

Agricultural co-operatives for managing natural capital to achieve UN Sustainable Development Goals 12 to 15: A conceptual framework

Abstract

Natural capital is becoming an important topic for global biodiversity and sovereign risk of nations for their food supply chains which can be linked to the United Nations Sustainable Development Goals 12 to 15. In this paper we explored the literature to develop a conceptual framework to determine how primary industry co-operatives (such as in agriculture and aquaculture) can play a role in managing natural capital. The conceptual framework developed shows that members of co-operatives have roles to act within their organisation that utilise natural capital. Acting out these roles may see the co-operative become pro-active in governing its natural capital based on economic and social goals which are guided by the co-operative principles and values. Working with the financial services sector, co-operatives would be able to engage with their members to educate and share knowledge on strategies to manage and/or mitigate the risk of natural capital depletion. This can be managed through farm management techniques and financial instruments such as credit and insurance.

Key Words

Co-operatives, Natural Capital, UN SDGs, Climate Change, Insurance, Finance, Sustainability

1 Introduction

Increased pressure on food production has resulted in the degradation of land and natural resources which have been further exacerbated by other factors, such as deforestation and climate change (Salvini, Dentoni, Herold, & Bregt, 2018). Natural resources are regarded to be a form of capital, i.e., Natural Capital. Natural Capital (NC) can be defined as components

of the earth's renewable and non-renewable assets in its eco-system that provide a flow of benefits to people (Terama, Milligan, Jiménez-Aybar, Mace, & Ekins, 2016). When NC is abused, depreciation in value occurs and if pushed to the brink, productivity is threatened exposing critical risks to economies, increased food insecurity and endangering the well-being of humankind (OECD, 2021). If unattended, NC can collapse exponentially (Islam, Yamaguchi, Sugiawan, & Managi, 2019).

Unsustainable agricultural production, harvesting and animal grazing impair the function and delivery of natural eco-system services (Grantham, Tibaldeschi, Izquierdo, Mo, Patterson, & Rainey, 2021) which contribute to NC depletion. Farmers can be compromised as they are impacted by climate change, with excessive use of chemicals, fertilisers, soil tilling and livestock emitting methane etc. in the pursuit of cost reduction and yield maximisation, they also contribute to NC depletion and climate change.

The purpose of this paper is to develop a conceptual framework which explores the management of NC in agricultural systems through co-operatives. Conceptual frameworks serve as useful ways to illustrate a common understanding between stakeholders of major causal relationships and pathways (Olander, Mason, Warnell, & Tallis, 2018) and to be used as a blueprint for valuation in many assessments (Marais, Baker, O'Grady, England, Tinch, & Hunt, 2019). We also aim to provoke thinking of this important topic for agriculture/aquaculture-based co-operatives.

A co-operative is a business owned and controlled by members who use its services (Briscoe & Ward, 2000; ICA 1995). For the purposes of this paper, members of co-operatives are farmers, and they represent micro, small to medium-sized enterprises, that is (M)SMEs. According to the World Cooperative Monitor (2021) research into the top 300 co-operatives by turnover in US\$, the agriculture sector represents 32.7%, and by GDP, it forms 31.7% of all economic activities. This makes co-operatives and economic activities undertaken through them, a powerful platform within the agriculture industry as they exist in almost every country of the world, in low- medium- and high-income countries (World Cooperative Monitor, 2021).

The co-operative does not own the individual farms. However, it is reliant on the individual farmers to manage their NC which contributes to the yield and output of product required for the agricultural co-operative to deliver food to the market. Co-operatives can also be supported by the financial sector to operate smoothly through challenging periods with finance and insurance products.

Specifically, this paper explores how the following stakeholders can contribute towards managing NC through co-operatives:

- 1) the farming members of agricultural co-operatives.
- 2) the co-operative board and management.
- 3) the financial services sector.

Agricultural co-operatives are commonly established to respond to market failures, or market unpredictability, through collective action as a community of members to achieve solutions to problems to which they are confronted (Cook & Iliopoulos, 1999). The focus of a co-operative is on the economic and social objectives important to its members, rather than on profit maximisation to shareholders (Novkovic, 2008). This is not to dismiss the importance of profit maximisation; however, co-operatives are known to entail stronger commitment and social action towards community policies (Juliá & Meliá, 2004) but must still generate profit to exist.

In relation to the conceptual framework in this paper, we propose that co-operatives play an important aspect to both the economic and social objectives in the effort to collectively manage natural resources for business sustainability, being a platform that can achieve some of the United Nations Sustainable Development Goals (UN SDGs) and facilitate access to financial services products that can reduce risk both, of farming operations and to NC.

In this endeavour, the contribution of this analysis to the literature is to put forward the gravity of co-operatives in managing NC. The literature is focused on how co-operatives can contribute towards the UN SDGs with examples on how certain co-operatives can improve

their business performance. Specific research on NC management through agricultural co-operatives is yet to emerge.

The remainder of this paper is structured as follows. First, we examine the literature that is relevant to this investigation. Second, from the literature review, we develop our conceptual framework to determine how agricultural co-operatives can form the basis of risk reduction related to their NC. We then provide a discussion on how this framework has practical implications, limitations, and future research considerations.

2 Literature Review

There are vast bodies of literature that describe the link between climate change and other environmental challenges and agricultural systems. Achieving sustainability and regenerating natural capital are also part of the UN 2030 SDGs global agenda. With the particular focus of this investigation being on co-operatives, this is another area of research interest, as is the role of the finance sector in reducing risk in agricultural activities. How NC should be valued to form part of the financial system is another challenge. According to the UCISL (2022a), valuing nature must be considered with every finance decision to avoid irreparable damage. Capital should be utilised towards activities which can restore and protect nature. All these issues are explored in further detail below (UCISL, 2022b).

2.1 The United Nations' Sustainable Development Goals

The UNs' 17 SDGs are defined commitments which were agreed upon by the representatives of 193 countries in 2015 with the aim to achieve economic, social, and environmental targets and associated indicators (Imaz & Eizagirre, 2020). Specifically, SDGs 12, 13, 14, and 15 can be facilitated through co-operatives, an area specifically researched by Díaz de León et al. (2021) and shown in Table 1.

Agricultural co-operatives can acquire and develop new knowledge which would be of benefit to the members in addition to themselves as organisations due to their vast networks

and membership base. This is also one of the reasons SME members join co-operatives according to Ghauri et al. (2020a). Through training sessions, knowledge can be built for the members which would be shared with the community. Agricultural co-operatives can therefore play a pivotal role towards aligning the SDGs with NC through their platform to achieve both economic and social outcomes. Agricultural co-operatives should be considered by UN country-members as a key stakeholder to fulfil the SDGs and their objectives (Díaz de León et al., 2021).

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Exploring the UNs' SDGs through different perspectives of their social impact can provide further examination of this phenomenon (Gau & Viswanathan, 2018). Agricultural co-operatives can contribute towards the sustainability global agenda, and they have been recognised by the United Nations' Task Force towards achieving some of the UNs' SDGs (Fernandez-Guadaño, Lopez-Millan, & Sarria-Pedroza, 2020). This is because agricultural co-operatives can contribute towards environmental development through protection of the environment from damage or danger (Díaz de León, Díaz Fragoso, Rivera, & Rivera, 2021). Agricultural co-operatives can also be contributors towards sustainable development because of their importance for rural sustainable development and the survival of the territories/communities in which they operate (Fernandez-Guadaño et al., 2020). Gau & Viswanathan (2018) suggest they could offer a bottom-up strategy to develop an understanding on how to effectively design and implement SDGs.

2.2 Natural capital and climate change in agricultural systems

Globally, there has been increased pressure on food production leading towards degradation of land and natural resources (Salvini, Dentoni, Herold, & Bregt, 2018). Economic activity not only impacts on NC, but is dependent upon it, and when exposed to destruction, poses severe economic shocks (OECD, 2021). Climate change is a global threat to food

security (Mbow, Rosenzweig, Barioni, Benton, Herrero & Krishnapillai, 2020) impacting agricultural land holders through reduced crop yields and losses in harvest (Beltrán-Tolosa, Navarro-Racines, Pradhan, Cruz-Garcia, Solis, & Quintero, 2020). Financial constraints, such as poor access to credit or insurance, exacerbate the socio-economic unpredictability for farmers due to climate change impacts (Sietz, Choque, & Lüdeke, 2012). Limited awareness by farmers of the impact climate-smart agriculture has on minimising losses (Muench, Bavorova, & Pradhan, 2021) results in incorrect strategies for adaptation which lower agricultural preparedness and productivity (Woods, Nielsen, Pederson, & Kristofersson, 2017).

The sustainability of natural farm resources over the longer term is difficult to maintain (Vilei, 2011). Due to the randomness of weather variability, profits from crop production have become uncertain (Cong et al., 2017) with impacts of climate change persistently increasing (Duncan, Saikia, Gupta, & Biggs, 2016). To combat these impacts, neither mitigation nor adaptation strategies would be beneficial. Mitigation can be defined as actions undertaken to avoid or lower the impact of risks before an associated natural hazard occurs (Hayes, Wilhelmi, & Knutson, 2004). Adaptation can be regarded as those actions which can adjust risk and respond to the changes triggered by the natural hazard (Smit & Wandel, 2006).

The assessment of NC “risk” in agriculture is a major challenge as there are large numbers of individual farmers (Ascui & Cojoianu, 2019) geographically dispersed in the form of (M)SMEs, each working within their respective business operations. Left to their own accord, if they ignore NC, direct self-degradation occurs because in essence, they are depleting or destroying their own production assets (Miribung, 2020). This is done through the production and utilisation of non-environmentally friendly farming methods and techniques such as application of chemicals and poor irrigation practices.

Studying the various aspects of managing on-farm NC goes beyond the scope of this paper, however the explored literature shows there is an increasing interest in this area. For example, farmers who are more active in managing their soil NC through adaptation strategies develop cost-effective business practices to respond to climate change risks (Cong et al.,

2017). Awareness campaigns related to the use of pesticides and fertilisers can also improve adaptive farming approaches (Biggs, Gupta, Saikiad & Duncan, 2018). Irrigation and the deterrence of deforestation (Fahad & Wang, 2018) are similarly approaches to combat climate change impact on farming and its NC. Ultimately, NC, if mis/overused, will depreciate in value and if pushed to the brink, productivity can collapse resulting in critical risks to economies, the ability to provide food and the well-being of humankind (OECD, 2021).

In the Asia-Pacific region, climate change and natural resource depletion are threatening sustainability. Africa is threatened by drought, salinity, and wildfire, whilst Europe is increasingly witnessing dangerous temperature increases and coastal sea level rises (Islam et al., 2019). In Australia, agricultural businesses occupy and manage 51% of its landmass (ABS, 2016/2017). They play a role in managing Australia's NC stocks that provide benefits to the well-being of the country's population (Natural Capital Committee, 2013).

The agricultural system faces significant challenges due to climate change factors. Specifically, water, soil and natural vegetation are NC which needs to be preserved for sustainability. With respect to the agriculture system, Figure 1 provides examples of the impact water, soil and vegetation have on crops and livestock at the farm level:

INSERT FIGURE 1 HERE

Figure 1 shows some of the challenges and issues faced by farmers with the list not being exhaustive. For example, water as an issue also refers to its suitability (including salinity, traces of dangerous elements and eutrophication among others) for crops and livestock, let alone availability and storage issues due to droughts and floods. Water holding capacity (for example, dams, water retention in soil, evaporation rates etc.) assists crops and pastures to survive during droughts protecting them from adverse climate impacts (Cong et al., 2017). Vegetation not only serves for animal shelter and protection, but also as a source of feed and wind breaks. Natural and native vegetation, which also acts as an important shelter for infant livestock and protects soil against erosion, may also be exposed to catastrophic fires

impacting on livestock systems and crops. Different soil types are required for various crops. For example, the trace elements required in the soils for broad acre farming differ from those needed for stone fruits. Soil, as a natural capital, impacts on the yield. Managing the soil ecosystem has been proven to benefit farmers in reducing the risk and variability of production (Cong, Termansen, & Brady, 2017).

Therefore NC has a close association to some of the UNs' SDGs, in particular Goals 12 to 15. Agricultural co-operatives, we propose, can provide an efficient strategy to develop collective action in response to climate change and other environmental challenges related to NC. Membership in a co-operative can offer farmers improved productivity, risk sharing, access to resources otherwise difficult to obtain, and an opportunity to strengthen their knowledge and social networks (Krivokapic-Skoko, 2002). For many (M)SMEs, the co-operative business model represents a means of forming strategic alliances via collective ownership of resources within a social network that engenders trust and collaboration (Gall & Schroder, 2006) towards achieving common goals.

2.3 Co-operatives as a vehicle for managing natural capital

It is known that co-operatives are better able to implement the principles of sustainable development in its economic, social, and environmental attributes (Mozas-Moral & Puentes, 2010). Agricultural co-operatives have the potential to provide environmental benefits through efficiency in their supply chains transferring knowledge and skills to reduce environmental uncertainty (Branchenko & Oglethorpe, 2011).

Agricultural co-operatives have the potential to become an integral partner to facilitate access to information, education, and knowledge for many of their members because of their size and role in the agricultural sector. Furthermore, agricultural co-operatives may be in the position to influence members on important contemporary issues such as climate change and NC.

The International Cooperative Alliance (ICA), the global representative body for cooperatives, prescribes the principles and values according to which agricultural co-operatives operate. Table 2 provides the ICA's (1995) definitions for these co-operative principles. Although they do not doctrine, for the most part, co-operatives are guided by these principles (Baranchenko & Oglethorpe, 2011) thereby ensuring benefits associated with their business model are not abused. These principles underpin the co-operative movement and collective action through both economic and social outcomes. Adhering to such social and economic objectives can be a valuable way to strengthen members' commitment to the cooperative (Jussila, Goel, & Tuominen, 2012) and achieving collective goals. At times drift can occur where the co-operative principles and values are not being implemented as is the situation in the case study analysis conducted by Ghauri, Mazzarol & Soutar (2021b). Nevertheless, for the most part, the co-operative principles and values form the co-operative identity.

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These principles can also play a role in the implementation of the UNs' SDGs (Martinez-Leon, Olmedo-Cifuentes, Martínez-Victoria, & Arcas-Lario, 2020). An example of this is where the principle of voluntary and open membership contributes to poverty elimination or SDG 1 and gender equality or SDG 5), while the principle of education, training and information contributes to improvement in education or SDG 4 (Fernandez-Guadaño et al., 2020).

The principles of education, training and information can be leveraged to highlight the importance of how SDGs relate to NC and members of the agricultural co-operatives. Co-operatives are able to work with farmers to collect data and reports which could be used as supporting education materials or case studies to share amongst their members.

Members also have different roles to perform within their respective co-operative as classified by Mamouni-Limnios et al. (2018). These are as follows:

- The *patron role* is the financial and functional value in trading with the co-operative (Mamouni Limnios et al., 2018). Members ultimately patron a co-operative to obtain fair

prices, quality service and transactional efficiency (Mazzarol, Simmons, & Limnios, 2014).

- The *investor role* is important when a co-operative wishes to raise capital and grow or offer financial returns from profits to its members (Cook, 1995). In the investor role, a member is rewarded for their patronage with dividends or tradeable shares that have appreciable value (Mazzarol et al., 2014).
- The *owner role* is where members consider the co-operative as their own property. Members have a stronger sense of ownership when they recognise the cooperative as their own, embracing its true purpose and investing their personal resources (Jussila & Tuominen, 2010).
- The *community member role* can be a powerful motivator for non-economic returns (Fulton, 1999). ‘Soft’ or social outcomes can be combined with ‘hard’ economic objectives when creating a cooperative’s member value proposition (Simmons, 2015).

These roles need to be engaged with the co-operative board and management team which can lead to action on NC at farm level. An important element of agricultural co-operatives is that members are (M)SMEs or investor-owner firms themselves (Van Dijk, 1999). The (M)SME owner decides on whether they should join a co-operative (Jussila et al., 2012), and it is typically assessed on their perceived utility derived from membership (Fulton & Adamowicz, 1993). In their study of why SMEs become members of co-operatives, Ghauri, Mazzarol and Soutar (2021a) found the following reasons that prompted membership: 1) economic, 2) knowledge & networking (Social), 3) business support, 4) administration, 5) services, 6) safety net and 7) lobbying & advocacy. Both economic and social outcomes can be observed within these reasons. Table 3 provides a summary of the reasons that prompt co-operative membership.

It can be noted in Table 3 that the second reason for SMEs joining co-operatives is for knowledge and networking (social). Knowledge, or education, which is also a key principle of co-operatives, is central to achieving the SDGs to make future managers, policy makers and consumers aware of their roles towards sustainable development (Azmat & Polonsky, 2018). This can also extend to members of agricultural co-operatives because they are the source of food supply chains.

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Baranchenko and Oglethorpe (2011) conclude in their study that agricultural co-operatives have the potential to provide environmental benefits via efficiency to their supply chains to transfer knowledge and skills that will ultimately reduce environmental uncertainty through the reduction of GHG emissions. Their model, however, neglects to take into consideration the different roles of members which ultimately approves the decision making of the board and management to influence the agricultural co-operative's ability to achieve success. Member roles have been traditionally conflated in the past, however the four-member framework proposed by Mamouni-Limnios et al. (2018) has received new interest in the roles members have in their co-operative. Supporting this framework is the findings of Ghauri, Mazzarol and Soutar (2022) who concluded that co-operative members have to be more active beyond the traditional patron and investor functions. Member roles can be stimulated to achieve outcomes (Ghauri et al., 2022) that are more favourable to the entire co-operative and its members towards meeting established objectives.

Another critical aspect is the co-operative board members' duty of care. Board members are elected by the co-operative membership and traditionally include at least one member to represent them. The board, management, and members should, we argue, evaluate if NC poses a risk to their operations. This is of crucial relevance because members often rely on management to lead their agricultural co-operatives to foster competitiveness (Miribung, 2020). Given agricultural co-operatives operate within the localities of their members, they are

in a position of trust and influence (Gertler, 2001). This renders their communications to be more advantageous and effective as locally controlled organisations (Ortíz Mora, 1994).

Management is a crucial element to agricultural co-operatives because of reported difficulties in attracting the right team members due to salary constraints. This is in addition to management requiring a different mind-set compared to the traditional investor-owned firm (Imaz & Eizagirre, 2020). Co-operative members need to ensure that the managerial team takes into considerations NC as a whole to maintain business sustainability. An example is the Geraldton Fishermen's Co-operative (GFC) which lobbied successfully for fishing quotas to ensure stock would be replenished for future generations (GFC, 2022). Each year the co-operative plays a lead role in managing the total allowable commercial catch and a ban on catching breeding females in order to preserve future stock. This is possible because of the foresight by the board.

Adapting to climate change is essential in this process. Knowledge gained through networks is a proxy leading to awareness of the necessary changes for strategic adaptation by farmers for planning purposes (Kopytko, 2018). Such a planned approach of adaptation requires co-operative action (Brooks & Adger, 2005). Ghauri et al.'s (2021a) seven reasons why SMEs join their co-operatives confirm that members look to achieve economic outcomes via their organisations providing them with knowledge and networking (social), business support, administration, services, safety net and lobbying and advocacy, that is, the co-operative is configured to improve the (M)SME in its own right.

Fahad and Wang's (2018) study of farmers impacted by climate change also notes that a lack of access to credit, market access and information and knowledge were some of the constraints to which they need to adapt. Organisations can lower their environmental impact throughout their supply chains through pro-active co-ordination with their buyers and sellers (Salvini et al., 2018). Agricultural co-operatives can also provide such benefits as they are reasons why members join them in the first instance, i.e., to create efficiencies in the supply chain enabling consolidation and simplification (Baranchenko & Oglethorpe, 2011).

These co-operatives can serve as facilitating partners in alliances across various stakeholders, such as different levels of government, NGOs, and other industry organisations, to promote training, communication, education, and belong to contemporary movements focussing on pressing global issues, such as the natural environment (Gertler, 2001). In addition to this, research has shown farmers who have access to credit, participated in training frequently and those who were members of a co-operative adapted better to climate change impacts than those who were not members (Muench, Bavorova, & Pradhan, 2021).

In their study of Spanish olive co-operatives, Mozas-Moral, Fernández-Uclés, Medina-Viruel, and Bernal-Jurado (2021) found the implementation of the UN SDGs, in particular Goals 12, 13 and 15, had a positive impact on performance of the co-operative; this included concern for the environment. Díaz de León et al. (2021) also determined the UNs' SDG 12, in addition to the others they cited, had a clear alignment and benefits for co-operatives in Mexico. When there are collective goods in discussion, such as NC, co-operatives can benefit rural societies due to their strength of creating cohesion (Sánchez-Martínez, Rodríguez-Cohard, Garrido-Almonacid, & Gallego-Simón, 2020).

2.4 Challenges in valuing natural capital

Whilst it is beyond the scope of this paper to provide valuation methods on NC, it is important to note some of the challenges in doing this. If decision-makers in business and government currently do not see the benefits NC assets have in supporting the ecosystems in which they operate, this could result in risk for both businesses and the broader economy (Leach, Grigg, O'Connor, Brown, Vause, Gheysens, ... & Jones, 2019). The interaction between NC and the agricultural business does not immediately impact on market value, production and cashflow rendering NC to be undervalued, or not be valued at all (Marais et al., 2019).

Confusion exists in the valuation of NC because of challenges identifying the critical components and their importance (Islam et al., 2019). Most nations measure productivity by

GDP; however, this measurement does not take into consideration the depletion or use of natural resources (Dasgupta, Duraiappah, Managi, Barbier, Collins, Fraumeni, ... & Mumford, 2015). Accounting for natural resources in most countries has also not been utilised in decision making (Virto, Weber, & Jeantil, 2018). This demonstrates the difficulty in not only measuring NC, but also establishing a consistent methodology for the world to follow.

For those who have a strong sense of sustainability, NC is considered to be non-substitutable and should be protected from depletion (Islam et al., 2019). According to this view, NC cannot be easily measured in monetary terms, especially from a social cost-benefit perspective (Missemer, 2018). At the other end of the spectrum, those having a weaker sense of sustainability accept substitutability of NC allowing a monetary value for a social cost-benefit analysis (Islam et al., 2019). This weaker view allows for NC depletion to be compensated by human-made capital stocks (Chiesura & De Groot, 2003).

Despite the challenges and differences in perspectives, there has been slow agreement and possible frameworks for valuing NC. The NC accounting framework takes into consideration information on stocks and flows of natural resources in both physical and monetary terms, however, it is hardly utilised within the context of decision making at the farm level (Marais, Baker, O'Grady, England, Tinch, & Hunt, 2019). If it is utilised, the accounting protocol can determine the nature and extent of farming operations' impacts and dependencies on NC (Ascui & Cojoianu, 2019).

An ability to value NC provides the opportunity for both the financial and insurance sectors to play a role within agriculture systems from the perspective of the environment and sustainability. This however requires data, which is often limited rendering constraints on quantification (Burkhard, Kroll, Müller, & Windhorst, 2009). However, once a baseline is developed, farmers can monitor the value and condition of their NC assets over time to facilitate investment and operational decisions (Marais et al., 2019).

2.5 Risk reduction and the financial sector

Smit and Skinner (2002) suggest that financial instruments are included in the suite of strategies to manage farmers' exposure to NC risk include in addition to cultivar selection, technology and crop diversification. Finances can be used to purchase effective and efficient farming technology and insurance can offset damage from climate induced losses in production. There are limited methods for assessing NC for lending, investment (Ascui & Cojoianu, 2019) or insurance purposes. Climate change impact measurement on NC is also rare, if existent at all (Georgopoulou, Mirasgedis, Sarafidis, Hontou, Gakis, Lalas, & Zavras, 2015).

The Natural Capital Declaration, signed by 40 international financial institutions in 2012 to take into consideration NC, is limited with respect to credit risk assessment for bank loans (Cojoianu & Ascui, 2018). Reasons for this are the challenges around the general awareness of NC, opportunity costs between long-term issues versus short-term gains, lack of industry standards and methods to quantify NC risks (Cojoianu, Hoepner, Rajagopalan, & Borth, 2015).

In 2016, the Chair of National Australia Bank, who, according to Ascui and Cojoianu (2019), provides financial services to one in three farmers in Australia, stated in his speech titled "Advancing Australia's natural capital" that:

"As a bank, we understand that the commercial opportunities available to our agribusiness customers are heavily dependent on the quality of their natural capital assets. ... [T]hose who manage their natural capital well – their soil health, water, energy and bio-diversity – tend to be more resilient and more productive over time. ... We need to manage our natural capital with the same diligence that we manage our financial capital." (Henry, 2016)

The above quote demonstrates how the topic of NC was on the radar of banks in Australia. There is a clear indication that their agribusiness customers require financial products and services however banks are becoming aware of risks associated with a decline

in NC if not managed. The development of context-specific impacts of environmental risks on NC may provide opportunity and benefit for borrowers to be made aware of such risk to be identified and incorporated into their business operations (Cojoianu & Ascui, 2018). This may lower the risk associated to their farming practices by reducing potential depletion or climate impact of NC.

There are very few examples in the literature to assess NC in a systematic manner for both lending and investment purposes (Ascui & Cojoianu, 2019). Lenders tend to rely on their experiences as the best guide rather than provide a value to environmental risk (Coulson, 2002). A mix of art and science is required to balance the complexities of reframing the financial statement mindset of lending institutions to include long-term implications of NC in the same manner short-term financial capital is observed and managed (Ascui & Cojoianu, 2019).

The insurance industry is also exposed to the effect of climate change and subsequent frequent and intense catastrophic events resulting in payouts impacting the insurance industry (Collier, Elliot, & Lehtonen, 2021). There is limited literature on insurance and NC. Quaas, Baumgärtner, and De Lara (2019) found that the insurance value of NC may be positive or negative where the level and sign of insurance value are related to the conservative use of eco-systems and investments. One of the questions posed in the insurance value concept of NC is whether an increase in NC decreases or increases the risk premium of the eco-systems user (Quaas et al., 2019).

Although bank lending has yet to develop consistent methods to value NC, the insurance and re-insurance industry sees climate change as a business opportunity to assess and manage the associated risks (Collier et al., 2021). Assessment tools, such as catastrophe modelling (Johnson, 2013), have become the “gold standard” and widespread for risk assessment (Collier et al., 2021). Such tools facilitate the distribution of catastrophic events through advanced risk transfer mechanisms (Aguiton, 2019).

The concept of insurance value has been used to analyse agro biodiversity (Baumgärtner & Quaas, 2010), soil biodiversity (Pascual, Termansen, Hedlund, Brussaard, Faber, Foudi & Jørgensen, 2015), and environmental risks, including landslides, flooding and wildfires (Huang, Finkral, Sorensen, Kolb, 2013). The perception of risk relies on experience in management decisions (Jørgensen, Termansen, & Pascual, 2020). This was tested by Schaub, Buchmann, Lüscher, and Finger (2020) who showed that the management of grasslands through crop diversity impacted positively on both yield and reduced risk. The value of insurance on NC can be maintained through preservation, secured through sustainable use and enhanced through restoration of ecosystems (Primmer & Paavola, 2021). According to Collier et al. (2021), research shows insurance establishes social relations through individuals, institutions, states, and markets because it can bring accountability to various stakeholders.

This brings us to the development of our conceptual framework where we propose that the financial services industry, through both lending and insurance practices, can work with agricultural co-operatives to support the management of NC in farming regions. This could generate a larger coverage of farming communities and stakeholders to identify context-specific risk identification, assessment and management practices of NC. Once a framework for measuring NC is created and agreed upon, it may provide a snapshot of where a country's NC is being depleted (Fairbrass et al., 2020), throughout various regions and communities. This will also positively impact the performance of the agricultural sector which is highly reliant on the state of the natural environment.

3 Conceptual framework

Based on the literature emerging on the topic of NC, we propose our conceptual framework shown in Figure 2.

INSERT FIGURE 2 HERE

As indicated earlier, by reflecting on why SME members, such as farmers, join co-operatives, Ghauri et al. (2021a) outlined seven reasons. All of these reasons can have some form of NC element encompassed in them. For example:

1. Economic outcomes can only be realised if NC continues to provide yields/output.
2. Knowledge & networking are required to provide information and collectively, members can work together to manage regional and community NC once they understand NC's significance.
3. Business support can assist transitioning towards NC management.
4. Administration can assist farmers with tracking NC within their regions and communities.
5. Services can be created by the co-operative to collaborate with the financial sector to create instruments to assist with NC improvement and transfer of climate change risks.
6. Safety net provides sustainability into the long-term management of NC.
7. Lobbying and advocacy helps develop support for the co-operative members through policies and incentives provided by the government, financial services, and NGOs.

Within the co-operative, members have four roles (Mamouni-Limnios et al., 2018; Ghauri et al., 2022). We agree with the advice of Ghauri, Mazzarol and Soutar (2022) who suggested that these traditional roles can become more active and thereby suggest the roles be used specifically in the context of the identification of NC management.

The roles of investor, owner and community members need to be especially considered. As investors, members need to consider investing in their farming enterprises which should include investing in NC. Secondly, as owners, they have the responsibility to ensure their farming enterprises are future proof producing sustainability well into the future. Finally, as community members, collectively they should have a sense of responsibility for their region's NC to ensure a sustainable agriculture industry. This also provides strong motivation for the co-operative in its governance to ensure it is mindful of NC which ultimately is managed by its members at the farm level. As owners and community members of a co-operative, members should be engaging with its board and management team to satisfy risk and governance for business sustainability. We do not discount the patron role. With respect to the conceptual framework, we regard the patron and investor role as one where members would utilise NC strategies and financial instruments to assist in NC management.

All stakeholders in the value chain can collaborate to investigate scenario planning where certain NC's can be assumed to be available, for example, at 50% and 25% capacity along with the impact it would have on each stakeholder. This would demonstrate or highlight the urgency required for NC management. Whilst there are various accounting frameworks and protocols available, simple examples should be developed through scenario planning to demonstrate the flow on impacts to the farm, co-operative and ultimately the supply chain. For example, reduction/depletion in NC dependencies such as pollinators, water, soil degradation and others can all be plausible markers to approximate the impacts on production over a three-, five-, and ten-year period. We must be cognisant that the maintenance of NC occurs over the long term whereas investment is viewed within short time frames in monetary and liquidity terms (Van den Belt & Blake, 2015). Therefore, a strategy to demonstrate various scenarios could be impactful on the farmers and develop a longer-term outlook on NC.

Once this is achieved, co-operative members as patrons and investors can entertain discussions with the financial services sector, along with consultation of the board and management, to develop appropriate products and services to meet their particular requirements. On this basis, the co-operative can serve as the facilitator to engage with all

stakeholders to disseminate knowledge, provide business support, services, and economic outcomes for its members through lobbying and being advocates of NC management.

The financial services sector, by working with the co-operative and engaged members, can develop a suitable range of financial instruments to facilitate both NC and respond to climate change impacts on farming enterprises. This could be through adaptive or regenerative farming techniques. With engaged members of the co-operative, the financial services sector could co-develop instruments which would appeal and result in better utilisation. In this regard, the co-operative becomes a central actor in the process by both engaging and educating its members to provide economies of scale for the financial services organisations wanting to benefit from this new market opportunity. There are co-operative banks which can also partake in this which aligns with the principle of “co-operation amongst co-operatives”. Insurance co-operatives also make up a large percentage of the top 300 co-operatives by USD turnover representing 34% (World Cooperative Monitor, 2021). They too present an opportunity to co-operate with their fellow co-operatives.

The co-operative board and management should be cognisant of business sustainability with respect to NC and the UNs’ SDGs. It is important to bear in mind that the co-operative does not own the agricultural land, this is owned by members. Co-operatives therefore are more of a facilitator to promote education, training, and information. If this is achieved, it can be argued that good governance is implemented by virtue of the co-operative principles of education, training and information being delivered.

Co-operatives can implement changes to assist their members to meet with the UNs’ SDGs (Sánchez-Martínez et al., 2020). This is well recognised within the countries of the European Union where co-operatives are believed vital for regional development and contribution towards the economy, society, and the environment (Chaves, 2008).

4 Conclusion

The conceptual framework developed in Figure 2 can bring awareness to governments, NGOs, and financial services to engage with agricultural co-operatives in their respective countries. In doing so, policies and funding could be made available to protect NC whilst simultaneously investing in it for the longer term.

Not all countries may have data collection points that are current, reliable, and sufficiently sophisticated to capture the information used for NC and climate change assessment. Agricultural co-operatives have an opportunity to utilise our conceptual framework to be the facilitator of this essential approach to also capture data which can become valuable information and then knowledge. It is a matter of urgency given unprecedented impacts on the climate and biodiversity around the world today. This endeavour would restore or preserve NC for the longer term and create a sustainable value chain cognisant of the pressures faced by climate change and other environmental challenges on the production and supply of food.

The practical and managerial implications of the conceptual framework include:

1. Broader understanding of the issue on NC and the need for a longer-term time horizon perspective for its management. This needs to be facilitated through capacity building, knowledge sharing and developing a sense of urgency.
2. Co-operatives need to be proactive in protecting their value chain(s) as a matter of governance to ensure members continue benefiting from their membership. If supply or patronage of the co-operative is impacted negatively due to NC depletion or climate change impacts, this reduces the flow of income through the co-operative's value chain and may lead to less active members supporting the co-operative. They may end up developing other strategies to survive resulting in the co-operative de-mutualising.

3. Co-operative members need to fulfil their roles with a NC mindset. That is to patron financial instruments provided through financial services institutions for their farming enterprises, invest in NC and technologies to modernise and future proof their farms, act as owners taking responsibility for their NC assets with a systems' thinking perspective, and working collectively as community members towards NC management.
4. Financial institutions and other actors within the value chain can work with a service-dominant logic approach to co-develop financial instruments to benefit the co-operative and its members.

We believe that our conceptual framework may provide opportunities for further refinement with case studies to test its power. The model needs to be tested and validated that will provide opportunities to accelerate the movement towards capturing large sectors of primary industry through the co-operative philosophy. Otherwise, we argue, an extremely difficult proposition is ahead of the sector when it comes to managing NC and climate change. Trying to engage with individual primary producers will not be efficient, especially when time is the essence. Primary industry remains vulnerable to climate change impacts, NC depletion and financial risk. The co-operative business model may very well be the most efficient method to facilitate global visions in a collective manner.

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Figure 1: Natural capital impacts at the farm level (with examples)

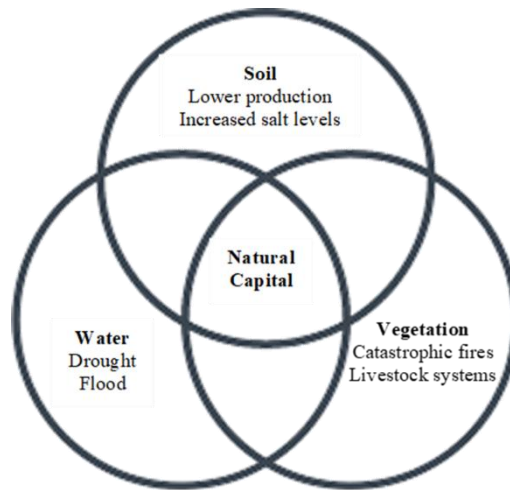
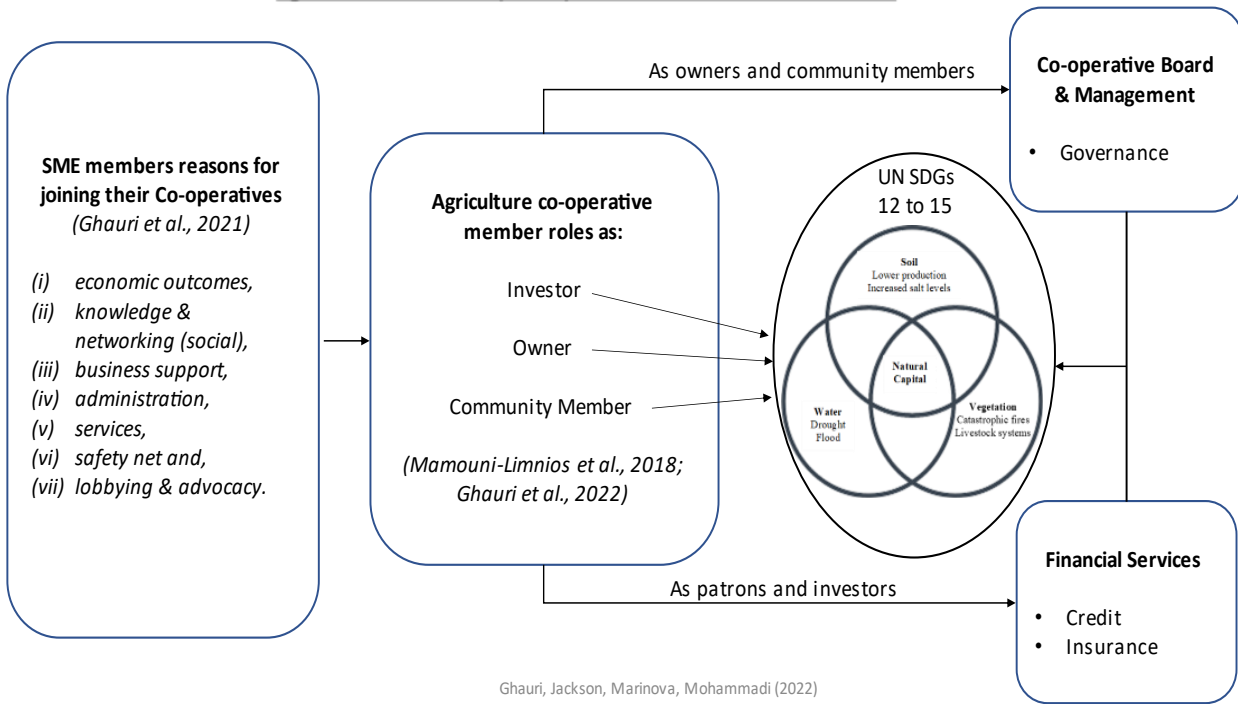


Figure 2: Conceptual framework to manage NC and UNSDGs by co-operative SME members and financial services

Agricultural Co-operatives: A conceptual framework to manage climate change impact on agricultural natural capital by members and financial services



Ghauri, Jackson, Marinova, Mohammadi (2022)

Table 1: Co-operatives' contributions towards United Nations Sustainable Development Goals (SDGs)

(Source: Díaz de León et al., (2021, 149)

SDG	Description	Co-operative strategies for implementing the SDG
Goal 12 – Responsible consumption and production	<i>Sustainable management of natural capital resources, reduction of food waste, as well as promotion of sustainable agricultural production practices.</i>	<i>The principles and values of co-operatives encourage reflection and change in production and consumption habits, both inside and outside the organisation.</i>
Goal 13 – Climate action	<i>Strengthening of environmental care measures, as well as education and awareness among communities.</i>	<i>Cooperatives involve people in the search for solutions and alternatives for managing the natural resources of their community. In addition, they promote friendly environmental laws and production processes.</i>
Goal 14 – Life below water	<i>Reduce sea pollution and protect marine and coastal ecosystems</i>	<i>Cooperatives involve people in the search for solutions and alternatives for managing the natural resources of their community. In addition, they promote friendly environmental laws and production processes.</i>
Goal 15 – Life on land	<i>Promote the sustainable management of terrestrial ecosystems. End deforestation and ensure the conservation of mountain ecosystems</i>	<i>Cooperatives involve people in the search for solutions and alternatives for managing the natural resources of their community. In addition, they promote friendly environmental laws and production processes.</i>

Table 2: Cooperative Principles

Principle	International Cooperative Alliance (ICA) Definition
Voluntary and open membership	<i>Cooperatives are voluntary organisations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political, or religious discrimination.</i>
Democratic member control	<i>Cooperatives are democratic organisations controlled by their members, who actively participate in setting their policies and making decisions. Men and women serving as elected representatives are accountable to the membership. In primary cooperatives members have equal voting rights (one member, one vote) and cooperatives at other levels are also organised in a democratic manner.</i>
Member economic participation	<i>Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all the following purposes: developing their cooperative, possibly by setting up reserves, part of which at least would be indivisible; benefitting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.</i>
Autonomy and independence	<i>Cooperatives are autonomous, self-help organisations controlled by their members. If they enter into agreements with other organisations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.</i>

Education, training, and information	<i>Cooperatives provide education and training for their members, elected representatives, managers, and employees so they can contribute effectively to the development of their cooperatives. They inform the public, particularly young people, and opinion leaders, about the nature and benefits of co-operation.</i>
Cooperation among cooperatives	<i>Cooperatives serve their members most effectively and strengthen the cooperative movement by working together through local, national, regional, and international structures.</i>
Concern for the community	<i>Cooperatives work for the sustainable development of their communities through policies approved by their members.</i>

Source: ICA (1995)

Table 3: Reasons why small and medium-sized enterprises (SMEs) join co-operatives

Theme	Summary
Economic	<i>All executives and members stated the reasons for joining a co-operative had to provide economic benefits. These economic benefits could only be achieved with like-minded people/businesses which provided the economies of scale i.e. strength in numbers.</i>
Knowledge & Networking (Social)	<i>It was noted that the SME members had limited access to resources that could assist them with various aspects of their businesses. The co-operatives were able to provide the technical and business knowledge to members to ensure consistency with respect to the services and products provided by the SMEs. Members also reported they benefitted through the social interaction with other members which also facilitated the transfer of knowledge. They all felt as one, operating as like-minded individuals who owned the co-operative.</i>
Business Support	<i>Business support referred to how the co-operative assisted their members with how to run their businesses. There are similarities between this, services, administration and knowledge & networking (social) themes.</i>
Services	<i>The services provided by the co-operative were specific to their industries. Co-operatives had to be careful to manage the expectations of the formal services to ensure they were able to be utilised by all members efficiently and effectively. Members sometimes had requirements from the co-operatives that were specific to their businesses, however, were not provided by the co-operative as it was not a common service required by the majority of</i>

	<i>members. This again reflects the utilitarian nature of the co-operative in order for benefits for all members, rather than a few. This resulted in the co-operatives needing to align the MVP to the overall membership base rather than a few.</i>
Administration	<i>The co-operatives provided significant administration support which minimises the time members have to allocate in this area. Often the administration function is provided in the form of consolidated financial statements and reports which the members use to assist in meeting their compliance requirements.</i>
Lobbying & Advocacy	<i>Lobbying and advocacy was done mostly behind the scenes from the co-operative. This shows that the members are generally unaware of the lobbying & advocacy done by the co-operatives to benefit the industry and members.</i>
Safety net	<i>The safety net theme often referenced economics where payments were made on time and the co-operative was trusted. The strength in numbers within the co-operative also included the sense of the co-operative being a safety net for the members.</i>

Source: Adapted from Ghauri et al. (2021a)