agroecology through involvement and reflection. In: Méndez E, et al., editors. *Agroecology. A transdisciplinary, participatory, and action-oriented approach*. Boca Ratón: CRC Press Taylor & Francis Group; 2016. p. 73–98.
52. Horner C, Morse C, Carpenter N, Nordstrom K, et al. Cultivating pedagogy for transformative learning: a decade of undergraduate agroecology education. *Front Sust Food Syst*. 2021. <https://doi.org/10.3389/fsufs.2021.751115>.
53. Illescas G, Olguín A, González V. *Tiempos, crónica y memoria de vida colectiva entre cafetales*. 1st ed. Mexico: Editorial Lagares; 2022.
54. Leco C, Lemus A, Keyser U. *Juchari eratsikua: retrospectiva histórica, territorio e identidad étnica*. 1st ed. México: Concejo Mayor de Gobierno Comunal de Cherán. Editorial Morevalladolid; 2018.
55. Cortés J. coord. *Marhuatspani. El servir a lo sagrado entre los P'urhépecha*. Zamora: IIH-UMSNH, Colmich; 2019.
56. Global Alliance for the Future of Food. *The politics of knowledge: understanding the Evidence for Agroecology, Regenerative Approaches and Indigenous Foodways*. 2021. <https://futureoffood.org/insights/the-politics-of-knowledge-compendium/>. Accessed 25 Mar 2022.
57. Tzul G. *Sistemas de gobierno comunal indígena: la organización de la reproducción de la vida. Producir lo común. Entramados comunitarios y luchas por la vida*. Madrid: Traficantes de sueños; 2019. p. 171–82.
58. Clarke W. Chapter XII, the structure of permanence: the relevance of self-subsistence communities for world ecosystem management. In: Bayliss-Smith TP, Feachem RG, editors. *Subsistence and survival. Rural ecology in the pacific*. London: Academic Press Inc; 1977. p. 363–84.
59. Wilson S. *Research is ceremony. Indigenous research methods*. 1st ed. Winnipeg: Fernwood Publishing; 2008.
60. Hernández-Xolocotzi E. *La investigación de huache*. *Revista geografía agrícola*. 2007;39:113–6.
61. Hernández-Xolocotzi E. *Exploración etnobotánica y su metodología. Programa nacional de etnobotánica, Universidad Autónoma Chapingo*; 2001.
62. Gómez-Pompa Arturo. *Las raíces de la etnobotánica mexicana*. *Acta Biológica Panamensis*. 1993;1:87–100.
63. Hernández-Xolocotzi E, editor. *Agroecosistemas de México: contribución a la enseñanza, la investigación y la divulgación agrícola*. 1st ed. México: Talleres Colpos-Chapingo; 1977.
64. Toledo V, Barrera-Bassols N. *La memoria biocultural*. 1st ed. Barcelona: Icaria; 2008.

65. Moreno-Calles AI, Toledo V, Casas A. Los sistemas agroforestales tradicionales de México: una aproximación biocultural. *Botan Sci.* 2013;91(4):375–98.
66. Moreno-Calles AI, et al. Etnoagroforestería: el estudio de los sistemas agroforestales tradicionales de México. *Etnobiología.* 2014;12(3):1–16.
67. Moreno-Calle AI, Casas A, Rivero-Romero A, et al. Ethnoagroforestry: integration of biocultural diversity for food sovereignty in México. *J Ethnobiol Ethnomed.* 2016. <https://doi.org/10.1186/s13002-016-0127-6>.
68. Moreno-Calles AI, Rojas A, Romero Y, et al. Agrosilviculturas en territorios semiáridos de Puebla, México. *Revista Etnobiol.* 2021;19(3):1–13.
69. Steward J. *Theory of culture change. The methodology of multilineal evolution.* 1st ed. Champaign: University of Illinois Press; 1972.
70. Dietz G. Hacia una etnografía doblemente reflexiva: una propuesta desde la antropología de la interculturalidad. *AIBR Revista de Antropología Iberoamericana.* 2011;6(1):3–26.
71. Velázquez V. *Territorios encarnados: extractivismo, comunalismos y género en la meseta P'urhépecha.* 1st ed. Jalisco: Cátedra Interinstitucional Universidad de Guadalajara, CIESAS-Jorge Alonso; 2019.
72. Aragón-Andrade O. *El derecho en insurrección. Hacia una antropología jurídica militante desde la experiencia de Cherán, México.* 1st ed. Morelia: ENES-UNAM; 2019.
73. Pérez M, Argueta A. Saberes indígenas y diálogo intercultural. *Cultura y Representaciones Sociales, IIS UNAM.* 2011;5(10):31–56.
74. McAlvay A, et al. Ethnobiology phase VI: decolonizing institutions, projects, and scholarship. *J Ethnobiol.* 2021. <https://doi.org/10.2993/0278-0771-41.2.170>.
75. Freire P. *Extensión o comunicación La concientización en el medio rural.* 13th ed. Mexico: Siglo XXI editores; 1984.
76. Fals-Borda O. *Ciencia propia y colonialismo intelectual.* 3rd ed. Bogotá: Carlos Valencia; 1987.
77. Haverkort B, Delgado F, Shankar D, Millar D. *Hacia el diálogo Intercientífico. Construyendo desde la pluralidad de visiones del mundo, valores y métodos en diferentes comunidades de conocimiento.* 1st ed. La Paz: AGRUCO/Plural editores; 2013.
78. PRATEC. *Criar y dejarse criar.* In: PRATEC. 2022. <https://pratec.org/wpress/>. Accessed 28 Apr 2022.
79. Beaucage P. *Cuerpo, cosmos y medio ambiente entre los nahuas de la Sierra Norte de Puebla. Una aventura en antropología.* 1st ed. Madrid: Plaza y Valdés Editores; 2012.
80. Ramos F. *Grupo Vicente Guerrero de Españaíta, Tlaxcala. Dos décadas de promoción de Campesino a Campesino.* 1st ed. Mexico: REGN-Fundación Rockefeller; 1998.
81. Cobo R, Paz L, Bartra A. *Somos tosepan 40 años hacienda camino.* 1st ed. Mexico: Rosa Luxemburg Stiftung; 2018.
82. Ibarra L, Escobedo E. *Fogata Kejtisani. What's yours is mine, and what's mine is mine? Re-thinking intellectual property and research ethics from the experience of the P'urhépecha community of Cherán.* Oñati Socio-legal Series. 2019. <https://tinyurl.com/36xccn94>. Accessed 13 Nov 2021.
83. Harding S. From Feminist empiricism to feminist standpoint epistemologies. In: Harding S, editor. *The science question in feminism.* Ithaca: Cornell University Press; 1986. p. 136–62.
84. Smith D. El punto de vista (standpoint) de las mujeres: conocimiento encarnado versus relaciones de dominación. *Revista Temas de mujeres-CEHIM.* 2012;8(8):5–27.
85. Nazarea VD. A view from a point. *Ethnoecology as situated knowledge.* In: Nazarea VD, editor. *Ethnoecology: situated knowledge/located lives.* Tucson: The University of Arizona Press; 1999. p. 41–7.
86. Nygren A. Located knowledge in the environment-development discourse. *Critique Anthropol.* 1999;19(3):267–88.
87. Haraway D. Situated knowledges: the science question in feminism and the privilege of partial perspective. *Fem Stud.* 1988;14(3):575–99.
88. Federici S. *Reencantar el Mundo. El feminismo y la política de los comunes.* 1st ed. Madrid: Editorial Traficantes de sueños; 2020.
89. Mies M, Shiva V. *La praxis del ecofeminismo. Biotecnología, consumo y reproducción.* 1st ed. Barcelona: Icaria Editorial; 1998.
90. Caswell M, Maden R, McCune N et al. *Amplifying Agroecology in Vermont: Principles and Processes to Foster Food Systems Sustainability.* 2021. <https://scholarworks.uvm.edu/arsfoodsystems/4/>. Accessed 17 Jan 2022.
91. Giraldo O, Rosset P. Principios sociales de las agroecologías emancipadoras. *Desarrollo y medio ambiente.* 2021. <https://doi.org/10.5380/dma.v58i0>.
92. CSJCA. *Community-based participatory research. A guide to ethical principles and practice.* 2012. <http://tinyurl.com/47f4t8dp>. Accessed 22 Oct 2020.
93. Pohl C, Hirsch G. *Principles for designing transdisciplinary research.* Munich: Oekom Verlag; 2007.
94. Norström A, et al. Principles for knowledge co-production in sustainability research. *Nat Sustain.* 2020. <https://doi.org/10.1038/s41893-019-0448-2>.
95. Miranda M. *De Tsel'tal a Tsel'tal: Una experiencia de aprendizaje agroecológico en Las Cañadas de Ocosingo.* 2019. Tesis de maestría en Ciencias en Recursos Naturales y Desarrollo Rural, ECOSUR, El Colegio de la frontera Sur.
96. PIDAASSA. *Marco conceptual, principios, actores y actrices en la metodología de Campesino a Campesino.* 1st ed. Bolivia: PIDAASSA- Brot für die Welt; 2008.
97. Abreu P, Aguilar H. Salutogênese-Camponês a Camponês: uma metodologia para promoção da saúde de populações expostas a agrotóxicos. *Saúde em Debate.* 2018;42(4):261–74.
98. Medeiros L, Alvarenga C, Cardoso E, et al. *Caderneta agroecológica e os quintais: sistematização da produção das mulheres rurais no Brasil.* 1st ed. Minas Gerais: Centro de Tecnologias Alternativas da Zona da Mata; 2018.
99. MST-CE. *Construindo a agroecologia no semiárido Manual da metodologia camponês a camponês.* 1st ed. Ceará: Movimento dos Trabalhadores Rurais Sem Terra- Cooperativa Central das Áreas de Reforma Agraria do Ceará; 2019.
100. Machín B, Roque A, Ávila D, Rosset P. *Revolución agroecológica: el movimiento de Campesino a Campesino de la ANAP en Cuba.* 1st ed. La Habana: ANAP-LVC; 2010.
101. Machín B. *El Movimiento Agroecológico De Campesino a Campesino en sus 20 años de implementación en Cuba. Realidades, Realizaciones y Retos. Agroecología.* 2017. <https://revistas.um.es/agroecologia/article/view/330411>. Accessed 29 Sept 2020.
102. Val V, et al. *Agroecology and La Via Campesina I. The symbolic and material construction of agroecology through the dispositive of "peasant to peasant" processes.* *Agroecol Sustain Food Syst.* 2019. <https://doi.org/10.1080/21683565.2019.1600099>.
103. LVC. 2013. *De Maputo a Yakarta. 5 años de agroecología en LVC.* <http://tinyurl.com/4axskz3m>. Accessed 12 Oct 2020.

104. Delgado F, Silvestre C. Avances teórico-metodológicos y experiencias de diálogo intercientífico en países andino-amazónicos. 1st ed. La Paz: Ministerio de Educación; 2021.
105. CEMDA. Otro México es posible. Diálogos para la construcción del Estado pluricultural. 1st ed. México: CEMDA A.C; 2020.
106. Zurba M, Berkes F. Caring for country through participatory art: creating a boundary object for communicating Indigenous knowledge and values. *Local Environ*. 2014. <https://doi.org/10.1080/13549839.2013.792051>.
107. Gasché J, Vela N. Sociedad bosquesina. Ensayo de una antropología rural amazónica, acompañado de una crítica y propuesta alternativa de proyectos de desarrollo. 1st ed. Tomo I. Iquitos: IAP; 2011.
108. Sartorello S, Bertely M. Milpas educativas para el buen vivir: nuestra cosecha. 1st ed. Mexico City: Ultradigital Press; 2020.
109. Silva E, Keyser U. La Milpa educativa espacio cotidiano de articulación entre la comunidad y la escuela, en la comunidad p'urhépecha de Cherán, Michoacán, México. *Articulando e Construyendo Saberes*. 2019. <https://doi.org/10.5216/racs.v4i0.59218>.
110. Fals BO. Una sociología sentipensante para América Latina. 1st ed. Mexico: Siglo XXI editores; 2015.
111. Fals Borda O, Mora-Osejo L. Context and diffusion of knowledge, a critique of eurocentrism. *Act Res*. 2003;1(1):29–37.
112. Fals-Borda O. Historia doble de la Costa 4. Retorno a la tierra. 1st ed. Bogotá: ElÁncora Eds; 1986.
113. Morales H, Hernández C, Mendieta M, Ferguson B. Sembremos ciencia y conciencia; manual de huertos escolares para docentes. San Cristóbal de las Casas: El Colegio de la Frontera; 2017.
114. Meek D, Bradley K, Ferguson B, et al. Food sovereignty across the Americas: multiple origins converging movements. *Agric Hum Values*. 2017. <https://doi.org/10.1007/s10460-017-9780-1>.
115. Ferguson B, Morales H, Hernández C, López L, coords. Alimentación, comunidad y aprendizaje: recursos para docentes. 1st ed. Chis: Ecosur; 2019.
116. Morales H, García M, Bermúdez G. coords Huertos educativos Relatos desde el movimiento latinoamericano. 1st ed. Chis: Ecosur; 2019.
117. RIHE. Red Internacional de Huertos Escolares. 2022. <https://www.redhuertos.org/>. Accessed 28 Apr 2022.
118. Morales H, Ferguson B, Chung K, Nigh R. Escalamiento de la agroecología desde el huerto escolar y la importancia de reconocer la cultura, los alimentos y lugar. *Desenvolvimento e Meio Ambiente*. 2022. <https://doi.org/10.5380/dma.v58i0.81460>.
119. Gutiérrez R, Salazar H. Reproducción comunitaria de la vida. Pensando la transformación social en el presente. *Producir lo común. Entramados comunitarios y luchas por la vida*. Madrid: Traficantes de sueños; 2019. p. 21–44.
120. IAASTD. Agriculture at the crossroads. 1st ed. Washington DC: Island Press; 2009.
121. Gutiérrez R, Linsalata L, Navarro M. Chapter 6. Producing the common and reproducing life: keys towards rethinking the political. In: Dinerstein A, editor. *Social sciences for an other politics*. Cham: Palgrave Macmillan; 2016. p. 79–91.
122. Piaget J. Clasificación de las ciencias y principales corrientes de la epistemología contemporánea. 1st ed. Buenos Aires: Editorial Paidós; 1979.
123. Lam D, Hinz E, Lang D, et al. Indigenous and local knowledge in sustainability transformations research: a literature review. *Ecol Soc*. 2020. <https://doi.org/10.5751/ES-11305-250103>.
124. Scholz R. Mutual learning as a basic principle of Transdisciplinarity. In: ResearchGate. 2000. <https://tinyurl.com/4uta3est>. Accessed 20 Sept 2020.
125. Bueno I, Moreno-Calles AI, Merçon J. *Yeknemelis*: social learning and intercultural transdisciplinary collaboration for sustainable life. *Sustainability*. 2023. <https://doi.org/10.3390/su15129626>.
126. Merçon J. Introducción. Investigación transdisciplinaria e investigación-acción participativa. *Convergencias, diferencias y nuevas perspectivas*. In: Merçon J, editor. coord. Investigación transdisciplinaria e investigación-acción participativa. Mexico: CopltarXivesRed de Socioeco y Sust, Conacyt; 2021. p. 29–60.
127. Peukert D, Vilmaier U. Collaborative design prototyping in transdisciplinary research: an approach to heterogeneity and unknowns. *Futures*. 2021. <https://doi.org/10.1016/j.futures.2021.102808>.
128. Einbinder N, Morales H, Mier y Terán M, et al. Agroecology from the ground up: critical analysis of sustainable soil management in the highlands of Guatemala. *Agric Human Values*. 2022. <https://doi.org/10.1007/s10460-022-10299-1>.
129. Anderson C, Maughan C, Pimbert M. Transformative agroecology learning in Europe: building consciousness, skills, and collective capacity for food sovereignty. *Agric Hum Val*. 2019. <https://doi.org/10.1007/s10460-018-9894-0>.
130. Grey S, Patel R. Food sovereignty as decolonization: some contributions from Indigenous movements to food system and development politics. *Agric Hum Val*. 2015. <https://doi.org/10.1007/s10460-014-9548-9>.
131. Anderson C, Pimbert Michel, Chappell M. Jahi, et al. Agroecology now-connecting the dots to enable agroecology transformations. *Agroecol Sustain Food Syst*. 2020. <https://doi.org/10.1080/21683565.2019.1709320>.
132. Morin E. Epistemología de la complejidad. *Gazeta de Antropología*. 2004;20(2):1–14.
133. Olivé L. Hacia un modelo de sociedades plurales de conocimientos y el pluralismo epistemológico. In: Hernández S, editor. coord. Educación intercultural a nivel superior: reflexiones desde diversas realidades latinoamericanas. Mexico: UIEP/UCIRED/UPEL; 2013. p. 35–50.
134. Bezner R, Hickey C, Lupafya E, Dakishoni L. Repairing rifts or reproducing inequalities? Agroecology, food sovereignty, and gender justice in Malawi. *J Peasant Stud*. 2019. <https://doi.org/10.1080/03066150.2018.1547897>.
135. Pontes T. et al. La vida al centro. Soberanía alimentaria desde la experiencia feminista campesina de VIDA AC, México. In ABA. *GT mulheres da ABA*. 2021 <https://tinyurl.com/33tmwmdj>. Accessed 18 Aug 2022.
136. Val V, Rosset P. Agroecología(s) emancipatoria(s) para un mundo donde florezcan muchas autonomías. Buenos Aires: CLACSO; 2022.
137. Kealiikanakaoleohaililani K, Giardina C. Embracing the sacred: an indigenous framework for tomorrow sustainability science. *Sustain Sci*. 2015. <https://doi.org/10.1007/s11625-015-0343-3>.
138. Nicolescu B. La transdisciplinarietà. Manifiesto. In: *Multiversidad Mundo Real* Edgar Morin, A. C. 1996. <https://tinyurl.com/37spdwr>. Accessed 21 Oct 2020.
139. Méndez V, Caswell M, Gliessman S, Cohen R. Integrating agroecology and participatory action research (PAR): lessons from Central America. *Sustainability*. 2017. <https://doi.org/10.3390/su9050705>.
140. Siltoe P, editor. *Indigenous knowledge: enhancing its contribution to natural resources management*. 1st ed. Wallingford: CABI; 2017.
141. Santiago-Vera T, Rosset P, et al. Re-conceptualizing and decolonizing resilience from a peasant perspective. *Agroecol Sust Food Syst*. 2021. <https://doi.org/10.1080/21683565.2021.1952362>.

142. Varela F, Thompson E, Rosch E. *De cuerpo presente. Las ciencias cognitivas y la experiencia*. 2nd ed. Barcelona: Gedisa; 1997.
143. Lopes D, Oliveira S, Silva E, et al. *Diálogos transdisciplinarios em agroecologia; projeto café com agroecologia*. 1st ed. Viçosa: FACEV; 2021.
144. McCune N, Luna Y, Vandermeer J, Perfecto I. Cuestiones agrarias y transformaciones agroecológicas. In: Benítez M, Rivera-Núñez T, García L, editors. *comps. Agroecología y sistemas complejos*. Mexico City: Coplt-arXives-SOCLA; 2021. p. 27–50.
145. Johnson J, et al. Weaving indigenous and sustainability sciences to diversify our methods. *Sustain Sci*. 2016. <https://doi.org/10.1007/s11625-015-0349-x>.
146. Lam D, Freund M, Kny J, et al. Transdisciplinary research: towards an integrative perspective. *GAIA*. 2021. <https://doi.org/10.14512/gaia.30.4.7>.
147. González P. Colonialismo interno. Una redefinición. In: IIS-UNAM. 2003. https://conceptos sociales.unam.mx/conceptos_final/412trabajo.pdf. Accessed 29 Mar 2020.
148. Millán M. Alcances político ontológicos de los feminismos indígenas. In: Millán M, editor. *Coord Más allá del feminismo: caminos para andar*. Mexico: Red de Feminismos descoloniales; 2014. p. 119–44.
149. Escobar A. *Sentipensar con la tierra Nuevas lecturas sobre desarrollo, territorio y diferencia*. 1st ed. Medellín: Ediciones UNAULA; 2014.
150. Guerrero P. *Corazonar. Una antropología comprometida con la vida*. 1st ed. Quito: Ediciones ABYA-YALA; 2010.
151. Marcos S. La espiritualidad de las mujeres indígenas mesoamericanas: descolonizando las creencias religiosas. In: Espinosa Y, Gómez D, Ochoa K, editors. *Tejiendo de otro modo. Feminismo, epistemología y apuestas descoloniales en Abya-Yala*. Popayán: Editorial Universidad del Cauca; 2014. p. 143–60.
152. Toledo V. Agroecology and spirituality: reflections about an unrecognized link. *Agroecol Sustain Food Syst*. 2022. <https://doi.org/10.1080/21683565.2022.2027842>.
153. Echeverría B. *Valor de uso y utopía*. 1st ed. Mexico: Siglo XXI editores; 1998.
154. Peçanha J, West S, Masterson V, et al. Stewardship as a boundary object for sustainability research: linking care, knowledge, and agency. *Landsc Urban Plan*. 2018. <https://doi.org/10.1016/j.landurbplan.2018.07.005>.
155. Trevilla D, Estrada E, Soto M. Agroecología y cuidados: reflexiones desde los feminismos de Abya Yala. *Millcayac- Revista Digital de Ciencias Sociales*. 2020. VII, 13: 621–645.
156. Boff L. *La sostenibilidad. Qué es y qué no es*. 1st ed. Cantabria: Editorial Sal Terrae; 2013.
157. Gutiérrez R. coord. *Comunalidad, tramas comunitarias y producción de lo común. Debates contemporáneos desde América Latina*. 1st ed. Oaxaca: Colectivo Pez en el Árbol- Ed Casa de las Preguntas; 2018.
158. *Futuros Indígenas. Declaración Milpamérica resiste*. In: *Futuros Indígenas*. 2022. <https://futurosindigenas.org/milpamerica/#firma>. Accessed 13 Oct 2022.
159. Martínez J. *Eso que llaman comunalidad*. 1st ed. Oax: Culturas Populares, CONACULTA/Sria. de Cultura, Gob de Oax/Fundación Alfredo Harp Helú Oaxaca, AC.; 2010
160. IDS, IPES-Food. Agroecology, regenerative agriculture, and nature-based solutions: Competing framings of food system sustainability in the global policy and funding spaces. In: IPES-Food. 2022. <https://tinyurl.com/4nwde7ux>. Accessed 24 Jan 2023.
161. Grupo ETC. *¿Quién nos alimentará?*. In: Grupo ETC. 2017. <https://tinyurl.com/3vcaz4mf>. Accessed 18 Mar 2020.
162. Catacora-Vargas G, Perfecto I, Third World Network/IPES-Food. Chapter 5. Agroecology for socioecological resilience. In: *The land Gap Report*. 2022. <https://landgap.org/2022/report>. Accessed 12 Mar 2023.
163. La Altieri M. agricultura tradicional como legado agroecológico para la humanidad. *Revista PH*. 2021;104:180–97.
164. González A. Agroecosistemas mexicanos: pasado y presente. *Itinerarios: revista de estudios lingüísticos, literarios, históricos y antropológicos*. 2007; 6: 55–80.
165. Rojas T. La agricultura prehispánica de Mesoamérica en el siglo XVI. In: Miño M, coord. *Mundo rural, ciudades y población del estado de México*. Toluca: El Colegio Mexiquense: Instituto Mexiquense de Cultura. 1990; 15–40.
166. Koohafkan P, Cruz M. Conservation, and adaptive management of globally important agricultural heritage systems (GIAHS). *J Resour Ecol*. 2011. <https://doi.org/10.3969/j.issn.1674-764x.2011.01.004>.
167. Grain. (2021). UPOV: el gran robo de las semillas. <https://tinyurl.com/mr4a44x6>. Accessed 15 Aug 2022.

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