**Understanding the design characteristics and performance of collective payment agri-environment schemes**

**Authors: Mary Nthambi, Martin Dallimer and Nick Hanley**

1. **Rationale of the review**

Overall, the assessment and design of agri-environment schemes are characterised by two main perspectives – effectiveness and participation (Dik *et al.* 2021). In recent times, there is growing interest from policymakers and researchers in *collective payment* agri-environment schemes, where the central focus is on how groups of farmers/landowners participate together in conservation actions, and share the benefits of biodiversity conservation e.g. reduced deforestation, planting and maintaining trees (Kaczan *et al.* 2017; Dik *et al.* 2021; Villamayor-Tomas *et al.* 2021). An agri-environment scheme is said to be collective if a group of farmers/landowners/communities in formal/informal organisations enter collective conservation contracts/agreements/commitments with public authorities/government (Franks, 2010; Midler *et al.* 2015) in exchange for a payment conditional on fulfilling specified environmental requirements or actions (Hayes *et al.* 2019). Thus, farmers cannot decide on their own whether to participate or not in return for a payment but must decide as a group. Collective payment schemes award contract to such groups rather than to individuals.

Such schemes have been argued to play three major roles:

1. improving landscape-scale conservation outcomes (Westerink *et al.* 2013; Barghusen *et al.* 2020),
2. encouraging the participation of local farmer networks/groups and
3. providing a link between government/NGOs and local communities (Dik *et al.* 2021).

Collective payment schemes require that landowners/farmers hold land and resources under a common land title (Hayes *et al.* 2019) to be able to work together and share rewards (Kaczan *et al.* 2017). They also require participants to have common values and beliefs, be willing to work together to change a set of land practices, set rules and abide by them, and to share information (Franks, 2010). If a collective payment scheme is to be successful neighbouring landholders must work together (Franks, 2010), since failure to achieve, this will lead to “ecological gaps” occurring due to non-participating neighbours (Riley *et al.* 2018).

Challenges to the effectiveness of collective action schemes have been identified in different studies. They include difficulties around the identity of participants as they interact within groups and with public authorities, and how such relations affect social capital (Westerink *et al.* 2020). Social capital has been found to reduce as environmental collectives are transformed from self-governing organisations to formal cooperatives leading to reduced biodiversity conservation (Westerink *et al.* 2020). Furthermore, low social capital and trust can lead to a reduced incentive to engage in future collective/group level contracts (Narloch *et al.* 2017). If a collective payment scheme is to change behaviour, and provide social, economic and ecological benefits to participants, then its design should account for local institutional dynamics among other scheme characteristics (Hayes *et al.* 2019). These schemes are highly dependent on the nature of existing local institutions as they are characterised by collective decision-making: individual rewards are indirectly linked to individual member efforts and second-order collective action problems resulting from external relations (Hayes *et al.* 2019). Building relationships with other potential members of a collective contract is associated with high transaction costs as farmers/landowners choose between different options (Franks, 2010). Amidst the above-stated arguments, collective payment schemes have been applied to deliver desirable biodiversity outcomes e.g., improve water quality (2019) and increase forest area (Chervier and Costedoat, 2017).

To date, there has been a limited implementation of collective payment schemes, and little literature on this type of program. To be able to identify and understand why their implementation is limited despite their potential importance, a systematic review of existing empirical studies is required. So far two systematic reviews on collective payment schemes have been produced- Hayes et al. (2019) and Westerink et al. (2020). Hayes et al. (2019) review is centered around how local institutional dynamics change the behaviour of participants. Westerink et al. (2020) focus on the identity of collectives and the impact of changes on internal and external bonding and social capital. Even with these two reviews, there is still a need to provide a more detailed synthesis of the literature on the design characteristics of these schemes, whether and how their implementation strengthens social and cultural capital and the potential for within-group and second-order problems arising from external relationships. We also wish to identify important knowledge gaps.

Therefore, we synthesise existing literature to meet the following objectives, to identify:

1. scheme design characteristics and their role in enhancing cooperation to participate in collective payments schemes,
2. how collective payment schemes strengthen social and cultural capital,
3. potential within group and second-order problems arising from farmers/landowner relations with public authorities,
4. existing research gaps

We meet these objectives through a systematic synthesis of literature using the scoping review method (Arksey and O’Malley, 2005).

**Research questions**

We implement our scoping review in form of a detailed systematic review summary (see also supplementary material – excel sheet summary on collective payment schemes) while answering the following questions:

1. What agri-environment design characteristics motivate farmers to enroll in collective payment schemes?
2. What role do collective payment schemes play in strengthening social and cultural capital?
3. What are the challenges that result from the interaction between farmer/landholder/community with public authorities/government?
4. What are the existing knowledge gaps in literature?
5. **Search strategy**

We found keywords and alternative terms from studies addressing collective payment schemes such as Marshall (2004), Kuhfuss et al. (2016), Robinson et al. (2016), Chervier and Costedoat, (2017), Corso et al. (2017) and Riley et al. (2018). We defined different terms ‘collective’ ,‘payments’, ‘collective contracts’ and ‘agri-environment schemes’ separately (see Table 1) without restricting their meanings to a particular geographical scope or environmental indicators.

**Table 1: Definition of key terms in collective payment agri-environment schemes context**

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| --- | --- | --- |
| **Term** | **Definition** | **Source (s)** |
| Payment | The conditional compensation offered to a group of farmers as a reward for fulfilling scheme requirements | Hayes *et al.* (2019) |
| Collective | Is a legal entity or a group of farmers in charge of implementing agri-environment schemes in return for a conditional reward | Barghusen *et al.* (2020) |
| Agri-environment schemes | Agri-environment schemes are the programs that government (s) has set up to help farmers to participate in biodiversity conservation through the adoption of environmentally friendly farm practices | EEA, (2021) |
| Collective contracts | These are agreements between the government and group of farmers/landholders with formal scheme conditions and requirements | Franks, (2010) |

**2.1 Database search process**

We searched Scopus and Web of science up to February 2022 using a combination of different keywords (see Table 2). Our search was limited to English language but was not limited to a date or geographical scope. Boolean “OR” and “AND” were used to combine different keywords, asterisk (\*) sign to shorten such words with several endings and “…” to limit search to a set of keywords. To identify studies, not in the databases we searched, we screened through reference lists of selected studies.

**Table 2: Keywords and search strings**

|  |  |  |
| --- | --- | --- |
| **Payment for results** | | **Agri-environment schemes** |
| “collective”, OR “community”,  OR “group contracts”, OR  “collaborative”, OR  “cooperative schemes”, OR  “collective payments”, OR  “collective action” | AND  “payment schemes” OR, “agri-environ\*” OR “social capital” OR, “cultural capital”, OR  “agri-environmental governance” OR  “agri-environ\* problems”, OR  “cost-effectiveness” OR “agri- environment” | |

* 1. **Selected studies**

We included articles from peer-reviewed journals in the English language. First, we transferred these studies into Endnote online software from where we removed all duplicates. Then we reviewed studies based on titles and abstracts. Further, we selected studies that meet eligibility criteria through full-text screening. A selected study was said to be eligible if (i), it was empirical and findings were derived through analysis of primary or secondary data in real-life case study areas, (ii), it was on agricultural collectives or group-level payments or social capital, or collective contracts or cost-sharing commitments, and incentives for cooperation in collective action, or (iii) it indicated that farmers work together in groups or engaged in collective participation to deliver environmental outcomes in return of a reward, or (iv) was on factors influencing the participation of farmers in collective payment schemes, and or (iv) on coordinated farmland biodiversity conservation. We excluded systematic reviews, book chapters, reports, editorials, commentaries, and studies not focusing on the empirical application of payment for results or suggesting an environmental indicator and or unrelated to agri-environment schemes.

**2.3 Data extraction process**

We conducted a comprehensive data extraction process consisting of six parts. The first part consists of study characteristics such as name of the first author, year of publication, title, the objective of the study, study type, study area, and data type etc. The second part has data on collective payment schemes design characteristics namely: suppliers, buyers, basis for collective action and size surface area under consideration (if specified). The third part consists the existing land use/management practices, desired land-use changes, who signs the contract, contract duration, type of cooperation/contract name, contract enforcement, payment type and compensation mechanism etc. The fourth part contains information on the implied/indicated effect on social and cultural capital, causes of heterogeneity on scheme design, and factors determining participation in the scheme. The fifth part has information on the main study findings, study weaknesses, and future research gaps. The final part has a list of references for the studies included in our review. A detailed summary of this review is attached in form of an excel sheet (see supplementary material).

**2.4 Data analysis strategy**

We analysed extracted data using descriptive statistics and drew interpretations and conclusions from pooling together themes from different studies.

**3. Results**

Our search using different combinations of our keywords in Web of Science and Scopus gave us a total of 959 articles out of which 32 articles met our set criteria for inclusion in our review. The studies we selected were carried out in Cambodia, France, Netherlands, United Kingdom, USA, Wales, Australia, Peru, Tanzania, Switzerland, Spain, Kenya, Canada, Mexico, Bolivia, Indonesia, Uganda, Ecuador and the Kyrgyz Republic. The studies were carried out purely in various habitats - agricultural habitats (16%), forests (28%) and watersheds/aquatic habitats (22%). However, there are studies that focused on mixed habitats - combining agricultural area with woodlands or grasslands or shrubs or wetlands (9%), grassland combined with forest or shrubs or wetland (13%), and energy (3%). In these habitats, collective payment schemes implemented were referred using terms that denote different forms of cooperation/contract types – collective contracts (41%), collective incentive schemes/collective action (25%), collaborative/joint implementation (16%), collective agreements (9%), group contracts (6%) and cooperatives (3%). Farmers/landholders fulfilled conservation goals in return for conditional rewards presented in two forms: in-kind (22%) and monetary payments (59%) while in the rest of the studies though related to collective payment schemes, rewards were not clearly stated (19%).

Total number of articles identified after using our search terms (n = 959)

Articles selected after removal of duplicates, commentaries, books and book chapters and studies with no link to agri-environment schemes (n = 105)

Articles (n = 129) were excluded because they were not peer reviewed articles related to agri-environment schemes

Abstract and titles after exclusion of articles with no mention of collective payment schemes or any relevant information to this regard (n = 67)

Full text articles were excluded because:

* Had no secondary and primary data on collective payment schemes or
* No mention of collective incentives/external rewards, social capital in collective schemes, group-level payments, cost-sharing commitments etc or
* No mention of factors influencing participation in collective payment schemes

Full-text screening and number of empirical studies included in our review (n = 32)

Total number of studies that had relevance to agri-environment schemes (n = 234)

**Figure 1: Flow diagram demonstrating our search strategy and study selection**

**4.1 Collective payment scheme design characteristics**

The suppliers of environmental goods in the collective payments’ schemes are either communities and groups of farmers/landowners/farmer organizations while the buyers are governments, cooperatives, international non-governmental organisations involved in conservation, or fellow farmers. Collective contracts/agreements between the suppliers and buyers are usually either signed directly by representatives of informal farmer groups/communities (e.g. Midler *et al.* 2015; Kuhfuss *et al.* 2016; Alix-Garcia *et al.* 2017) or by formal regional cooperatives (Carmona-Torres *et al.* 2011; Mills *et al.* 2011; Villanueva *et al.* 2015; Yoder, 2019) or community executive bodies/commune councils (Hayes *et al.* 2015; Chervier and Costedoat, 2017; Hayes *et al.* 2018). Signed collective contracts/agreements are enforced through (i) communal sanctions to non-complying communities (Chervier and Costedoat, 2017) or individuals (Mills *et al.* 2011), (ii) a control system that involves the use of rules to allow or control certain farm practices (Corso *et al.* 2017; Amblard, 2019), (iii) rewarding individuals who successfully participate with penalties for non-compliance (Marshall, 2004; Carmona-Torres *et al.* 2011), (iv) monitoring process after involving participants in the design of collective contracts (Emery and Franks, 2012) or through an external agent or patrol (Kaczan *et al.* 2017), (v) trust and social norms governing individuals’ behaviour (Willy *et al.* 2013) and (vi) planning and information sharing to avoid penalties (Zaga-Mendez *et al.* 2021).

There are two main types of payments included in the design of collective schemes as rewards for conservation outcomes - monetary and in-kind payments. In-kind payments are in form of subsidies or labor or school donations that lead to indirect benefits through cost savings and/or increased gross margins (Carmona-Torres *et al.* 2011; Corso *et al.* 2017; Josefsson *et al.* 2017; Kolinjivadi *et al.* 2019). Monetary payments are in form of [[1]](#footnote-1)collective bonuses (Villanueva *et al.* 2015; Kuhfuss *et al.* 2016) or [[2]](#footnote-2)communal payments (Hayes *et al.* 2015; Hayes and Murtinho, 2018). Other forms of payments include individual salaries or lumpsum payments (Villanueva *et al.* 2015; Kuhfuss *et al.* 2016; Chervier and Costedoat, 2017). Farmers/landowner groups are compensated based on the amount of land enrolled in the scheme (Chervier and Costedoat, 2017), changing/selecting best land management practices (Emery and Franks, 2012; Villanueva *et al.* 2015; Zaga-Mendez *et al.* 2021), differences between sizes of gross margins (Carmona-Torres *et al.* 2011), reduced amounts of herbicides (Kuhfuss *et al.* 2016; Corso *et al.* 2017), carbon emission reductions (Robinson *et al.* 2016) or agricultural equipment and inputs (Narloch *et al.* 2017). The amount paid is calculated based on farmers’ opportunity costs or revenue lost due to the adoption of measures or labour costs (Alix-Garcia *et al.* 2017; Amblard, 2019) or compliance costs (Kuhfuss *et al.* 2016; Zaga-Mendez *et al.* 2021) or gross margin transfers from farmers who would benefit more to those who would need to sacrifice their revenue (Carmon-Torres *et al.* 2011) or costs of measurable and verifiable reductions of carbon emissions (Robinson *et al.* 2016).

Collective payment scheme design is heterogeneous and differs based on several factors. For instance, site-specific characteristics such as slope, proximity to roads, ecological differences in farms (Carmona-Torres *et al.* 2011), farm size (Kuhfuss *et al.* 2016), farm tenure types (Bremer *et al.* 2014), crops planted (Midler *et al.* 2015) and differences in farming systems (Amblard, 2019). Differences in design are also associated with individual-specific characteristics such as age, gender, education, number of people in a group, their closeness to neighbours (Midler *et al.* 2015), and the number of households to be affected by the scheme implementation (Chervier and Costedoat, 2017). Other individual-specific characteristics include farmers’ opinions on conservation and values, differences in benefit expectations (Villanueva *et al.* 2015; Riley *et al.* 2018; Villamayor-Tomas *et al.* 2021) and preferred payment methods (Wiser, 2007). There are also factors associated with an individual’s social environment and they include trust, social capital (Alix-Garcia *et al.* 2017), the extent of participants’ cooperation (Kaczan *et al.* 2017), local cultural orientations (Emery and Franks, 2012; Fischer *et al.* 2019) and differences based on interactions between judicial, legislative, and local institutions governing schemes (Yoder, 2019).

**4.2 How collective payments schemes strengthen social and cultural capital**

Social and cultural capital can be enhanced through collective payment schemes. Here we define social capital as the ability of people who are governed by trust, institutions, interactions, and attitudes to work together (Alix-Garcia *et al.* 2017) to achieve certain environmental goals. Cultural capital is defined as the subcomponent of social capital that consists of cultural values and culturally accepted structure of beliefs, and way of life among neighbouring individuals that are linked to the ability to generate well-being in the future (Carmona-Torres *et al.* 2011; Corso *et al.* 2017; Chervier and Costedoat, 2017; Amblard, 2019). Social capital enables better interactions between stakeholders and farmers/landowners (Hardy *et al.* 2020) to deliver environmental benefits at a landscape scale level (Carmona-Torres *et al.* 2011). When individuals work together and share benefits, trust, norms, and cohesiveness are enhanced (Midler *et al.* 2015; Chervier and Costedoat, 2017; Fischer *et al.* 2019), reducing the costs associated with collective actions (Amblard, 2019). These, in turn, increase farmer participation (Corso *et al.* 2017) and enhance environmental benefits (Emery and Franks, 2012). Collective bonus payments lead to increased social capital, and social expectations (Kuhfuss *et al.* 2016), determine how individuals contribute (Kaczan *et al.* 2017) and preserve collective knowledge generated (Josefsson *et al.* 2017). Shared information and infrastructure can lead to enhanced participation (Yoder, 2019), creation of new external relationships (Zaga-Mendez *et al.* 2021) and development of pro-social norms that improve prospects for future collaboration (Hayes and Murtinho, 2018).

Cultural barriers can diminish as people come together to conserve the environment and share benefits (Emery and Franks, 2012). However, differences in cultural settings help to determine the conditional payments to offer (Andersson *et al.* 2018) and the existing social and cultural beliefs that bind individuals together to take advantage of collective action (Hayes *et al.* 2015). As a result, cultural orientations are considered an important factor affecting cooperation and participation in collective action schemes (Fischer *et al.* 2019). Cultural capital is also enhanced through shared acceptance of penalties for non-compliance (Marshall, 2004) which increases communal benefits (Narloch *et al.* 2017). Regarding land management, land use practices are passed from past to present and when it comes to allocation of land, traditional values (e.g.value placed on traditional crops over improved crop varieties) are used to guide allocation of land for agriculture and conservation (Narloch *et al.* 2012; Midler *et al.* 2015) and determine participation in collective action initiatives (Willy and Holm-Müller, 2013; Zaga-Mendez *et al.* 2021). A collective bonus strengthens the descriptive norms and beliefs of farmers/landowners concerning their participation in the scheme (Kuhfuss *et al.* 2016).

**4.3 Potential within-group and second-order problems between farmers/landowners, intermediaries, and public authorities**

Farmers working together experience different challenges associated with other individuals in a group or between groups and public authorities. In groups, it can be difficult to define a unit of analysis for collective payments in the contract due to complexities around property rights and how an individual’s compliance affects community rules and generates conflict during the distribution of benefits (Chervier and Costedoat, 2017). Communal distribution norms may clash with equity goals, creating conflict between individuals and frustrating their expectations, even in highly organized communities (Hayes and Murtinho, 2018). The perceptions of the scheme determine the expectations of neighbouring farmers/landowners who can either conform to existing cultural norms or not (Emery and Franks, 2012). Even the expected rewards for complying and penalties for non-compliance can drive farmers to engage in a vicious cycle of retaliation impeding the success of the scheme (Midler *et al.* 2015; Fischer *et al.* 2019). Some farmers may result in strategic behaviour and free-riding, undermining the success of the scheme (Wiser, 2007; Kaczan *et al.* 2017; Yoder, 2019). Further, when the participation of farmers is filtered through strict land title requirements, wider participation may be constrained to smaller landholders with land rights as opposed to their counterparts with higher opportunity costs and larger farm sizes (Bremer *et al.* 2014). Still, some participants are unaware of cultural change arising from participation in collective schemes owing to limited exchange and distribution of information and support in the identification of local landscapes (Barghusen *et al.* 2021).

Problems also arise from the interaction between intermediaries and public authorities who sign off contracts. For instance, the use of commune councils to represent local communities may lead to heavy political influence from local government leaders who may want to be associated with the success of the scheme, particularly in the distribution of benefits (Milne and Adams, 2012). During the distribution of benefits to participants, some corrupt leaders may pocket some of the payments for themselves, especially in developing economies (Andersson *et al.* 2018). Further, community decisions may not be voluntary as the market nature of conservation may take a toll on local agencies’ opinions and silence the voices of certain community members (Milne and Adams, 2012). Once the public authorities stop payments then there are insufficient incentives for farmers to continue engaging in conservation (Andersson *et al.* 2018).

1. **Research Knowledge Gaps**

Our review identified several research gaps. More research is required to improve agricultural practice through a wider inclusion of new contract designs that account for collective dimensions and collective bonuses to conserve the environment (Kuhfuss *et al.* 2016). The effectiveness of setting contracts that are conditional on additional actions, prioritizing contracts with communities with strong internal governance, and offering communities a role in making the rules that affect them, all need to be tested (Kaczan *et al.* 2017). Collective payment schemes target conservation at the landscape scale, but research is required to understand how measures and payments can be adapted at farm scale to improve the effectiveness of collective schemes (e.g., in watersheds), as well, estimate the resulting transaction costs (Amblard, 2019).

Further, individual payments may cause crowding-in of social norms stabilising collective action, while collective rewards may lead to crowding-out of social norms resulting to ineffective collective schemes (Narloch *et al.* 2012). The crowding-out effect of social norms may imply an existence of a social cost affecting the cost-effectiveness of the scheme (Narloch *et al.* 2012). There is, therefore, a need for further research to quantify these costs and determine whether a collective scheme would be less beneficial in various social contexts (Narloch *et al.* 2012). Research is also required to compare the effectiveness of different individual and collective payment levels and evaluate how setting of different conservation thresholds would facilitate collective action (Narloch *et al.* 2012). The cost-effectiveness of group-level contracts combined with collective payments is influenced by the conservation incentives selected and, the social interaction and trust between participants (Narloch *et al.* 2017). As a result, there is need to carry out research to understand how existing patterns of collective action and social factors interact with payment mechanisms to encourage cooperation among landowners (Narloch *et al.* 2017).

Moreover, collective payment schemes are more effective in some areas compared to others. For instance, a study carried out by Chervier and Costedoat (2017) in Cambodia forest found out that scheme additionality was limited in steep slopes, while it was more effective in areas closer to roads compared to remote ones where forest remained intact, and those with lower population compared to the ones with higher population. The scheme generates heterogeneous impacts and its effectiveness depends on the level of risk in target areas which means some areas may require more conservation effort over others (Chervier and Costedoat, 2017). Due to this, research is required to quantify the transaction costs and their impact on cost-effectiveness when schemes are adapted to local conditions (Chervier and Costedoat, 2017). In addition, farms are diverse, however, homogenous farm types may reduce costs of defining actions while increasing the costs of assimilating alternative farm types (Amblard, 2019). There is a need for research on farm diversity that disentangles the trade-offs between benefits and transaction costs which depends on the farm type and level of cooperation (Amblard, 2019).

More data, from larger representative samples and impact evaluation methods, should be made available to understand how local institutional dynamics influence the costs and benefits of conservation (Chervier and Costedoat, 2017; Amblard, 2019). Future research should focus on empirically measuring and teasing out additional governance attributes and procedural dimensions to help in identifying decision-making institutions that enable communities to successfully mediate the costs and benefits of said conservation programs across a diverse set of individuals within a community (Hayes *et al.* 2015; Hayes and Murtinho, 2018). Communication and democracy are important tools in the design of collective schemes and there is a need to collect data to establish whether communicative actions and deliberative democracy are in use (Corso *et al.* 2017).

In socially sub-optimal societies, private benefits to be realised among farmers/landholders require the enhancement of governance structures of the schemes to effectively deal with biophysical and socioeconomic mismatches that hinder sustainable conservation and use of resources (Carmona-Torres *et al.* 2011). Further, research is required to establish whether sharing risk among individuals facilitates their cooperation to join collective schemes, and how differences in their risk perceptions influence the temporal and spatial conservation outcomes (Fischer *et al.* 2019). There is also a need to establish how individuals’ intrinsic motivations and their social preferences for cooperation and collective action influence the crowding-out or crowding-in effects of collective payment schemes (Midler *et al.* 2015). The decision-making process in multi-level collective action problems across and between production levels needs to be disentangled (Villamayor-Tomas *et al.* 2021).

There should also be research focusing on the drivers of participating in collective action schemes including how best to design economic incentives and increasing awareness of available conservation options (Josefsson *et al.* 2015). The performance of collective payment schemes without monetary incentives and a comparison between the costs of schemes and the benefits arising from their implementation is also an important research gap (Villanueva *et al.* 2015). Research to understand how social interconnections are built between crucial pillars such as the interaction between intermediaries, existing community networks, and public authorities including consideration of the power asymmetries is required (Zaga-Mendez *et al.* 2021). It is also important to focus on investigating and comparing how these relationships affect the performance of collectives with long and short operation terms (Hardy *et al.* 2020). Finally, research is required to establish the interaction of social norms and external rewards (Narloch *et al.* 2012) and how sharing of conservation burdens ensures farmers comply with agreed conservation contracts (Narloch *et al.* 2017).

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1. Collective bonus is the amount paid to a community or group of people, in addition to a baseline payment for aggregate participation in conservation beyond certain threshold (Kuhfuss *et al.* 2016; Kaczan *et al.* 2017) [↑](#footnote-ref-1)
2. A community payment is the baseline amount paid to an intermediary on behalf of the community as compensation for conservation behaviour after reaching a certain threshold (Hayes and Murtinho, 2018). [↑](#footnote-ref-2)