

Agroecology accounting: biodiversity and sustainable livelihoods from the margins

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Abstract

Purpose – The purpose of this paper is to provide a socio-ecological counter account of the role that agroecology plays in supporting the sustainable livelihoods of a co-operative of smallholder coffee farmers, where very little value is created at their end of the coffee commodity chain. Agroecology may be defined as the science that provides the ecological principles and concepts for the design and management of productive agricultural ecosystems that conserve natural resources.

Design/methodology/approach – This study uses a case study design of a coffee-producing co-operative in India using data collected from participant observation, focus groups and unstructured interviews with indigenous smallholder farmers. It combines the science of agroecology with the labour theory of value as a theoretical framework.

Findings – An agroecological approach supports agricultural biodiversity, while promoting sustainable livelihoods since members of the co-operative are able to reduce their use of external inputs. However, an agroecological transformation is curtailed by the continued dependence on corporate value chains. A framework using the labour theory of value is used to explain the extraction of surplus value from the labour of both the smallholder farmers as well as nature. This study provides evidence of the role of government policy and practice in perpetuating the status quo by not promoting either research on agroecology or direct consumer to producer value chains while providing subsidies for the inputs of industrial agriculture.

Originality/value – There have been very few studies that have provided an account of the limited value generated in agricultural commodity chains for smallholder farmers due to the need to purchase the inputs of industrial agriculture supported by government subsidies. This study extends the field of accounting for biodiversity into agriculture using the science of agroecology to explain the role played by biodiversity in increasing the amount of value generated by smallholder farmers. By utilising the labour theory of value, the authors have introduced the notion of the labour power of nature as represented by the environmental services that nature provides.

Keywords Agriculture, Co-operatives, Agroecology, Organic farming, Accounting for biodiversity, Sustainable livelihoods

Paper type Case study

Introduction

There have been reductions in the amount of value that goes to the producers of agricultural commodities (McMichael, 2012). “Value” is the combination of “use value” and “exchange value” deriving from agricultural commodities. “Use value” relates to when the producers



use the commodities for their personal consumption and “exchange value” relates to when they sell these commodities in the marketplace (Marx, 1976). This paper provides a subaltern emancipatory counter account (Alawattage and Wickramasinghe, 2009; Gallhofer *et al.*, 2006) of the role played by the use of agroecological techniques of farming in mitigating the loss of value generated by indigenous (Gallhofer and Chew, 2000; Gallhofer *et al.*, 2000) smallholder coffee farmers. In doing so, it provides a socio-ecological (Milne, 1996), “counter account” (Gallhofer *et al.*, 2006; Lehman *et al.*, 2016; Vinnari and Laine, 2017) to extend the accounting for biodiversity literature to the field of agriculture, using the narrative of indigenous farmers and their coffee co-operative about the role that nature and its biodiversity play in promoting their sustainable livelihoods.

This paper provides a subaltern account (Alawattage and Wickramasinghe, 2009; Graham, 2009; Jayasinghe and Thomas, 2009) by making visible the realities faced by a co-operative of indigenous smallholder coffee farmers in India. Spivak (1988) defines the “subaltern” as those whose perspective is repressed in the discourse of the dominant class. Sengupta *et al.* (2007) define smallholder farmers as those farming on less than or equal to 2 hectares of land. Smallholder farmers are representative of the subaltern. The use of the term “counter account” indicates our use of the oral narratives of marginal, smallholder coffee farmers in providing a voice to the marginalised (Gray and Laughlin, 2012), to question the efficacy of agricultural policy and practice. The reduction in value received by the producers of agricultural commodities has challenged the survival of smallholder farmers who cultivate these commodities including the coffee farmers who are the focus of this study.

An understanding of value and its explanation of how profit is generated is the basis of accounting (Bryer, 1994) and this study uses the labour theory of value to engage with the value provided by biodiversity to farmers, where the notion of the labour power of nature is introduced as represented by the environmental services that nature provides (Barrios, 2007; van der Sluijs *et al.*, 2015). If the farmers were to use the techniques of industrial agriculture, they would have to purchase these inputs through the sale of their labour power. Industrial agriculture has compromised traditional agro-ecosystems and replaced biological functions, originally provided by diverse communities of organisms, with increased external inputs of energy and agrochemicals (Bonmarco *et al.*, 2013). This creates the condition for the alienation of labour as represented by “the external relation of the worker to nature and to himself” (Marx and Engels, 1998, p. 81).

In, *Capital* Vol. 1, Marx (1976) refers to this “alienated labour” as “surplus value” that is converted into the “private property” of the capitalist. In the case of the farmers who are producing coffee, its price is not in their hands; it is not proportionate to the amount of labour power that they invest. Taking this conception and applying it to the case of agroecology, we explore how nature, instead of being monetised, is providing valuable inputs to farmers for free. Agroecology calls for the holistic management of the agro-ecosystem (Altieri, 1983, 1993, 2002), minimising external inputs, such as synthetic fertilisers and pesticides, producing better environmental, economic and social outcomes for farmers (Altieri, 2002, 2008; Babin, 2015). Agroecological designs often incorporate both traditional knowledge (Altieri, 1983; Anuradha, 1998) and practices of modern agroecological science (Altieri, 2002, 2008), promising to deliver livelihoods for local and regional communities (Altieri and Toledo, 2011). They significantly reduce the usage of inputs (Altieri, 2002, 2008; Babin, 2015), such as water and energy, for agricultural production as well as making the distribution of food more equal (Babin, 2015; Hamprecht *et al.*, 2005). Agroecology is a response to the scientific perspective in order to question the taken-for-granted assumptions on which industrial agriculture is based (Sevilla Guzmán and Woodgate, 2013). The goal of this paper is to question the dominance of industrial agriculture using an emancipatory counter account of indigenous coffee farmers regarding their practice of agroecology to support their livelihoods.

The paper is structured as follows. The following section introduces accounting's engagement with sustainable development and the challenges of the human impact on the environment. It then engages with the accounting for biodiversity literature, as well as agricultural accounting research to show their inadequacy in accounting for sustainable development. Accounting literature dealing with the labour theory of value is introduced as an alternative framework in combination with the field of agroecology to account for the impact of the practices of monoculture agriculture on the livelihoods of smallholder farmers. The third section of the paper details the research methods used. The fourth section provides details of the agroforestry case study. The final section provides a discussion and conclusion with suggestions for future research.

Agroecology: utilising agricultural biodiversity for sustainable livelihoods

Accounting's ability to make the changes necessary to take sustainability seriously are questionable, since it has had limited success with updating its values and beliefs (Milne, 2007) and often does not value either environmental or social considerations (Adams, 2004; Gray and Bebbington, 2000; Spence, 2009). To give due consideration to these will require making the economic subservient to the environmental and social and effectively portray the damage caused by the actions of capitalism (Milne, 1996; Spence, 2009). There are ever growing calls for new forms of accounting that can effectively account for the human impacts on the environment as a result of their being ignored due to being considered non-market activities or externalities (Cooper, 1992; Maunders and Burritt, 1991; Milne, 1996, 2007; Spence, 2009). To be able to account for the human impact on the environment, accounting has engaged with the concept of sustainable development, which deals with "everyone's needs being met in an ecologically sustainable and socially just manner" (Bebbington, 2001, p. 128). An interdisciplinary approach that can bring together various perspectives is required to account for sustainable development (Bebbington and Larrinaga, 2014; O'Dwyer and Unerman, 2014; Parker and Guthrie, 2014), including theoretical frameworks that are drawn into accounting from different disciplines (O'Dwyer and Unerman, 2014), such as the natural and social sciences (Milne, 1996). The emphasis of this paper to provide an emancipatory counter account is consistent with Gaffikin's assertion (2009, p. 271) that "if accounting is to be involved in attempts to determine any effective solution to the problems of the impact of exploitative corporate behaviour on the environment (corporate domination) there needs to be much greater effort at building effective emancipatory resistance". The ineffectiveness of the accounting profession to influence corporate behaviour (Bebbington *et al.*, 1994; Gray and Bebbington, 2000; Lehman, 1999), along with the radical changes that need to be made to the way markets and capitalism function (Unerman and Chapman, 2014), will require a shift in emphasis away from the corporation as the accounting entity. Our focus on a coffee producer co-operative is an effort in this direction.

In this paper we provide a socio-ecological account of the role that nature plays (Cooper, 1992; Davila and Oyon, 2008; Hines, 1988, 1991), in promoting sustainable livelihoods in the context of agriculture. The field of accounting research has engaged with agriculture in a variety of ways, such as through gross margin accounting (Jack, 2005, 2006), post-productivism and corporate power in the context of UK agriculture (Frances and Garnsey, 1996; Jack, 2007), standardised management accounting in the context of agriculture in Australia (Jack, 2015) and the adoption of strategic management accounting tools in the context of post-subsidy reform in the field of agriculture (Jack, 2009). Additionally, Jack (2007) brings our attention to the nature of the modern food supply chain, wherein farmers are mostly left to take all the risk, as well as Frances and Garnsey (1996), who critique the dominance and control of the food system by UK supermarkets. This research also shows that a few large agribusiness companies that control the supply chain are able to buy food cheaply

based on the subsidies provided to the farmers by government (Frances and Garnsey, 1996; Jack, 2007).

In terms of the environmental impact of government fertiliser subsidies in agriculture, the field of accounting has had limited engagement (Adams, 2004; Laine, 2009; Milne and Grubnic, 2011). Adams (2004) engaged with the relationship between increasing fertiliser use in less-developed countries and its impact on nitrogen loading, while Laine (2009) mentioned the management of effluents at a fertiliser plant of a Finnish chemical company. Milne and Grubnic (2011), in their discussion of greenhouse gas emissions (GHGs), make the point that the biggest contribution to GHGs in the New Zealand context is from agriculture. Fertilisers are a significant part of this, such that a reduction in fertiliser use has had a positive impact on reducing GHGs. Support for fertiliser use remains central to agricultural growth strategies and increased use of fertiliser is considered a key factor of agricultural productivity improvements, with government policy focused on supporting fertiliser consumption through considerable interventions in fertiliser manufacturing and distribution (Genetic Resources Action International (GRAIN), 2010; Von Lampe *et al.*, 2014). Fertiliser subsidies are targeted with lowering the user costs of fertiliser while enhancing the use of fertiliser through the control of the prices of imported fertilisers via price ceilings or import subsidies, and in the Indian context, the compensation provided to Indian fertiliser producers for both domestically produced and imported fertilisers in 2007 was US\$8 billion – more than 0.8 per cent of the country's GDP in that year (Von Lampe *et al.*, 2014).

Chemical fertilisers destroy the natural nitrogen in the soils that is available to plants and cause farmers to use increasing amounts of fertilisers every year to sustain yields (Genetic Resources Action International (GRAIN), 2015). Chemical fertilisers deprive the soil of organic matter, making it hard and overly acidic, while also leading to excessive nitrogen leaking into rivers and lakes and eventually destroying ecosystems (GRAIN, 2010). Soils around the world have lost, on average, at least 1-2 percentage points of organic matter in the top 30 cm since chemical fertilisers began to be used, which amounts to about 150,000-205,000 million tonnes of organic matter. This has resulted in the emission of 220,000-330,000 million tonnes of CO₂ into the air, or 30 per cent of the current excess CO₂ in the atmosphere (GRAIN, 2015). The industrial method of farming currently incentivises monocultures and cash crops, and is one of the main drivers of ongoing biodiversity losses in agricultural landscapes (Altieri, 1983; Barrios, 2007). In this paper, we engage with the negative impact of industrial agriculture on biodiversity as well as on the livelihoods of smallholder farmers. Furthermore, we provide an emancipatory counter account of the usage of agroecological methods of farming through the voice of smallholder coffee farmers. This entails the environmentally friendly replacement of fertilisers through the incorporation of ecosystem services management in agricultural practices (Bommarco *et al.*, 2013). The narrative account of coffee farmers provides a counter account to mainstream agriculture as well as the “arithmomorphism” (the tendency to see the world through numbers) of mainstream accounting based on neoclassical economics (Dillard, 2008; Georgescu-Roegen, 1971; Maunders and Burritt, 1991; Roslender and Dillard, 2003; Tinker and Gray, 2003; Tinker *et al.*, 1982).

Ecosystem services, such as pest control and pollination, are critical benefits of biodiversity important for agricultural production, boosting crop yield and offsetting the need for expensive inputs (Milligan *et al.*, 2016). The engagement of accounting with biodiversity (Jones, 1996, 2003; Jones and Solomon, 2013; Boiral, 2014; Sizemore, 2015) was initiated by Jones (1996), who proposed a framework to measure the value of corporate natural assets. The centrality of biodiversity has not been evidenced in corporate sustainability and biodiversity reporting (Freeman and Groom, 2013; Rimmel and Jonäll, 2013; Van Liempd and Busch, 2013). The accounting system in Jones' (1996, 2003) framework consists of a hierarchical model of counting the habitats and the species of flora

and fauna within these habitats in terms of an inventory and total population count. Jones (2003) tested his framework in the Elan Valley Nature reserve in the UK by providing an inventory of the habitats, flora and fauna with an estimate of their monetary value. Siddiqui (2013) applied Jones' (1996) framework to take an inventory of the habitats of the largest mangrove forest in the world, the Sundarbans, but failed to account for marginal stakeholders such as the indigenous people living in the forest, despite his acknowledgement of their dependence on the natural resources provided by the forest for their livelihoods.

Tregidga (2013) brought out the dangers in undertaking the measurement of biodiversity and its impacts under the guise of the idea that "in order to be protected, nature and biodiversity must be integrated into economic decision-making" (p. 826). Jones' (1996) framework does an important job of opening a dialogue for biodiversity accounting; however, the framework does not consider the degraded habitats or missing flora and fauna leading to the reduction in biodiversity that is taking place due to "habitat loss and modification as a result of intensified agricultural practices" (Sizemore, 2015, p. 145). This framework, despite taking an interdisciplinary perspective, does not account for the loss in biodiversity and fails to provide an account of the impact of this loss on the livelihoods of indigenous communities.

Jones and Solomon (2013) argue that looking at biodiversity as a provider of ecosystem services is an anthropocentric perspective and suggest a deep green position, which is nature for nature's sake (Gray, 1992, 2002, 2010). Consistent with this perspective, Samkin *et al.*'s (2014) deep ecology approach promotes an intrinsic value of nature excluding people, i.e. a bio-centrism that believes that "biodiversity and other natural resources are valuable simply because they exist and there is value in conserving them" (p. 6). In this paper, our focus is on an anthropocentric view of biodiversity through its provision of ecosystem services that promote the livelihoods of smallholder coffee farmers. The delivery of ecosystem services is facilitated by the integration of shade trees and the conservation of small forest fragments within or adjacent to a farm, and can support increased levels of pest control services provided by birds and ants (Milligan *et al.*, 2016). The evidence is that the preservation of biodiversity promotes a symbiotic relationship between the farmers and their surrounding environment. In the case of agroecological coffee systems, shade trees are planted alongside cultivated coffee plants to create a diversity of trees and plants that provide habitats for many other species, which in turn limit pests of the coffee (Perfecto and Vandermeer, 2015). Coffee plants that interacted with Africanised honey bees (*Apis mellifera scutellata*) showed a weight increase of 25 per cent as compared to those with no exposure to insects, suggesting that "coffee plants would benefit from being grown in habitats that are suitable for sustaining valuable pollinators" (Roubik, 2002, p. 708).

Smallholder farmers are faced with a dependence on the technologies of the green revolution (Altieri, 2002) and domination by development strategies of third-world governments that subsidise large agribusinesses (McMichael and Reynolds, 1994). As a result, small farming communities and their food production practices become ever more marginalised, losing their voice and visibility (Vaidyanathan, 2010). The high cost of fertilisers mandates taking on high interest rate credit (Reddy, 2010; Sidhu, 2010), which leads to debt incurment (Kalkat, 2010; Sidhu, 2010; Srivastava, 2010). Thus, farmers using industrial agricultural methods are seldom able to generate enough income from their farms to break this cycle (Deshpande and Arora, 2010; Hebbar, 2010; Reddy, 2010).

This situation in being faced by farmers due to a decline in traditional farming techniques that were based on the concept of intercropping, where a combination of different crops was grown together in such a way that some of them provided the essential sustenance for the soil (Innis, 1997). A modern reinvention of traditional farming techniques is organic agriculture, and research on its socio-ecological benefits provides evidence that it improves floral, faunal and landscape diversity while leading to less pesticide and nutrient pollution of ground and

surface waters, and it improves community economic development through greater co-operation among organic farmers (Crowder and Reganold, 2015). There is also evidence that organic agriculture can help alleviate poverty for smallholder farmers and improve their livelihoods owing to cheaper input costs for agriculture (Seufert *et al.*, 2012). However, despite the promise of higher and more stable prices, organic agriculture in the Global South is often an export-oriented system tied to a certification process by international bodies (Seufert *et al.*, 2012), which might impose a dependency relationship.

Furthermore, the viability of industrial agriculture mandates a farm size much greater than that available to the smallholder farmer (Kannan and Papola, 2007; Sengupta *et al.*, 2007, p. 120). Thus, smallholder farmers face significant challenges not least of which is trying to ensure that they can provide a sustainable livelihood to their families. In order to understand the importance of achieving a sustainable livelihood, it is important to first understand what it is and why it is so essential for farmers to achieve it. In order to be sustainable, a livelihood must be able to cope with and recover when there are shocks or situations of stress that endanger the continuation of the livelihood (Chambers and Conway, 1992; Scoones, 1998). Examples of common livelihood stresses include declining wages and income, lack of access to credit for external inputs, and falls in the prices of agricultural commodities. Stresses and shocks could also be caused by environmental factors such as droughts, lack of rainfall, floods and events caused due to the impact of climate change (Scoones, 2009).

Industrial agriculture has low resource use efficiency, making its economic and environmental costs unacceptably high due to the use of large quantities of chemical fertiliser which are not only expensive, but also destroy the soil organisms and along with them the ecosystem services that they provide, such as pest and disease control by regulating soil structure and nutrient supply (Barrios, 2007). A case in point is the extensive use of neonicotinoids, which are persistent, and potent insecticides that have been found to cause the destruction of biodiversity, and therefore compromise ecosystem functioning and the provision of ecosystem services by a wide range of affected species and environments (van der Sluijs *et al.*, 2015; Woodcock *et al.*, 2017). Despite attempts made by farmers to make ends meet, the farmers “find their calculations and plans nullified as corporations raise the costs of their inputs and depress the prices obtainable for their outputs” (Jack, 2007, p. 906). Hence the labour of a farmer that practises monoculture agriculture ends up being used to ensure profit for the companies that produce these inputs at the expense of the livelihood of the farmer. As a result, very little value is created at the producer end of the value chain on the farms of smallholder farmers.

The limited amount of value created at the producer end of a value chain, according to Marx, was enabled by the capitalist’s control over the “means of production” (Bowman and Toms, 2010). For smallholder farmers practising monoculture agriculture, the “means of production” are the external inputs that are sold to the farmers by the agribusiness industry. In smallholder agriculture, the farmers create the value on the farm, while the value is captured by the companies that control the retail end of the value chain. The fact that farmers have limited avenues to sell their produce directly to the end consumer means that they are compelled to sell to the corporate value chains, which impose on farmers the need to sell their labour power instead of the produce of their labour (Bowman and Toms, 2010). In the context of this study, the value is in the labour invested by the coffee farmers and more broadly in the labour invested by smallholder farmers in general. The crops that farmers grow on their farms are commodities whose value in monetary terms is below the value of the labour that the farmers need to invest in order to grow them.

In providing a socio-ecological account of the perspective of smallholder coffee farmers, we utilise Marx’s labour theory of value. For Marx, the basis of the theory of value is the social relationship within the context of production between wage-labour and capital

(Tinker *et al.*, 1982). The lack of value creation on the farm is not due to a lack of effort on the part of the farmers, because under capitalism, the profit that is generated comes from unpaid labour (Bryer, 1999) that is turned into surplus value (Bryer, 1994). The generation of surplus is enabled by “the commodification of labour” and is the defining principle of the capitalist system, which is pre-occupied with keeping labour costs low (Cooper and Puxty, 1996, p. 290). In Marx’s theory of value there is a clear difference “between value creation (exploitation in the labour process) and value capture (appropriation of profit)” (Bowman and Toms, 2010, p. 186). Exploitation is defined as the difference between the value generated by workers and what they are paid (Smith, 2015).

Furthermore, to explain the accumulation of profit through the services provided by nature, we utilise the *Economic and Philosophic Manuscripts of 1844* (Marx and Engels, 1998) where Marx and Engels (1998, pg. 76) see humans as being a part of nature: “Man lives on nature – means that nature is his (sic) body, with which he must remain in continuous intercourse if he is not to die. That man’s physical and spiritual life is linked to nature means simply that nature is linked to itself, for man is a part of nature”. Since the human is a part of nature and derives the means of life from nature, when the capitalist pays for the value produced by the worker in the form of labour, the capitalist is able to accumulate the value provided by nature in the process of production (Marx, 1976). This is because nature is not paid a wage for the service that it provides. Marx’s (1976, p. 133) definition of labour sees nature as central to human existence: “as the creator of use-values, as useful labour, [which] is a condition of human existence which is independent of all forms of society; it is an eternal natural necessity which mediates the metabolism between [society] and nature, and therefore human life itself”.

As an alternative to purchasing and using external inputs, which would require the investment of labour power, farmers could utilise the services provided by agricultural biodiversity to achieve a sustainable livelihood. There is evidence that farmers who practise farming using the principles of agroecology are in a better position to ensure their sustainable livelihoods (Bengtsson *et al.*, 2005; Butler *et al.*, 2007). The elimination of chemical fertilisers could also reduce annual global greenhouse emissions by as much as 10 per cent, since there is a growing body of evidence that shows that their products are not needed to feed the world and farmers can stop using chemical fertilisers without reducing yields by adopting agroecological practices (GRAIN, 2015). Additionally, the shift from chemical fertilisers to agroecological practices would allow farmers to rebuild organic matter in the world’s soils, and thus capture a possible two-thirds of the current excess CO₂ in the atmosphere within 50 years (GRAIN, 2015). The evidence of the effectiveness of biodiversity as compared to the technologies of the green revolution (Rosset and Martínez-Torres, 2013) requires a change in attitude so that traditional subsistence agro-ecosystems are no longer regarded as “primitive” and as the product of ignorance, but rather as the product of ecological rationales (Altieri, 1983, 2008; Vidyarthi and Rai, 1985). Agricultural biodiversity, through the practice of agroecology, provides services to farmers that replace the use of costly inputs (Altieri 1983, 2002) and promotes the sustainable livelihood of smallholder farmers as opposed to conventional agriculture using chemical inputs and mechanisation (Altieri, 1983, 1993; Rosset and Martínez-Torres, 2013).

Thus, agroecology promotes sustainable livelihood security (Chambers, 1992), especially in terms of preventing distress migration and core exploitation. Core exploitation is the situation where farmers end up losing their land due to indebtedness and are then forced to migrate (Chambers, 1992). Within the context of the coffee farmer, the stresses that they face represent regular, predictable disturbances that have a cumulative effect and are best represented by their need to have access to credit. Shocks, on the other hand, are larger in scale and more infrequent. They are more unpredictable with an impact that is more sudden. In the case of coffee farmers, they are represented by coffee price shocks, which are sudden

drops in the price of coffee in the international coffee market (Subervie, 2011; Talbot, 2004). It has been suggested that these issues can be addressed through the practice of agroecology within coffee systems (Roubik, 2002; Perfecto and Vandermeer, 2015).

Research methods

This study is based on the case of a coffee-producing co-operative in Southern India. It uses data collected from participant observation, focus groups and interviews with indigenous farmers in order to illustrate how smallholder coffee farmers are working to achieve a sustainable livelihood. It combines participant observation (DeWalt and DeWalt, 2010; Gans, 1999) and unstructured interviews (Corbin and Morse, 2003) with the individual coffee farmers and employees of a coffee producer co-operative. Past research in coffee communities has used semi-structured interviews (Bacon, 2005; Valkila, 2009) with farmers, in some cases combined with the use of focus groups (e.g. Bacon, 2005; Kitzinger, 1994, 1995) for data collection.

Data were collected (please refer to Table I for details) using direct observation, review of documentation, focus groups and unstructured interviews with the coffee farmers and members of the producer co-operative organisation at different levels. The participant observation provided a rich amount of information due to the impromptu nature (Johnson, 1990) of the interaction that took place with different people within the co-operative structure. Extensive field notes and journals were kept during several visits to the field and in cases where these have been cited, they have been referred to as “journal” in the case study. In some cases, permission was given by the participants to record the interviews either in English or Telugu and in these cases the interview quotes are verbatim copy of the interview or the translation of the interview conducted in Telugu into English. These instances have been categorised in the case study as “interview”.

As stated before, the interviews were unstructured and took place during the course of time spent at the field site by one of the researchers as the researcher came into contact with people and asked their permission to have a discussion with them about the issues that were of importance to them. The unstructured interviews were designed to capture the personal experiences of the coffee farmers and employees of the co-operative in the course of a one-to-one conversation, which was the method employed by Herbohn (2005). Another benefit of the unstructured approach was that the conversation was led by the

Type of interaction	Number of interactions	Participant	Duration	Details
Personal observation	6	Farmers/community co-ordinators (CCs)/ managers	3-4 hours each	Activities on the farm, co-operative office and coffee processing facility
Unstructured interview	10	Farmers	30 minutes to 1 hour each	Farmers talked about issues that they are facing
Focus group	5	Farmers	1 hour each	Challenges at the level of the village development committee
Unstructured interview	10	CCs	30-45 minutes each	Issues faced by the CCs in their work with the farmers
Focus group	1	CCs	2 hours	Challenges with the coffee harvest
Unstructured interview	16	Managers of the co-operative/Foundation	30 minutes to 1 hour each	Operational issues including with the coffee and the agroforestry project
Unstructured interview	1	Director of European mutual fund	1 hour 45 minutes	Purpose of the agroforestry project and what is hoped to be achieved and long-term plans

Table I.
Details of data collection

interviewee, and issues that were a priority to them remained the focus of the conversation and discussion. This is in line with our methodology of providing a subaltern account of people living at the margins.

The interviews were conducted on the farms of the individual farmers or in their village so that they would feel at ease. The focus groups were conducted with members of the two village development committees (VDCs) that were the focus of our research. Interviews were conducted with Indian farmers, employees of their coffee co-operative and key decision makers from their partner organisations undertaking the agroforestry project in 2013, and were conducted in both Telugu and English. Language fluency of one of the researchers in both Telugu and English allowed for the interviews conducted in Telugu to be translated to English. Some of the interviews were digitally recorded and subsequently transcribed. The recorded interviews conducted in the native language were transcribed directly to English using a process of listening to the interview multiple times. No formal coding programme was used for the purpose of data analysis. The coding of the data was achieved through multiple readings of the transcripts of the interviews. Our primary data were triangulated (Modell, 2009) with secondary data from studies by Ranjan Jena and Grote (2016) who studied the impact of Fairtrade on the livelihoods of the same coffee co-operative we studied and Ninan and Sathyapalan (2005), who studied the costs of coffee cultivation at the farm level in the South Indian context. The following section presents details of the case study.

The case study

Case background

The case is focused on a coffee co-operative in Southern India (co-operative), which was set up on the basis of biodynamic agricultural practices, making use of the ecosystem services provided by nature to improve the livelihoods of the indigenous tribal communities of this region who represent the subaltern. The co-operative has a membership of over 11,000 farmers who depend upon growing coffee as a primary source of income. One of the board members provided a brief history of coffee in the region:

We found out only around 2004 that coffee was very suitable for our climate. We realised that we could cultivate coffee even though we do not have access to irrigated water and it survives and produces a harvest just with the water provided to it during the monsoon. We got this understanding starting in around 2004 even though coffee had been introduced to us initially in 1975. So during the intermediate period, even though it was cultivated in our area, most of us did not know what it was, and the few that knew about it, that it was a bush that had berries which could be sold, would steal the coffee berries from the people who had them, but did not know their value and sell them in the coffee market. It was only when people started to see other people making a profit on the coffee of US\$250 to 500 a year that the interest in coffee went up (Interview dated 21 July 2012).

This story provides a context of the situation faced by the subaltern indigenous smallholder farmers in this region, in that despite the introduction of coffee in this region by the government in 1975, it did not develop any educational programmes for these farmers regarding the benefits of cultivating coffee. In 2002, the Indian Government asked the corporate foundation (Foundation) to assist these farmers. The Foundation then started working with them under a livelihoods project with a cohort of 1,000 farmers. In 2007, the co-operative was registered with 4,000 farmers who cultivated coffee as a part of the Foundation's initiative. The co-operative has achieved Fairtrade and organic certifications for its products. The organic and Fairtrade certifications were achieved in 2006 and 2008, respectively, and both are held by a social enterprise created by the Foundation. The fact that these certifications, which provide access to the international market, are under the control of the Foundation is the first evidence of the continued dependence of the

co-operative on corporate value chains. The members of the co-operative are not dependent on commercial seeds for their cultivation and have been using native seed varieties that they save each year from their harvest. The sovereignty of the indigenous farmers with regard to their seeds is evidence of the emancipatory potential within the co-operative. The co-operative is 100 per cent organic, or in the process of conversion to organic, and all the farmers are certified organic and/or practising biodynamic organic farming techniques based on traditional agroecological practices.

These were the comments from a focus group with a VDC of the co-operative regarding their motivation to take up coffee farming:

Since the formation of the co-operative, we have been motivated to get into coffee farming. Everyone should have at least one acre to half an acre in coffee. This will ensure that along with the usual crops that we grow it will provide additional income and thereby be useful towards ensuring that we have a livelihood. We do not have job opportunities in our village so we have a lot of interest in agriculture since it is our only source of revenue. We are keen to learn new ways to improve our income from agriculture, since we are fully dependent on agriculture (Journal, 29 July 2013).

There has been continual volatility in the coffee market which has had an adverse impact on the grower since the coffee crisis in the early 2000s, when coffee prices fell to under US\$2.20 per kilogram (Bacon, 2005). For many coffee growers, this has meant that they are barely able to cover their costs of production or even put food on their family's table (Bacon, 2005; Valkila, 2009). A further fall in coffee market prices puts the coffee farmer's livelihoods in a precarious situation (Valkila, 2009), making it essential that the families of coffee farmers have an alternative means of income generation.

The members of the co-operative have also been adversely impacted by the coffee crisis. Before the founding of the co-operative, the coffee farmers in the area were at the mercy of the traders, who would buy the coffee from them at a low price and resell it at a much higher price. To this day this is a problem in the region, where the co-operative is not present or among the farmers who are not members of the co-operative. Here is the perspective of a coffee farmer who is a member of the co-operative regarding the situation with regard to coffee:

We have a good reputation for our coffee internationally, but we the farmers who grow the coffee feel that we are not getting a price for the coffee that provides an income. Further, the government in its policies is not providing any support or assistance to the coffee farmers. Going forward it is essential that we get a price that covers our cost of production. This will protect us from the hands of the traders, who are coming in and buying our coffee at rock bottom prices (Journal, 27 July 2013).

This provides evidence of the treatment of the subaltern by the government. During the period of this study the price of coffee in the international market was rather low, as a result of which the co-operative was unable to find a buyer at a price that covered its costs of production. As a result of this, many of the farmers ended up selling some of their coffee to traders to cover their need for cash even though the prices offered by the traders were much lower. This is evidence of how the labour of the coffee farmers is commodified but not sufficiently valued, leading to the creation of surplus value for both the coffee traders at the local as well as international level. The economic situation faced by the members of the co-operative is explained by Ranjan Jena and Grote (2016), who collected their empirical data in March-April 2010 in 256 coffee farmer households, of which 155 were members of the co-operative and the remainder of the respondents were not certified. Within the sample of certified and non-certified coffee farmers, on average the Fairtrade-certified farmers earned an income of about US\$20.08 more per acre per coffee season compared with the farmers who were not certified and hence their overall household income was found to be

greater than the non-certified group (Ranjan Jena and Grote, 2016). However, this increased income is not significant enough to get the Fairtrade-certified farmers out of poverty or to ensure a significant improvement in their living standards, since 94 per cent of the sample of farmers were in poverty, making less than US\$2/day (Ranjan Jena and Grote, 2016). This is further evidence of the extraction of surplus value from the coffee farmers even when they are within a Fairtrade value chain. Hence, there is a need to look for an alternative source of income. According to the president of the co-operative:

We have to think about this and find a solution and do something to implement the solution. That is what we have been thinking this year that if we can provide the members of the co-operative an alternative food crop, that will enable us to diversify the source of income from a dependence on coffee. The key idea is that we need to start thinking beyond coffee and look for alternative sources of income so that we can reduce the dependence on coffee and ensure that our incomes as farmers do not go down (Interview dated 27 July 2013).

This problem is shared by coffee growers around the world who are suffering from low revenues from their beans at the same time as facing increasing costs, as a result of which they have to switch to other economically attractive crops or leave farming altogether (Terazono, 2016). This is why the Foundation and a European multinational-led investment mutual fund (Mutual Fund) formed a partnership in 2011 and have worked with the co-operative to initiate an agroforestry project with the purpose of providing alternative sources of revenue by reducing the dependence on coffee. The Mutual Fund was founded in 2008 based on the logic of extending carbon credits to corporations through projects in developing countries, with the objective to restore degraded ecosystems, redevelop local economies and combat climate change. This was based on a belief in a hands-on approach to sustainability and the hope for an approach that would deliver strong social and economic impact. It is relevant to understand the basis of the approach taken by the Mutual Fund (Interview, 13 December 2013):

In both developed and developing countries, family farming is the predominant form of agriculture. 500 million family farmers today produce 70 percent of the world's food supply. For those farmers and their families grappling with environmental degradation and poverty, having access to practices that increase their productivity and incomes while simultaneously preserving or restoring soil fertility, water resources and biodiversity is a major opportunity. However, small family farmers are not currently bankable investees for investment funds despite the fact that they dominate the supply side of many major markets like cocoa, coffee or rubber. [The Mutual Fund's] purpose is to aggregate these farmers and to integrate them into value chains with the positive impact benefits monetized to give a return for the fund.

The agroforestry project

Since high-quality coffee is shade grown, the leadership of the Foundation in co-operation with the Mutual Fund came up with the idea of creating shade for the coffee using fruit trees. As discussed in an earlier section, this should also provide the means for the creation of habitats wherein the biodiversity can return and provide ecosystem services to the coffee farmers. Furthermore, given that trees sequester carbon, this enables the community to earn some extra money from selling carbon credits to the international market. In addition, as the fruit trees mature, they provide an alternative source of revenue for the farmers that affords them the opportunity to diversify their livelihoods from a dependence on coffee alone. The motivation for the Mutual Fund to participate in the project is provided by its director:

The agroforestry project was based on our belief in a hands-on approach to sustainability wherein, in addition to the purchase of carbon credits to offset our emissions, the hope is for an approach that will deliver strong social and economic impact through the restoration of ecosystems (Interview, 13 December 2013).

Based on this emancipatory potential, the farmers of the co-operative have undertaken the agroforestry project as an agroecology programme to plant around 6 million saplings during a five-year period over 6,000 hectares to improve the biodiversity of the coffee ecosystem and lead to an increase in the variety of trees on the farm along with an increase in the biodiversity of spiders, bees and birds. The project started with the planting of 1 million saplings in each of 2011, 2012 and 2013. In the words of one of the farmers:

The idea is to have different sources of income growing in different zones of the farm, which will enable us to have income all around the year. For example, since the coffee harvest is from October to December, and the pepper harvest is in March, it would be important to have other sources of income during other times of the year. So I have planted an indigenous species that we call 'krici' which bears fruit, whose seeds give edible oil that has an excellent taste when cooked and I can harvest it in the month of April. In total I have over twenty-five varieties of fruit trees on my coffee farm including mango, guava, bananas, lemon and lime trees among others (Interview, 24 June 2013).

This provides evidence that the emancipatory potential of the project is being fulfilled and the hope of diversifying the sources of income away from coffee is being achieved by utilising both the labour of the farmers as well as the labour provided by nature. Various horticultural tree species have been planted in a phased approach on 6,000 hectares. Seven different species groups are distinguished based mainly on similar growth conditions (similar biomass accumulation rates) and planting densities. In the next phase of the project, starting in 2014, coffee was introduced on 3,000 ha under the shade of those trees that were planted in 2011, 2012 and 2013. The agroforestry project is exclusively being implemented on marginal or fallow lands. The trees are being planted on parts of the community that did not provide any income in the past and did not have much biodiversity as the soil was degraded due to the practice of agriculture using chemicals. The extent of damage to the soil in the coffee growing regions of South India has been documented by the Coffee Board of India, which has conducted soil analysis where the soil had developed fatigue due to an increase in the acidity of the soil caused by the excessive application of fertilisers (Staff Reporter, 2017). Thus, the activities undertaken under the agroforestry project, such as the planting of trees along with the practice of biodynamic farming, will restore the fertility of the soil and enable the indigenous coffee farmers to utilise the services provided by nature in a restored soil. Thus, by implementing the agroforestry project on their farms, the farmers are able to utilise the labour of nature and thereby save money from not having to purchase expensive chemical fertilisers, while also improving the soil ecology.

The selection of the plots to plant the trees involved a participative rural appraisal (PRA) of each of the villages where the project was being implemented. PRA is a participatory approach driven by the needs of local people who work collaboratively to "analyse their living conditions, to share the outcomes, and to plan their activities" (Narayanasamy and Boraian, 2005, p. 10). In each village, all the farmers who were members of the co-operative formed a VDC where they drew a detailed map of the village indicating all the land usage patterns in the village. The VDCs focused on the lands that were barren as well as the permanent fallow lands. Since the co-operative uses biodynamics as an agroecological technique, the project is able to take up these types of land and is able to improve the degraded soil. As a result of the variety of tree species that have been planted, the leaves of these trees fall on the ground and create a mulch, which will gradually improve the fertility of the soil. Moreover, the soil biodiversity is gradually improved using vermicomposting, Cow Pad Pit (CPP) and the use of *Gliricidia* (*Gliricidia sepium*). Vermicomposting is a combination of the weeds in the farmers' land, cow dung and mud with earthworms. Together, this creates a soil that has enough nutrients in it as well as soil organic matter so that the tree saplings, which have been planted as a part of the agroforestry project, will survive and thrive without the need for expensive external inputs.

Furthermore, *Gliricidia* is a nitrogen fixer and when its leaves fall on the ground, they provide nitrogen to the soil, and when young, its leaves are ideal for composting since they decompose rapidly. A farmer who had built the first bio-centre consisting of a CPP explained what it consisted of:

A CPP is 16 inches deep, 2.5 feet in length and 2 feet wide. Into this is added the mixture of about 60 kilograms of lactating cow dung, 200 grams of egg shells and 200 grams of silica. This is allowed to sit in the CPP for some time and after this there is no bad smell and then it is ready for use. About 1 kilogram of this should be mixed with 13.5 litres of water and then used as a foliar spray. If more of it is available, it can be put at the roots of the plant as well (Journal, 26 June 2013).

Since the farmers keep cattle on their farm, the cow dung is available to them and hence without the need to invest money, they are able to produce very high-quality soil amendments that improve the fertility of the soil and also improve the health of the plants on their farm. The building blocks of this system of farming are the community and individual farmers with bio-centres that incorporate having a CPP and the use of beneficial earthworms through vermicomposting. This shows the role that these techniques play in activating the biodiversity that is present in the soil, creating the appropriate conditions for it to provide ecosystem services and fully utilise the labour provided by nature to fulfil the emancipatory potential of bringing together a community of subaltern indigenous farmers.

Progress and challenges for an agroecological transformation

Each of the individual plots of land for the members of the co-operative is between two to three acres. Because of their small scale, they are unable to pay for additional labour. This additional labour would have been required if they had practised monoculture agriculture, with the dependence on chemical inputs provided by agribusiness. Instead of having a dependence on these, since they have adopted the techniques of agroecology, they can utilise the CPP, vermicomposting and mulching which are elements of biodynamic farming. This provides them with the means to secure their livelihoods since it incorporates the use of biodiversity to replace their need for external inputs so that essentially the labour of nature is replacing the need to invest additional human labour. For example, supporting spider populations to grow and provide natural pest control webs enables the spiders to play a critical role of integrated pest management, thereby reduce the usage of synthetic pesticides, which harm biodiversity and endanger the health of the farmer. The members of the co-operative provided their rationale for choosing sustainable methods of farming without the usage of chemical inputs:

In conventional farming, we would need to buy seed each year, along with fertiliser and pesticide. With the amount of money that it would cost to pay for these inputs, we would not be able to make any money. This is the reason why conventional farmers in other parts of the state are committing suicide. By being an organic farmer, I am making all the inputs on my farm that I need for farming and so I am able to save all the revenue that I get from farming this way (Interview, 28 June 2013).

Ninan and Sathyapalan (2005) provide details of the cost of coffee cultivation in South India, based on 1999 prices, which is relevant for the discussion of cost of production. Based on Ninan and Sathyapalan (2005), we were able to calculate the cost of coffee cultivation for a farm using industrial agricultural techniques as about US\$1,396 per acre per year, and using this as a starting point we were able to estimate the cost for a farm utilising agroecological farming practices as US\$536 per acre per year. The difference in cost, indicating a saving of about US\$860 per acre per year for farmers utilising agroecological farming practices, reveals the value of the ecosystem services provided by nature. Furthermore, the higher cost for a farm using industrial agriculture indicates the amount of additional labour that must be invested in this system of cultivation, which is surplus value for the companies that produce the inputs.

The evidence from the agroforestry project suggests that through the application of agroecological principles, it has made a contribution to improving the soil biodiversity of the villages where it is being implemented. The forest is coming back as a result of this project and the care for nature and a drive to change practices resonated with a farmer:

The people from the [governmental agency] used to come and give us incentives to use urea [conventional fertiliser], including a subsidy that gave it to us for free. However, we do not accept this subsidy now since we have seen the negative impact that urea has on the land and the soil. In the past many years ago, when my father was farming and we used urea, it would require more and more each time. We then dug up the soil to see that the urea had formed a black layer about a foot under the top soil. This black layer has a consistency like salt. So now when the [governmental agency] comes around with their subsidy, we tell them that we prefer using biodynamic organic farming methods. We make CPP [organic soil amendment] and use it after mixing with water as a spray on the coffee plants. We have found that since we shifted to organic farming, the quality of the soil is much better, with a high degree of microbial nutrients and it will produce a good harvest without any need for chemical pesticides or fertiliser (Journal, 28 July 2013).

Evidence from some of the farmers who have already diversified their coffee farms provides further validation of the impact the agroforestry project has had. One of the farmers told us about his farm:

I have at least ten sources of income on my farm. I have turmeric, bananas, marigold, broomsticks [...] In fact I have lost count of how many different income sources I have. I find something good; I just go ahead and plant it. Further, I have a CPP bio-centre that I have built on my farm, so that I do not need to buy CPP or depend on it from the outside. I also have the potential to sell my CPP to other farmers who have not yet built their own bio-centre (Journal, 26 June 2013).

Despite the benefits noted at the level of the farm, issues still remain for the co-operative and its farmers in terms of commercialising the produce from the agroforestry project. The government has interfered in the functioning of the co-operative and its attempts to expand beyond coffee to make its financial condition more stable. For example, the co-operative bought tamarind at US\$0.167 per kilogram and after further processing was able to sell it at US\$0.267 per kilogram. Once the government found out about this, they contacted the co-operative and informed them that the government had a monopoly on the tamarind and hence the co-operative could not participate in the trading of this commodity. The issue is that the government does not interfere with petty traders who trade all the different commodities including coffee without having any licence to trade from the government. However, when the co-operative, which is a union of small farmers, tries to improve its financial viability by expanding beyond coffee, it is not allowed to do so.

Another related concern is that the co-operative does not have marketing and international trade expertise. The limited success that the co-operative and its farmers have achieved in selling their coffee on the international market is largely due to the efforts of the Foundation working in partnership with the Mutual Fund to provide the co-operative with access to international buyers. The sale of its coffee in the international market has been facilitated by a marketing company that is owned and controlled by the Foundation with the argument that its participation in marketing the co-operative by creating a global branding and promotion exercise is beyond what the co-operative could have achieved on its own. The marketing company does acknowledge that it controls the coffee value chain and makes the argument that it will provide a share of the benefits to the co-operative in the future. "The farmers' co-operative will soon hold equity in the marketing company", reveals its CEO.

From the evidence presented in this case study, it is clear that the coffee farmers face many hurdles in being able to use the coffee they grow to sustain their livelihoods. This is due in part to their lack of control over the coffee commodity supply chain, and also due to

the volatility of the commodities market in general. In order to mitigate the effects of the coffee market volatility, the farmers in this case study have turned to participation in an agroforestry programme, which has supplied them with other income sources. Despite this, their lack of marketing acumen and access to end consumers imposes on them a continued dependence on corporate value chains.

Discussion and conclusion

In this case study our focus is to provide a counter account from the margins as represented by the members of a co-operative of indigenous coffee farmers, highlighting the role played by the ecosystem services provided by nature in promoting a sustainable livelihood. We do this by using the labour theory of value in combination with agroecology as the theoretical framework. By utilising the labour theory of value, we have introduced the notion of the labour power of nature as represented by the ecosystem services that nature provides. In the case of agroecology, these services of nature are not monetised and instead nature provides inputs for free. If the farmers were to use the techniques of industrial agriculture, they would have to purchase these inputs through the sale of their labour power. This would lead to farmers being crushed between the rising costs of their inputs and the falling prices offered for their produce as noted by Jack (2007).

The coffee farmers have been able to obtain ecosystem services from the services provided by agricultural biodiversity through the use of agroecological methods such as CPP, vermicomposting and the planting of beneficial plants such as *Gliricidia*, which is a nitrogen fixer. This has allowed for the substitution of the expensive inputs of monoculture agriculture with alternative agroecological farming practices, which have enabled them to retain a portion of the value generated on their farm. Furthermore, the coffee farmers have actively diversified their income by cultivating different fruit trees, encouraging biodiversity and opening up new sources of income beyond coffee using agroecology. This has led to farmers having an increased level of immunity from the fluctuations of the global coffee commodity prices, resulting in the potential improvement in their livelihoods and autonomy. The savings of about US\$860 per year from the ecosystem services provided by nature (Ninan and Sathyapalan, 2005) provides evidence of the emancipatory potential of using agroecological methods of farming.

However, as seen through the continued dependence of the co-operative on the Foundation and its marketing company, the coffee farmers are still at the mercy of agribusiness supply chains that control the price of the produce on the farm. The coffee co-operative is providing surplus value to the companies that control the value chain into which it sells its produce, since it has limited avenues to sell its produce directly to the end consumer. Thus, despite the evidence of progress through the use of agroecological methods at the farm level, challenges still remain within the value chain. The emancipatory potential of an agroecological transformation can be considered to be complete when the two most important parts of the food system – consumers and producers – can be directly linked through the development of alternative food networks.

The Foundation as well as the Mutual Fund have utilised the agroforestry project for the generation of surplus value for themselves through “the commodification of labour” (Cooper and Puxty, 1996, p. 290) of the smallholder farmers and their co-operative. This is consistent with how value is shared within the capitalist system, where the profit that is generated, represented by surplus value, comes from the production and sale of commodities based on the unpaid labour of both humans and nature. The unpaid labour is the labour invested by the farmers in growing crops whose value is not paid to them when they sell their produce into the value chain. Despite using the principles of agroecology, the co-operative of smallholder farmers is dealing with a situation where in addition to their unpaid labour, the labour of nature is also unpaid and is being appropriated as surplus value.

Despite taking an agroecological approach at the farm level, the Foundation has not been able to facilitate empowering the coffee co-operative to begin a focus on consumers within their local area in Southern India. As evidenced by how the government treated the coffee co-operative – when they attempted to take up the trading of tamarind – support from governmental agricultural policy is also required to enable the transition towards more sustainable food economies. Only then can the process of building a new global food system, based on resilience, participation, localness, fairness and justice, begin. This will require participation from government by supporting research on agroecology as well as reducing support for agribusiness subsidies, which promote the continuation of industrial monoculture agriculture.

This study has contributed to the accounting literature, providing a counter account of smallholder farmers, which is consistent with the accounting from the margins approach (Gray and Laughlin, 2012). This study was able to extend the accounting for biodiversity literature (Jones, 1996, 2003) through a focus on the value created by the actions of both human labour as well as the labour of nature. This study has also introduced the concept of sustainable livelihoods as the means to achieve sustainable development in the context of smallholder farmers.

We call for further studies that provide socio-ecological accounts from the margins by examining the social and environmental impact of policy initiatives and the operations of large agribusiness companies, including the environmental damage from the use of fertilisers and pesticides. These studies should examine the accountability of both governments and non-governmental organisations in promoting the use of industrial agriculture, which not only has an adverse impact on the livelihood of the smallholder farmer, but potentially also has a negative impact on the health of the farmers as well as consumers. There is also a need for studies that look at carbon accounting within agriculture, further developing the impact of fertiliser use on increasing GHGs. Furthermore, the labour theory of value framework has the potential for application in other labour intensive sectors.

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