FEDERATED COOPERATIVE STRUCTURES: IMPLICATIONS FOR MEMBERS' COMMITMENT.

A CASE STUDY OF THE COFFEE COOPERATIVE SECTOR IN NEPAL.

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ABSTRACT

This research aims at identifying how members' commitment varies with regards to the different levels of cooperative federations. Members' commitment is increasingly a challenge in the cooperative sector and especially as cooperatives grow and integrate more and more members to boost competiveness. Federated structures allow for rapid increases in the scale of operation while preserving the smaller primary cooperatives as independent units. In order to identify the commitment implications of federated cooperative structures, we collect primary data and make use of a case study on the coffee cooperative movement in Nepal. We find that this organisational strategy is not innocuous for commitment and consequently, farmers are less committed to their district cooperative unions than to their primary cooperatives. Furthermore, our results show that farmers also identify themselves less with and participate less in the federated bodies than with and in their primary cooperatives. This is suggestive of a mechanism through which commitment erodes along increasing size of the membership. The findings of this study contribute to the discussion on joint vertical integration in the cooperative context and emphasises the importance of not taking farmers' commitment for granted.

PREFACE

This MSc Thesis is the result of eight months of intense work and a wonderful experience in an incredible country. The almost 100 pages this end-report counts can simply not capture all the effort it contains nor, perhaps more importantly, everything I learnt. For the sake of brevity and despite the temptation, I refrain from including in appendix the recipe of Nisha's *dal bhat* or a list of essential Nepali phrases –most of them related to food- to survive among the beautiful hills of rural Nepal.

I do not want to spare, nonetheless, a word of thanks to all those that have contributed in numerous ways to this MSc Thesis.

Firstly, I would like to thank Agriterra for the great opportunity that they gave me and for having made this possible. I hope to live up to the expectations and that Agriterra will keep engaging students in their amazing work. Especial thanks to Willem and Richard and the team in Kathmandu for their support during my stay and their friendliness and kindness.

Thanks to WUR, the DEC chair group and my supervisor Marrit van den Berg for having given me the opportunity and freedom to shape my own project and, in this sense, develop myself.

Furthermore, thanks to Sandeep for the countless hours chasing farmers, hiking downhill, and especially, for those hiking uphill, and the evenings in the field. Heartfelt thanks too to Nisha, who provided me with a caring home in the middle of hectic Kathmandu and made for me the best non-spicy *dal bhat* that will ever exist. I cannot help but including here too my ever-supportive brother who, although mostly on the phone, has suffered and enjoyed this thesis almost as much as myself.

Finally, my greatest gratitude to all those that were willing to meet me during my time in Nepal and share with me their time, their experiences and their knowledge: dedicated NGO's employees and volunteers, hardworking civil servants and administrators, and the many many many welcoming, smiling, inspiring, survivor, generous, caring coffee farmers.

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1. INTRODUCTION

1.1. COOPERATIVES AND COMMITMENT

Despite the large diversity among different types of cooperatives, all of them are based on three principles: the user-benefit principle, the user-owner principle and the user-control principle. These principles govern the relationship between the cooperative and its members and imply that the members are simultaneously the owners, the controllers and the users of the cooperative (Barton, 1989). As a consequence of this close relationship between the cooperative and the farmers, cooperatives are dependent on a healthy involvement of its members in each of the three dimensions for its well-functioning.

Firstly, the user-benefit principle reflects that the members are the ones benefitting from the operations and services of the cooperative. The benefits that members receive depend, ultimately, on the transactions they themselves do with the cooperative. Side-selling is a well-studied example of the importance of members using the cooperative to actually realise benefits. When widely spread, side-selling can deeply damage the business case of the cooperative and, as a result, reduce the benefits that members eventually receive (Sexton & Iskow, 1988).

Secondly, the user-owner principle refers to the fact that the members of the cooperative also hold the ownership. They are the owners of all the assets and the residual claimants. The other side of the coin implies that the members are also the providers of the lion's share of the cooperative's capital. Consequently, cooperatives depend on their members to have access to financing, at least for a large part. In cases in which members fail to provide the necessary equity, cooperatives can incur high costs of external finance or lack solvency, which undermines the well-functioning and competiveness of the enterprise (Österberg & Nilsson, 2009).

Finally, the user-control principle implies that members are involved in the governance and control of the cooperative. Members are thus expected to actively engage in supervision and monitoring of directors and managers to ensure that there are no bad practices or abuses. Refusal of members to perform these tasks can translate into great threats to an optimal functioning of the cooperative (Bhuyan, 2007; Österberg & Nilsson, 2009). In cases of wide-spread indifference among members, grave abuses by managers and directors can directly lead to the unfeasibility of the cooperative.

The very nature of cooperatives places a lot of importance on members and renders their involvement vital for the success of the cooperative (Hakelius, 1996). Other authors (e.g.: Bhuyan & Leistritz (2001) and Bijman & Verhees (2011)) also argue that low involvement of farmers endangers the very existence of the cooperative. Cook (1995), among other, frames this challenge as a free-rider problem. The logical question is then what prevents farmers from acting as free-riders. While there may be multiple reasons to explain why members would not sell to competitors, be willing to finance the cooperative or be actively engaged in control, the most common and general reason is

the farmers' commitment to their cooperative. Cechin, Bijman, Pascucci, & Omta (2012), for example, find that committed members are less likely to engage in side-selling practices. Commitment also seems to increase the willingness of farmers to patronise and finance their cooperatives according to J. R. Fulton & Adamowicz (1993) and M. Fulton & Giannakas (2001). Further, Ole Borgen (2001) also argues that the level of commitment determines the willingness of farmers to adhere to the strategies of the cooperative. When lack of commitment exists, the cooperative needs to put in place monitoring and control mechanisms that guarantee the adoption of the strategy, which leads to high transaction costs and may further undermine social cohesion. More generally, commitment prevents members from behaving as free-riders (Bijman & Verhees, 2011).

The literature on members' commitment in the context of cooperatives is extensive. Despite all the differences regarding definitions and framings, there is general acceptance of the importance of commitment for the well-functioning and success of cooperatives (Bhuyan & Leistritz, 2001; Bijman & Verhees, 2011; Fulton & Giannakas, 2007; Morgan & Hunt, 1994). Interestingly, members' commitment is also more and more recognised as a pressing challenge for the future of cooperatives and no longer taken as self-evident.

One of the factors contributing to the erosion of members' commitment is the increase in the size of cooperatives. Ostrom (2000) studies collective action and identifies group size as an important factor negatively influencing cooperative outcomes. Thus, free-rider problems in cooperatives tend to become more acute when the number of members in a cooperative grows. Since commitment is, essentially, refraining from behaving opportunistically or as a free-rider, growing membership affects the general level of commitment of members and can impact the general working of the cooperative in multiple ways. Cook & Iliopoulos (2016), for instance, support this claim arguing that the individual benefits of getting involved in control and monitoring decrease as the number of member increases, which incentivises free-rider behaviour. Furthermore, larger and more complex organisations create an environment less suitable for repeated interactions among members, which is an important factor in creating commitment and trust (Ole Borgen, 2001).

Growing membership implies not only an increase in the number of individual members: as membership grows, heterogeneity among farmers is also likely to increase. Therefore, members are likely to increasingly differ in terms of their assets, their location, their needs and priorities, among others, as the group becomes larger. This may be problematic because of the negative effect that heterogeneity may have on commitment (Hansmann, 1996; Uzea & Fulton, 2014). Dnes & Foxall (1981) conclude that as cooperatives get larger, the sense of a common goal needs to be stronger in order to avoid opportunism. Bijman & Verhees (2011) note, however, that when heterogeneity is high, it is more difficult for the cooperative to transmit the perception that it acts in the interest of all members. In turn, farmers that perceive that the cooperative might not always be acting in their interests are less committed to it (Kyriakopoulos & van Bekkum, 1999).

This negative effect of size on commitment is especially interesting because both concepts lie within the very nature of the cooperative movement. On the side of commitment, we have already seen how cooperatives are based on three principles that emphasise the engagement and commitment of members. On the other hand, the idea behind the establishment of cooperatives is essentially to obtain benefits from economies of scale and gain bargaining power through horizontal integration as well as to achieve joint vertical integration to realise higher income (Koller, 1950). This is, the ultimate source of the benefits that farmers derive from their cooperatives is, precisely, the size of the membership. The tension arising from the commitment effect of size can be seen, for instance, on the debate regarding open and close membership policy of cooperatives (Bijman, Muradian, & Schuurman, 2016). While the International Cooperative Alliance recognises open membership as the first of the seven cooperative principles, cooperatives increasingly adopt close membership policies to lower coordination costs resulting from, among others, low commitment and to increase competiveness (Nilsson, 1998).

1.2. COOPERATIVE FEDERATIONS

As argued in the introduction, cooperatives are faced with the challenge of eroding commitment among their members and the negative impact of size on it. There are certainly many other factors that influence commitment as well as several organisational designs which could potentially offset or reduce the negative impact of size. The effect of size on commitment has been typically studied in groups with relatively simple structures or without paying attention to specific organisational designs. Therefore and given the importance of commitment, Kalogeras, Pennings, van Dijk, & van der Lans (2007) argue in favour of assessing cooperatives' organisational structure according to their impact on members' commitment.

One wide-spread organisational design in the cooperative field are the cooperative federated structures. Cooperative federated structures are characterised by the existence of a federated cooperative that is owned and controlled by other independent cooperatives, also known as primary cooperatives (M. E. Fulton & Giannakas, 2007). The relation between the federation and the primary cooperatives is comparable to the relationship between the primary cooperatives and their members. Primary cooperatives come voluntarily together to establish a federation in a way to increase scale of operation through horizontal integration and, as a result, obtain certain benefits. Primary cooperatives are thus the beneficiaries of the federation but also the controllers and the owners and, consequently, commitment is also important for the well-functioning of the federation.

The advantages and disadvantages of establishing a federated cooperative are, essentially, the same advantages and disadvantages of integrating farmers into a primary cooperative. Most of the benefits arise from the increase in scale of operation, which leads to economies of scale and higher bargaining power, among others. In this sense, substantial increases in the scale of operation are better achievable through the formation of cooperative federations owing to the local character of many primary

cooperatives (Hogeland, 2002). On the down side, federations are likely to face higher levels of heterogeneity among their members since they bring together farmers from different geographical areas and generate large increases in size. This may be problematic since federations also entail by definition some degree of centralisation of decision-making. Decision-making happening higher away from members may generate some detachment among members and trigger free-rider behaviour at federated level (Hogeland, 2002). Hogeland (2002) also warns that control and accountability tend to be blurrier in federated structures, which may also undermine the involvement of members in the control of the governing bodies.

The key characteristic of federated cooperative structures is that primary cooperatives remain at any time independent units and centralisation of decision-making is not complete but limited to certain fields. This allows the system to be flexible and strategically decide on the optimal level of centralisation of decision-making and activities. Uzea & Fulton (2014) remind us that deriving benefits from horizontal integration does not lead automatically to perfect coordination between actors and opportunistic behaviour by members can also prevent realising those benefits. Besides the economic costs of establishing control mechanisms to reduce opportunism, there are also further commitment costs, since control mechanisms usually undermine social cohesion and create discontent among the members (Cechin et al., 2012). In this context, the assessment of an organisational model in terms of its impact on commitment (Kalogeras et al., 2007) seems especially relevant and commitment is an important criterion to bear in mind when deciding on the distribution of activities and decision-making across the different levels in a cooperative federated structure.

2. KNOWLEDGE GAP AND AIM OF THE STUDY

In the introduction to this study, we have shown how members' commitment is a critical factor for the success of cooperatives and how size is seen to negatively influence commitment. Furthermore, we have also briefly introduced one common structure of cooperative organisations, namely cooperative federations. Cooperative federations allow for large increases in horizontal integration while preserving organisation of farmers in relatively small and independent primary cooperatives. The implications of this specific organisational design for commitment have not yet been investigated and contributing to this knowledge gap is the main aim of this study.

More specifically, we aim to identify how the commitment levels of farmers vary across the two levels of the federation, i.e.: farmers' commitment to the primary cooperative and their commitment to the federated body. Furthermore, we are interested in investigating at both levels the relationship between members' commitment and two factors that are directly affected by the size of the group: identification and participation. A more extensive description of these two factors and their theoretical relationship with commitment is provided in Section *3. Theoretical Framework.*

Bearing these two objectives in mind, we posit 6 research questions divided into two sets:

- **RQ1.1**: What is the members' commitment level towards their primary cooperative?
- **RQ1.2**: What is the members' commitment level towards their federated cooperative?
- **RQ1.3**: How does farmers' commitment level vary across the two levels of a cooperative federation?

- **RQ2.1**: How are farmers' identification with and participation in their primary cooperative related to their level of commitment?
- **RQ2.1**: How are farmers' identification with and participation in their federated cooperative related to their level of commitment?
- **RQ2.3**: How do these relations vary across the two levels of a cooperative federation?

3. THEORETICAL FRAMEWORK

We have shown in the introduction that commitment is, ceteris paribus, negatively influenced by the size of the group. In this section, we present two channels through which this negative influence would materialise. The first channel runs through the identification of farmers with their cooperative. The second channel considers the participation of famers' in the decision-making of their cooperative as the intermediate step between size and commitment.

3.1. IDENTIFICATION

Increases in the size of the group renders more difficult the achievement of cooperative outcomes. Furthermore, increases in size are usually associated with increases in the level of heterogeneity among farmers. As groups grow, members increasingly differ in terms of their goals, values, perceptions and individual situations. In addition, personal interactions between members also become more difficult and weaker as the group grows in size (van Bekkum & van Dijk, 1997).

This heterogeneity and the weaker individual connections undermine the creation of a set of shared objectives and values and the conscience of belonging to a group. We can encompass these under a general feeling of identification (Ole Borgen, 2001). This is, the extent to which members identify themselves with their cooperative. In this sense, increasing size puts pressure on the identification of members with the cooperative as a whole. Consequently, when the cooperative grows in size, farmers may start perceiving diverging interests, conflicting objectives or different values among members and of the cooperative as an organisation (M. E. Fulton & Giannakas, 2007).

It is not counterintuitive that farmers who do not identify themselves with their cooperative tend to also be less committed to it. This is, if farmers feel that the cooperative not always pursues their same interests and they do not have a strong

connection with other farmers in the cooperative, they would presumably be less willing to make efforts to contribute to the success of the cooperative or to commit their resources to it (Cechin et al., 2012).

3.2. PARTICIPATION

A direct effect of increasing the size of the membership is that the number of voices in decision-making also rises. As a result, individual voices are muffled by the multitude and lose individual importance. Individual members may perceive this as a loss of their individual capacity to influence decision-making, which can create some passivity among members (Österberg & Nilsson, 2009). The loss of individual influence power can be especially problematic when increases in size also bring about increases in heterogeneity with regards to objectives, priorities and values. The perception of conflicting interests together with the inability to bring about change owing to reduced influence power can further foster indifference among members (Österberg & Nilsson, 2009).

One clear consequence of increasing size is, as we have seen, the growing passivity which can trigger free-rider behaviour among members with regards to the control of the managers and directors of the cooperative. Decreasing influence power can, however, also affect members' commitment more generally. Österberg & Nilsson (2009) argue that people tend to accept changes and decisions better when they have the opportunity to influence the decision-making process. Thus, if members cannot participate directly or perceive that their participation is, to some extent, influential, they are more reluctant to commit to the strategies of the cooperative and comply with the decisions. Bijman et al. (2012) also see members' perception of their participation as an important factor affecting commitment. Thus, they point at the organisation of the cooperative governance as a strategic tool to strengthen commitment among members.

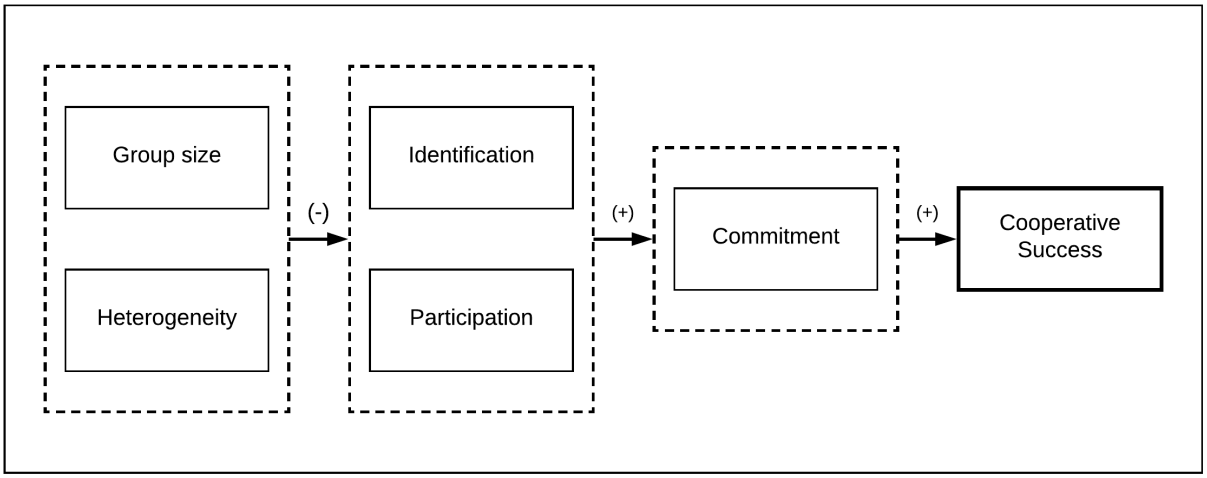

Figure 1. *Graphic representation of the theoretical framework.*

The literature on members' commitment in the context of cooperatives posits a positive relationship between, on the one hand, the identification of members with and their participation in their cooperative and, on the other hand, their commitment level. Further, the literature also identifies a negative relationship between the size of the group, and the heterogeneity it usually entails, and the level of members' identification with and participation in their cooperatives. Combining these two insights, we find a negative influence of group size and heterogeneity on members' commitment that runs through the identification and participation of members, as depicted in Figure 1. This is consistent with studies that show the importance of homogeneity for cooperative success (Hansmann, 1996) and the challenges associated with increasing size of cooperatives (Bijman & Verhees, 2011; Ostrom, 2000).

It is important to mention that the literature also identifies other factors that may determine or influence members' commitment such as dependency (Carman, 1997; Cechin et al., 2012; Henehan & Anderson, 2001) or costs of exit (Allen & Meyer, 1990; Morgan & Hunt, 1994). We, however, decide to focus on identification and participation because of their negative relationship with size. Federated structures create a new level of operation higher than the individual farmer and the primary cooperative. Hence, their impact on group size and, in turn, on identification and participation would presumably be larger than on dependency, cost of exit or other factors. Studying differences in members' identification and participation with regards to their primary cooperatives and the federated cooperative can yield insights that help us better understand differences in commitment across levels.

4. CASE STUDY

4.1. NEPAL AND COOPERATIVE FEDERATIONS

Nepal is a predominantly agricultural country in south Asia where agriculture accounts for 33% of the national GDP and 81% of the population lives in rural areas (World Bank, 2017). Furthermore, smallholder agricultural production in Nepal accounts for 70% of the total production (FAO, n.d.) with a national average size of agricultural holdings equal to 0,79 hectares (Central Bureau of Statistics, 2001). In this sense, addressing the challenges that smallholder farmers face can become an important tool to foster development and alleviate poverty. The establishment of producer organisations, in this sense, has been regarded as an effective mechanism to improve livelihoods both in academic and policy spheres (e.g.: Barrett, 2008; Cook & Iliopoulos, 2016; Govereh, Jayne, & Nyoro, 1999; Olwande, Smale, Mathenge, Place, & Mithöfer, 2015). In Nepal, the belief in the potential of the cooperative movement to contribute to the development of the country has led the country to adopt a 3-pillar economic model based on the public sector, the private sector and the cooperative sector (Bharadwaj, 2012). Thus, the national constitution explicitly includes the duty of the State to pursue policies "to promote the cooperative sector and mobilize it in national development to the maximum extent" (Nepal Law Commission, 2015, p.32).

Despite the long cooperative tradition in Nepal, the formal cooperative movement has been flourishing over the last decades since the establishment of the first cooperatives in 1957 (Thakuri, 2010). Currently, the cooperative movement is widely spread across the country with over six million cooperative members, although credit and saving cooperatives account for half of the total cooperative membership. Credit and saving cooperatives excluded, Nepal currently counts nearly 20.000 primary cooperatives (Department of Cooperatives, 2017). These cooperatives are governed by the national Cooperative Act of 2017 and previously by the former Cooperative Act of 1992. Interestingly for the aim of this study, these two legal texts recognise and allow the formation of federated cooperative structures. More specifically, five different levels of horizontal integration are recognised.

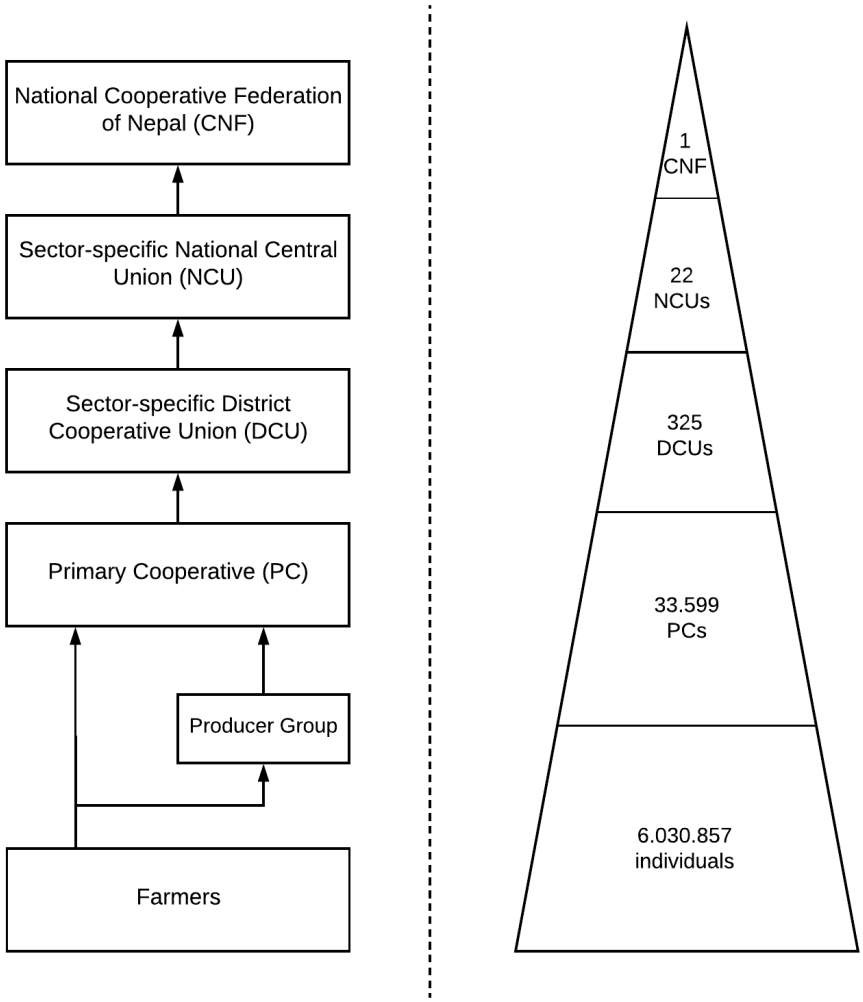

Figure 2. *Structure of the cooperative movement in Nepal. Source: Department of Cooperatives (2017*).

At the bottom of the scale, farmers can organise themselves into preliminary informal producer groups or directly become members of a primary cooperative. Primary

cooperatives active in the same sector can form a district cooperative union. Districts are the second administrative division in Nepal and each of the 75 districts can only have one district union of the same nature. This means, for instance, that there cannot be two unions in the same district active in the same sector (coffee, tea, fruits and vegetables, dairy…). The organisation is thus geographically determined and it depends on the administrative division of the country. Because not all districts have district cooperative unions for each sector, there are currently 325 district cooperative unions in Nepal. Different district cooperative unions active in the same sector can further integrate into a sector-specific national central federation. Finally, the National Cooperative Federation acts as an umbrella association of all cooperatives in Nepal. Figure 2 above shows the different levels in the federated cooperative movement in Nepal. Naturally, the integration within higher levels of horizontal level is voluntary and depends on the immediate lower level. Therefore, not all farmers need to be integrated fully into this structure.

Although those are the levels legally recognised, the cooperative act says nothing about the distribution of services and tasks across the different levels. Naturally, primary cooperatives and district cooperative unions are closer to the product and typically involved in the value chain. Thus, these levels are the most involved in provision of inputs for production, collection, processing and marketing. As we move towards higher levels of horizontal integration, the services offered support farmers indirectly through lobby and advocacy, capacity building and knowledge dissemination. What services are provided where and the specific tasks of each level differ significantly from sector to sector and also vary across districts.

4.2. THE COFFEE COOPERATIVE MOVEMENT IN NEPAL

Coffee is a relatively new crop in Nepal. Although it was first introduced in the country in 1938, it was kept as a curiosity and remained unnoticed for many years. Three decades down the road, it attracted the attention of the then king of Nepal, who started the import of coffee from India. Nevertheless, coffee remained at this point as an ornamental plant. In 1976, coffee started to be used as a soil conservation crop in development projects, which led to the first spread of coffee among farmers. Notwithstanding, the economic value of coffee was fully neglected. It was only in the 80's when the economic potential of coffee production received for the first time some attention. Both national authorities and international organisations engaged more boldly in the promotion of coffee production in the decade of the 90's through seed and knowledge dissemination. In 1993, the National Tea and Coffee Development Board was established and in 1996 the Swiss organisation Helvetas launched a project specific for the promotion of coffee. The latter would lead few years later in 2003 to the launch of the Helveta's Coffee Promotion Program (COPP), which has played a major role in the expansion of coffee production in Nepal. The pace of expansion of coffee accelerated considerably in the 2000's and it's been rapidly increasing up until the day of today. Despite its early introduction in 1938, coffee in Nepal is a 21st century phenomenon.

Figure 3 shows the evolution of coffee production both in terms of green bean production and area of production since 1995. Total production of green beans exceeded the 500 metric tons for the first time in 2016. Although this is a significant increase from under 13 metric tons in 1995, Nepal is far from other coffee producing countries. Neighbouring India, for instance, produced in 2016 348.000 Mt and other countries with a comparable size of territory such as Nicaragua and Laos produced 132.000 Mt and 31.200 Mt, respectively (International Coffee Organization, 2016). The limited yearly production and the marketing difficulties it entails account, in fact, for the biggest challenge the coffee sector in Nepal is facing.

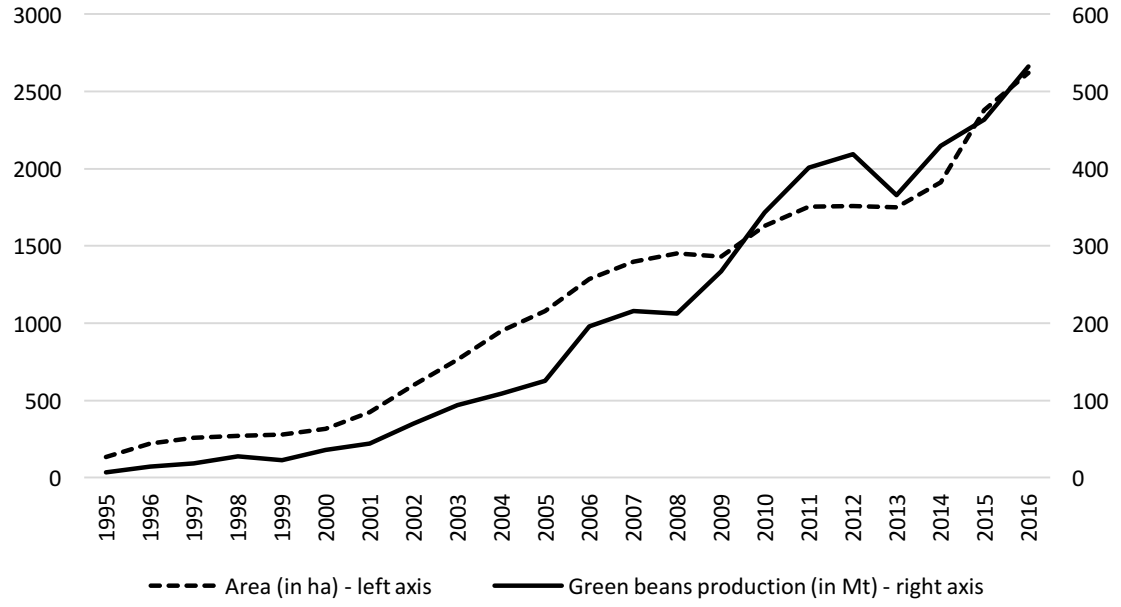

Figure 3. *Evolution of coffee production in Nepal since 1995 in terms of green beans production and area of production. Source: Ministry of Agricultural Development (2016).*

The geographical expansion of coffee within Nepal can be explained by looking at both the interventions of international organisations and the national policies. Initially, coffee production was something limited to the hilly districts of the region of Western Nepal. Gradually, projects of both international organisations and governmental bodies rolled out to other districts in other regions of Nepal. Currently, coffee is present in 40 districts, although in some of them the production is virtually negligible. Figure 4 shows the 25 biggest coffee producing districts, which account for more than 90% of the total coffee production in Nepal.

Given the incidence of poverty in rural areas in Nepal and the predominance of subsistence farming, all the efforts to expand the coffee production in Nepal have aimed at increasing livelihoods in rural areas. As a cash crop, the introduction of coffee is hoped to become an important source of income for the inhabitants of rural, hilly areas. Therefore, the main target of the interventions has been smallholder farmers. As a result, coffee production is mostly carried out by smallholder farmers who own or lease

small plots of lands and own few coffee plants. It has only been in the last years that there have been some large-scale investments by the private sector to establish coffee plantations. At the moment, 90% of the total coffee production in Nepal comes from smallholder farmers and channelled through cooperatives.

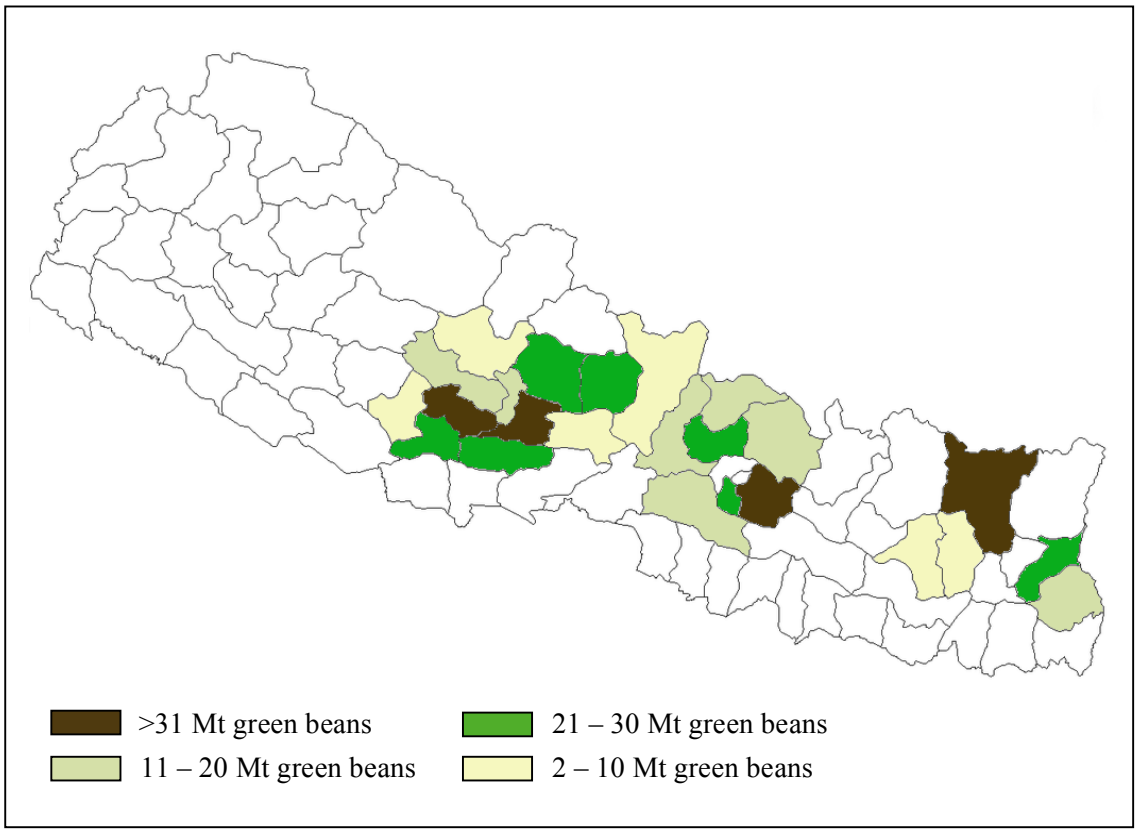

Figure 4. *Geographical distribution of coffee production in Nepal. Source: elaborated with data from Ministry of Agricultural Development (2016).*

Over the first years of intense coffee promotion in the 90's and early 2000's, the main focus of the interventions was on the technical side of the production. Thus, interventions typically aimed both at distributing seeds, tools and other inputs, and at providing trainings, increasing know-how and disseminating knowledge. Nevertheless, a focus on access to market was lacking. The incapacity of smallholder farmers to find a market for their produce by themselves and the exploitative treatment of traders created a profound atmosphere of discouragement among farmers and led many of them to cut down their coffee plants. It is in this context that attention shifted towards the formation of cooperatives to overcome the market problem. The first cooperatives were thus established in the years 2003 and 2004. Ever since, coffee cooperatives have been proliferating and there seems to be at the present moment a new wave of cooperative formation. Currently, Nepal counts 148 primary coffee cooperatives with approximately 6000 members (Department of Cooperatives, 2017). Maybe the number of members seems strikingly low. The reason behind it is that not all farmers growing coffee are members of a primary cooperative. Given that small joint production creates

significant challenges for marketing, cooperatives usually do not restrict their services to members, buy coffee from non-members and are engaged in providing inputs to potential new farmers. Thus, non-members usually do sell their produce through a nearby cooperative, which explains that 90% of total coffee production in Nepal is marketed by cooperatives.

Table 1. *District Coffee Cooperative Unions (DCU), Primary Coffee Cooperatives (PC) and their members. Source: Ministry of Cooperatives and Poverty Alleviation (2017).*

District	DCU	PC	Members	Av. Member/PC
Arghakhanchi	No	4	100	25,0
Gorkha	Yes	15	510	34,0
Gulmi	Yes	11	487	44,3
Kaski	Yes	15	484	32,3
Kavrepalanchok	Yes	15	375	25,0
Lalitpur	Yes	10	461	46,1
Lamjung	Yes	9	543	60,3
Myagdi	No	1	27	27,0
Nuwakot	Yes	12	417	34,8
Palpa	Yes	12	411	34,3
Parbat	Yes	18	686	38,1
Sindhupalchok	Yes	11	N.A.	N.A.
Syangja	Yes	10	1061	106,1
Tanahun	Yes	5	368	73,6
Total	**12**	**148**	**5930**	**N.A.**
Average	**N.A.**	**11,92***	**527,55***	**44,7**

*Note: * = Excluding districts without district cooperative union.*

Primary coffee cooperatives are small in terms of their number of members. They have on average 42 members and most of them have between 30 and 100. However, there are also cooperatives with as few as 25 members and with over 200 members. Table 1 provides an overview of the distribution of cooperatives across districts as well as the total number of cooperative members in each district. Besides the 148 primary cooperatives, district cooperative unions have also been established in 12 districts, most of which were established almost at the same time as the first primary cooperatives were founded. Each of the 12 district cooperative unions encompasses typically 10 to 12 primary cooperatives and cover, on average, more than 500 members. In the case of

the Nepali coffee sector, the integration of primary cooperatives into the federated system entails a nearly 12-fold increase in the scale of operation. Finally, the Central Coffee National Union, although already established, is still not fully operational owing to lack of resources.

The organisation of the processing chain and distribution of services across the different levels (farmer, primary cooperatives and district cooperative unions) vary from district to district and, sometimes, also within the same district. Figure 5 shows the segment of the value chain under control of the farmer through the cooperatives for the district of Lalitpur, which can be regarded as the best, or one of the best, working coffee cooperative federation in Nepal. The cooperatives in Lalitpur offer to their members a price higher than any other cooperative in Nepal besides also being the only one that distribute dividends at the end of the year. Factors contributing to this superiority are the lower transportation costs thanks to its proximity to Kathmandu, the organic certification that they hold and the partnership with a fair-trade German client that remains very involved in supporting the cooperatives. Although aware that the distribution of services does not necessarily explain the better performance of the coffee sector in Lalitpur, we present here its organisation of the value chain as a benchmark.

The value chain of coffee begins with the acquisition of inputs. Generally, district cooperative unions are engaged in the free provision of coffee seeds in an attempt to expand coffee production. Since the moment of plantation, coffee plants take three to five years to bear fruits and to reduce the waiting period, most primary cooperatives run nurseries so that farmers can purchase older plants. Once the seed or the seedling has been planted, farmers are responsible for the cultivation of the plant until harvest, including the acquisition of other inputs such as fertilisers or insecticides. In some cases, however, district cooperative unions provide trainings on farming methods and provide some extra inputs but this does not happen in a structural way and depends on specific campaigns. When the harvest is completed, farmers sell their red cherries directly to their primary cooperatives. Primary cooperatives act thus as collection centres for red cherries and perform the first step in the processing chain: pulping. During pulping the first layer surrounding the coffee bean is removed. The beans need then to be dried, yielding what is known as parchment coffee.

Parchment coffee is subsequently sold by the primary cooperatives to the district cooperative union. The district cooperative union removes yet other layers covering the beans until the stage of green beans. Most of the trade on coffee happens in the stage of green beans since roasting is very sensitive to clients' tastes and performing roasting may destroy rather than add value to the coffee beans. In Lalitpur, the highest quality coffee is exported in the stage of green beans to roasters. Only the coffee that is not taken by the international roasters is further processed to roasted beans and ground coffee. These are typically marketed in the local market, mainly sold to the service sector such as cafés and restaurants. The domestic demand is, although growing because of tourism and cultural globalisation, limited. Nepal does not have a coffee tradition and tea is very embedded into the local culture as the most popular drink. Therefore, the export market is considered as the best option by most of the coffee producers.

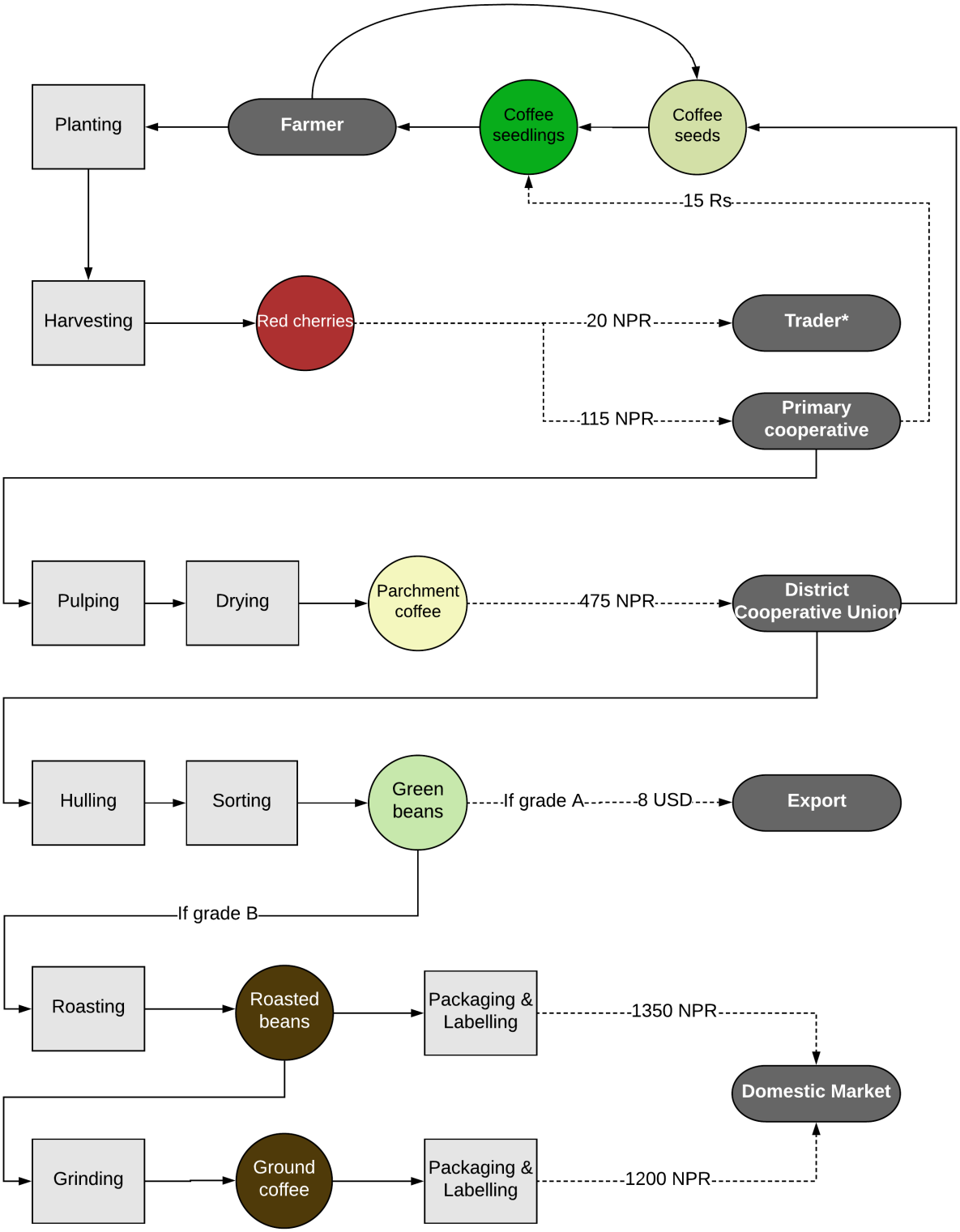

Figure 5. *Segment of coffee value chain under farmers' control through their cooperatives in Lalitpur district.*

*Note: * = transaction in a period before the establishment of the cooperatives included only for the sake of comparison. Dotted arrows denote transactions that involve the payment of a price.*

As mentioned before, there are differences in the organisation of the value chain across districts. Figure 6 provides a comparison of the cooperative segment of the value chain of Lalitpur, as a benchmark district, and three other districts included in this study.

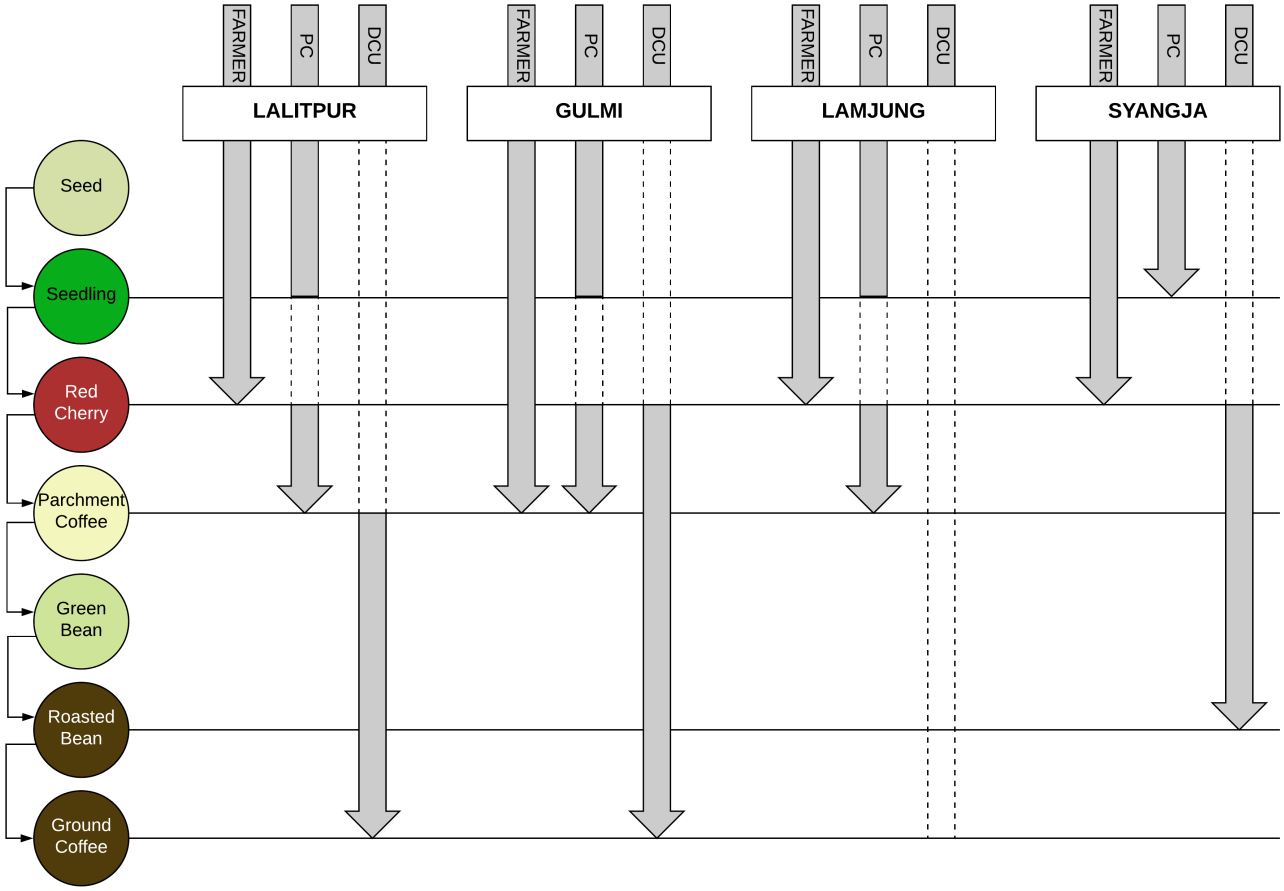

Figure 6. *Comparison of cooperative segments of coffee value chains in Lalitpur, Lamjung, Gulmi and Syangja.*
Note: the grey-shaded arrows denote the parts of the value chain in which the farmers, primary cooperatives and district cooperative unions are directly involved.

Gulmi was the district in which coffee was first introduced in 1938. Together with Lalitpur, it has one of the most developed coffee sectors in Nepal. Thus, Gulmi also processes coffee until the stage of ground coffee, although most of the production is exported as green beans. The major difference when compared to Lalitpur district can be found in that some farmers perform dry processing of red cherries and directly supply parchment coffee to their primary cooperative. Although only for a minority of farmers, the primary cooperatives can act merely as a collection centre.

The coffee sector in Lamjung is at other extreme of the development ladder. The district cooperative union currently lacks the resources to continue the processing of coffee and the size of the primary cooperatives does not allow them to perform the following steps of the chain. As a result, coffee leaves the control of the farmers as parchment coffee, a

very early stage of the value chain. The district cooperative union is active in the promotion of coffee, provision of seeds and trainings, and generation of market connections. It is noteworthy that there is no official economic transaction between primary cooperatives and the district cooperative union. The district cooperative union simply makes a market connection for the produce of the primary cooperatives and keeps a share of the price.

Finally, the coffee sector in Syangja presents a high degree of centralisation. While the system used to follow the same model as Lalitpur and Gulmi, the district cooperative union has decided to centralise pulping, process by which parchment coffee is obtained from red cherries. As a result, primary cooperatives are no longer involved in the processing of coffee, only being involved in the provision of seedlings, saving and credit services, and collection and transport of red cherries.

The cooperative movement started more or less simultaneously in all districts. Therefore, the differences in development cannot be attributed to time. Some variables that seemed to have played a role and may help to understand the differences are: infrastructure and transportation costs, external support and involvement, and internal leadership. Nevertheless, this list is not exclusive and is based on interviews with informants.

5. DATA & METHODOLOGY

5.1. VARIABLES AND MEASUREMENT

In order to provide answers to the research questions introduced in section 2, primary data were collected by means of a questionnaire. The main variables of importance for the theoretical framework and the purpose of this study are presented in this section together with the measurement strategy.

First, the **identification of famers with their primary cooperative** is a multidimensional construct that refers to the extent to which farmer share values and objectives with their primary cooperative as well as whether they have a general feeling of belonging. Secondly, the **participation of farmers in their primary cooperative** regards the involvement of farmers in the decision-making process of their cooperative and their capacity to influence it. Key to this is study is the outcome variable of commitment. Commitment is a complex construct that incorporates numerous dimensions. There is no single definition of commitment in the literature but there are, notwithstanding, some points of convergence or commonalities among different definitions and lines of research. Thus, commitment relates to the willingness of members to continue their relationship with and remain within the cooperative (Solinger, van Olffen, & Roe, 2008). Some authors, however, emphasise that commitment goes beyond the mere wish to maintain the relationship. Following Bijman & Verhees (2011) and Solinger et al., (2008), we see **commitment of farmers to their primary cooperative** as also including some level of effort to contribute to the organisation's success.

Similarly, we also define each of these variables at district level. This is, the identification of farmers with their district cooperative union, the participation of farmers in their district cooperative union, and the commitment of farmers to their district cooperative union. The content meaning of these variables is essentially the same, only diverging from the previous one with regards to the cooperative organisation they refer to.

Owing to their complex and multifaceted nature, the measurement of these variables is challenging and there is no single measure that comprises all dimensions. In these cases, the use of attitudinal questionnaires employing Likert scale scoring is common in the literature (Allen & Meyer, 1990; Anderson & Weitz, 1992; Bijman & Verhees, 2011; Cechin et al., 2012; Morgan & Hunt, 1994; Österberg & Nilsson, 2009). Data on these variables were, accordingly, collected by means of a questionnaire containing statements with regards to different dimensions of the variables presented above. Farmers could show their level of agreement or disagreement with the different statements making use of 5-point Likert scale in which 1 represents *strong disagreement* 2 represents *disagreement*, 3 represents *neutrality*, 4 represents *agreement*, and 5 represents *strong agreement.* It is important to bear in mind that the data obtained is of attitudinal character and therefore ought to be interpreted as the farmers' self-reported assessment of their identification with, participation in and commitment to the cooperative.

5.2. QUESTIONNAIRE CONSTRUCTION

An initial questionnaire was drafted based on the existing literature and was then adjusted according to the contextual information acquired by means of multiple interviews with relevant informants during the in-country fieldwork phase. Once the questionnaire was constructed, a double translation was performed to ensure the accuracy of the translation. The questionnaire was, thus, first translated into the local language by a native speaker after discussion of the meaning of each statement. Next, a second native speaker translated the questionnaire from Nepali back to English in order to identify possible mismatches. As a result, minor adaptations had to be made.

Before running the questionnaire for data collection in the selected areas (see subsection 5.3. on sampling below), the validity of the questionnaire was tested in the field through piloting with a reduced number of respondents. The test was carried out in a primary cooperative of the district of Lalitpur, where four farmers were interviewed. The farmers were selected to ensure representativeness. Therefore, farmers were selected according to gender, age, and the size of the coffee production. All four farmers together equal approximately 7% of the target sample size of the study. During the piloting of the questionnaire especial attention was paid to the relevance of the questions, their clarity, and the length of the questionnaire. As a result of the test, some questions were adjusted and some other were added, since the length of the questionnaire allowed to do so. The phase of questionnaire piloting also served a second goal besides the testing of the questionnaire: training of the translator. Interviews were conducted in the local language with support of an untrained translator. Prior to the data collection, some insights were given to the translator on how to avoid interviewer-

generated bias in the interviewees' answers. During the pilot phase, attention was also paid to the performance of the translator in order to correct any potential issue. Unfortunately, unexpected events forced us to substitute the translator before the initiation of the actual data collection. Despite the mishap, the insights and experience gained were also shared with the new translator.

The process of questionnaire development is depicted in Figure 7 and yielded a final questionnaire that counts 52 questions and is structured in four sections. The full English version of the questionnaire can be found in appendix A.

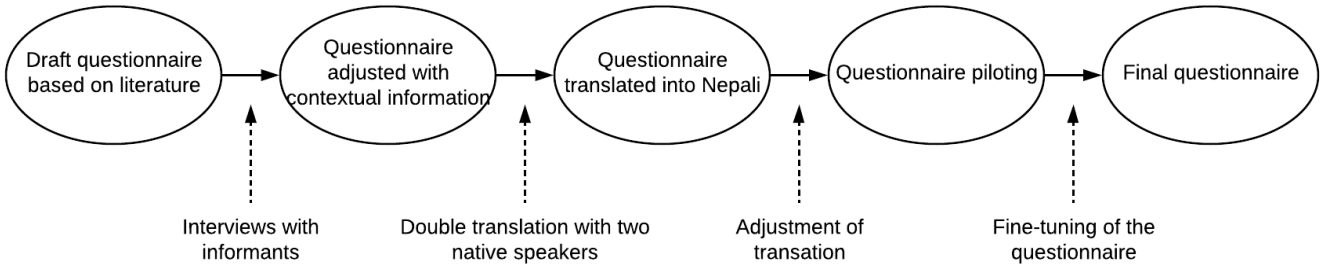

Figure 7. *Graphic representation of the process of questionnaire construction.*

Firstly, Section 1 contains 7 general questions and aims at understanding the engagement of farmers in coffee production. The questions in this section regard gender, number of plants, production, importance of income stemming from coffee farming, duration of the membership to the cooperative, attendance to the cooperative's General Assembly and whether the farmer belongs to an organic certified producer group.

Sections 2 and 3 are devoted to the collection of data on the variables of interest and relate to the farmers' primary cooperatives and district cooperative unions, respectively. Both sections follow the same structure and the content of the statements presented to the farmers is essentially the same. For each statement, farmers are asked to record their level of (dis)agreement making using of a 5-point Likert scale. Sections 2 and 3 can be divided into 4 parts.

The first three statements presented in section 2 (statements 8 to 10) assess the farmer's knowledge about their primary cooperative as well as their perceived dependency on the primary cooperative with regards to coffee production.

The following six statements make up the second part of section 2 and make reference to the farmer's identification with their primary cooperative. The choice of statements has been based on Allen & Meyer (1990) and Morgan & Hunt (1994) and encompasses different aspects of identification. An important component in identification is whether farmers perceive that both the cooperative and other farmers in the cooperative share their same objectives (Ole Borgen, 2001). Hence statements 11, 12 and 15 refer to the

perception of shared goals and objectives. Shared goals and objectives is, however, not enough. Identification also requires that farmers believe that there is a common feeling of what is important or right (Morgan & Hunt, 1994). In order to incorporate this dimension of identification, statements 13 and 14 concern the farmers' perception of shared values. Finally, statement 16 assesses whether farmers have a general feeling of belonging to the their primary cooperative.

The third part of section 2 contains five statements that measure the level of participation of farmers in their primary cooperative based on Österberg & Nilsson (2009). Statement 17 refer to the existence of enough mechanisms available to farmers to participate in the decision-making process of their primary cooperative. Statements 18 and 20 look into whether farmers perceive that they can actually influence the decision-making process. Finally, statements 19 and 21 dig deeper and concern the result of their influence – i.e.: whether their participation and influence in the decision-making of the primary cooperative translates into improvements of the farmers' individual situation.

The fourth and final part of section 2 comprises six statements with regards to the farmers' commitment to their primary cooperative. The selection of statements has been made in such a way so that this part reflects both dimensions mentioned in the definition above and adapted from Anderson & Weitz (1992), Bijman & Verhees (2011) and Cechin et al. (2012). Thus, statements 22 and 23 refer to the farmers' wish to continue the relationship with the cooperative in time whereas statements 24 to 27 aim to indicate the farmer's willingness to make some kind of effort in relation to their primary cooperative. Hence, all statements are phrased in a manner in which the efforts are either a request of the primary cooperative or aimed at the improvement of the primary cooperative. Statement 24 presents effort in terms of willingness to make adjustments in the farming methods. Effort in statement 25 is phrased in terms of time. Finally, statements 26 and 27 measure the farmer's willingness to contribute economically to their primary cooperative's success.

Section 3 aims to measure the farmers' identification with, participation in and commitment to their district cooperative union. Because it follows the same structure than section 2 and the content of the statements is essentially the same, it will not be described here for the sake of brevity. Nevertheless, Table 2 below provides the reader with an overview of the statements of sections 3 together with the statements in section 2.

Finally, Section 4 contains five final statements with regards to farmers' general perception of the organisation of the cooperative movement. Statements refer to the dependency of primary cooperatives on the district cooperative unions, the state of centralisation of decision-making and services, and the development of the national central cooperative union.

Table 2. *Sections 2 and 3 of the questionnaire.*

SECTION 2	SECTION 3
PART 2.1. GENERAL PC	**PART 3.1. GENERAL DCU**
8. I am familiar with my Primary Cooperative and the services it offers.	28. I am familiar with my District Cooperative Union and the services it offers.
9. I make frequent use of the services of my Primary Cooperative.	29. I make frequent uses of the services of my District Cooperative Union.
10. If I were not part of my Primary Cooperative, I would not be able to produce and sell coffee.	30. My District Cooperative Union offers essential services that I need to produce and sell coffee.
PART 2.2. IDENTIFICATION WITH PC	**PART 3.2. IDENTIFICATION WITH DCU**
11. My Primary Cooperative provides services that match my needs.	31. My District Cooperative Union provides services that match my needs.
12. My Primary Cooperative has goals and objectives that are other than mine.	32. My District Cooperative Union has goals and objectives that are other than mine.
13. My Primary Cooperative invests too much time in unimportant issues.	33. My District Cooperative Union invests too much time in unimportant issues.
14. I usually agree with my Primary Cooperative on what needs to be done and how it needs to be done.	34. I usually agree with my District Cooperative Union on what needs to be done and how it needs to be done.
15. Other farmers in my Primary Cooperative have the same priorities and needs as me.	35. Farmers in other primary cooperatives have the same priorities and needs as me.
16. I feel my Primary Cooperative almost as family and its problems are my problems.	36. I feel my District Cooperative Union almost as my family and its problems are my problems.
PART 2.3. PARTICIPATION IN PC	**PART 3.3. PARTICIPATION IN DCU**
17. I feel that there are enough mechanisms available to me to get across my concerns and interests to my Primary Cooperative.	37. I feel that there are enough mechanisms available to me to get across my concerns and interests to my District Cooperative Union
18. If I participate through the existing mechanisms, I can influence the decision-making at my Primary Cooperative.	38. If I participate through the existing mechanisms, I can influence the decision-making of my District Cooperative Union.
19. Through my participation in the decision-making at my Primary Cooperative, I can influence decisions so my economic situation improves.	39. Through my participation in the decision-making of my District Cooperative Union, I can influence decisions so my economic situation improves.
20. When I raise individual concerns to my Primary Cooperative, they are taken seriously and addressed within a short time.	40. When I raise individual concerns to my District Cooperative Union, they are taken seriously and addressed within a short time.
21. If I did not participate in the decision-making of my Primary Cooperative, my economic situation would be worse.	41. If I did not participate in the decision-making of my District Cooperative Union, my economic situation would be worse.
PART 2.4. COMMITMENT TO PC	**PART 3.4. COMMITMENT TO DCU**
22. I would keep doing business with my Primary Cooperative even if other options offered a higher	42. I would like my primary cooperate to keep doing business with the District Cooperative

price temporarily.	Union even if other options offered a higher price temporarily.
23. I will certainly remain a member of my Primary Cooperative for more than five years.	43. I certainly want my primary cooperative to remain a member of the District Cooperative Union in the future.
24. I am willing to change my farming methods if my Primary Cooperative asks me to do so.	44. I am willing to change my farming methods if my District Cooperative Union asks me to do so.
25. I am willing to put extra effort and invest my time in my Primary Cooperative if my Primary Cooperative needs it.	45. I am willing to put extra effort and invest my time in my District Cooperative Union if my District Cooperative Union needs it.
26. I am willing to receive a lower price for my production so my Primary Cooperative can grow and improve.	46. I am willing to receive a lower price for my production if that helps the District Cooperative Union grow and improve.
27.I am willing to pay a higher membership fee if that helps my Primary Cooperative grow and improve.	47. I am willing to pay a higher membership fee if that helps my District Cooperative Union grow and improve.

5.3. SAMPLING STRATEGY

As mentioned in section 4.2, the coffee sector in Nepal is still developing. To date, there are twelve operating district coffee cooperative unions in Nepal. These district cooperative unions cover 143 different primary cooperatives and 5803 individual coffee farmers (Department of Cooperatives, 2017). Since this study aims at understanding the differences in farmers' commitment towards their primary cooperatives and district cooperative union, the population is made up by these 5803 coffee farmers. Coffee farmers that are not member of a primary cooperative or whose primary cooperative is not a member of a district cooperative union are, thus, excluded from our population.

The sampling strategy was developed with an eye on having the highest variance and representativeness possible with a reduced number of observation owing to lack of resources. Hence, farmers were selected from different primary cooperatives and different districts. More specifically, we followed a two-stage cluster sampling strategy. Among the twelve districts with district coffee cooperative unions, three were selected. From these three districts, three primary cooperatives in each of them were, in turn, included in the study. Finally, we aimed at interviewing a minimum of seven farmers in each of the sampled primary cooperatives, adding up to 63 farmers.

The three districts (Gulmi, Lamjung and Syangja) were selected in a way to ensure heterogeneity with regards to the level of development of the coffee sector and the relative size of the primary cooperative and district cooperative union. Gulmi is one of the oldest coffee producing districts in Nepal and at the moment one of the most developed in terms of the proportion of the coffee value chain under farmers' control through the primary cooperatives and the district cooperative union. Size-wise, the primary cooperatives that conform its membership are relatively small with an average of 44 members per primary cooperative. The cooperative coffee sector in Lamjung is significantly less developed than in Gulmi or Syangja, since very small proportion of the coffee value is added within the cooperative sector. Primary cooperatives are medium-sized with an average of 60 farmers per primary cooperative. Finally, Syangja has a level

of development similar to the one in Gulmi but the primary cooperatives are, on average, considerably bigger – coffee primary cooperatives in Syangja have on average 106 members.

From each district cooperative union, three primary cooperatives were selected according to their accessibility. Factors determining the accessibility of a primary cooperative are its remoteness, possibility of travel from district capital and the reachability and availability of the contact person. Within each primary cooperative, between 8 and 17 farmers were interviewed depending on their remoteness and availability. As a result, 100 individual farmers from 9 different primary cooperatives were interviewed. Figure 8 below provides a schematic representation of the total sample and the distribution of observations among the different primary cooperatives and district cooperative unions.

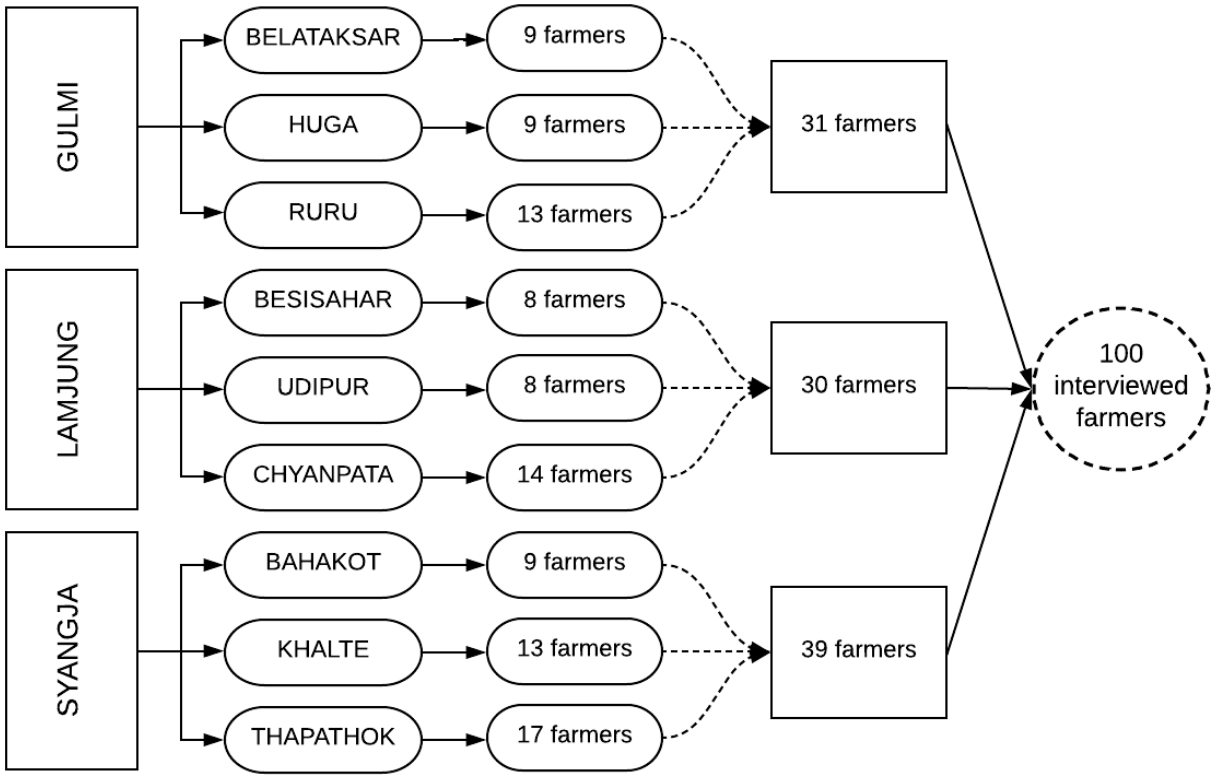

Figure 8. *Graphic representation of the sampling strategy.*

5.4. LIMITATIONS OF THE DATA

The data collected present certain limitations owing to both the measurement and sampling strategies employed. Here, we briefly discuss these limitations and their implications for the research. Results are to be interpreted and conclusion are to be drawn, thus, in the light of these limitations.

As previously mentioned, the measurement strategy of the variables yields self-reported assessments of the farmers' identification with, participation in and commitment to their primary cooperatives and district cooperative unions. This is a conscious choice based on the belief that it is the perceptions of farmers with regards to their identification and participation what have the potential to influence commitment rather than objective facts (Cechin et al., 2012; Österberg & Nilsson, 2009). Similarly, we understand commitment as attitude (Solinger et al., 2008) and as such, self-assessment by farmers of their commitment level is most appropriate. This approach contracts, however, with other authors who do measure the objective participation of members in an array of decisions (Bernard & Spielman, 2009) or calculate the extent of shared values from the comparison of the reported values of the two parties (Morgan & Hunt, 1994). As a result, the variables ought not to be interpreted as a general measurement of common goals and values, and of the democratic organisation of the cooperatives. Instead, they are better understood as a measure of satisfaction with regards to the identification and participation of farmers (Alho, 2015).

The measurement strategy is also likely to generate some bias towards socially desirable answers. The statements included in the questionnaire refer explicitly to the relation of farmers with their primary cooperatives and district cooperative union and low scores are associated with dissatisfaction with the functioning of the cooperative movement. In this sense, two factors may have contributed to encourage socially desirable answers. Firstly, the presence of a foreigner in the field may be perceived as an opportunity to attract support from international organisations, which is common in the cooperative movement. In the eyes of the interviewed farmers, showing dissatisfaction might have undermined the chances to attract support. Secondly, we were frequently introduced to the interviewees by the chairperson of the cooperative or district cooperative union. Although the chairperson was not involved during the interviews, their presence during part of the interview may have influenced the scores reported by the farmers upwards. As a consequence of the measurement strategy, there may be an upwards bias in the values of the variables.

The sampling strategy may also have implications for the interpretation of results and, more specifically, for the external validity of the research. Both primary cooperatives and interviewed farmers were chosen according to their reachability. This implies that the interviewed farmers were presumably the least remote farmers of the least remote primary cooperatives. Concerns would arise if the identification, participation and commitment of farmers were negatively influenced by remoteness. Although no empirical data were collected in this study to test that relationship, it is likely that more remote farmers participate less and are taken less into account by the cooperative. In fact, we did gather the testimony of a farmer who argued that he did not used to have access to certain equipment distributed by the cooperative owing to the remoteness and isolation of his farm. Likewise, the chairman of one of the sampled primary cooperatives informed us that non-member coffee growers that are relatively farther away from the primary cooperative refuse to become full members of the cooperative because their remoteness does not allow them to participate in the primary cooperative, while they can still supply their production to the cooperative and do business with it. These testimonies seem to point at vanishing benefits of the

membership as distance and remoteness increase and render our results sensitive to the sampling strategy. This same reasoning may apply for the relation between primary cooperatives and district cooperative unions, primary cooperatives that are relatively farther away receiving less attention and support from the district cooperative union. As a result, the non-random sampling strategy may have created an upwards bias in the data. The average identification, participation, and commitment of farmers would thus be presumably lower in case random sampling or a census had been carried out.

The potential upwards bias arising from desirable answers and non-random sampling must be taken into consideration and results are to be interpreted in the light of these limitations. Because both biases seem to put upwards pressure on the data, we can argue that the results reflect a rather optimistic picture of commitment among farmers.

5.5. STATISTICAL METHODS

To understand the choice of statistical methods, we need to recall at this point the research questions posited above in section 2. The first set of research questions aims at identifying how commitment varies across the two levels of the federation: primary cooperative and district cooperative union. The second set of research questions introduces the dimensions of identification and participation and intends to ascertain the magnitude of the association between identification and participation, on the one hand, and commitment, on the other hand.

As a first step to provide an answer to this research questions, we inspect the descriptive statistics for identification, participation and commitment. Secondly, we develop composite indicators and analyse the correlation between them. As a finally step, we conduct a canonical correlation analysis to dig deeper into the dimensionality of the associations between the variables.

5.5.1. DESCRIPTIVE STATISTICS

Each statement included in the questionnaire is transformed into one variable. As a result, our data set includes 52 variables, of which 34 are the main variables of interest devoted to the measurement of farmers' identification with, participation in and commitment to their primary cooperatives and district cooperative unions. Each of these 34 variables are labelled according to the dimension it measures and the level it refers to. A key relating variables and statements can be found in appendix B.

To identify possible differences in commitment across the federated levels, we inspect the average values and variance of the twelve variables measuring the commitment of members. Furthermore, we conduct hypothesis testing to ascertain whether the differences in each pair of variables are statistically significant. It is convenient to recall that for each variable at primary cooperative level, there is another variable measuring the same dimension at district cooperative union level. Hence, variables at primary cooperative level can be logically paired with their matching variable at district

cooperative level (see section 5.2. for a more detailed explanation on the process of variables construction).

Graphic inspection of the variables seems to point at non-normality in the distribution of the variables. Likewise, we conduct Shapiro-Wilk and Shapiro-Francia normality tests and fail to reject the non-normality among the variables. Despite the fact that the size of the sample (n=100) allows us to assume normality by application of the central limit theorem, we conduct, for the sake of robustness, two statistical tests. We first conduct two-tailed paired t-tests for the null hypothesis of both variables in each pair having equal means. Secondly, we perform Wilcoxon signed-rank tests as a nonparametric alternative to the paired t-test.

The same process is also conducted to identify differences across the federated levels in members' identification and participation.

It is worth mentioning that the clustered nature of our data requires the clustering of standard errors to adequately account for within-group dependence. Unfortunately, the limited number of clusters included in this study (9 primary cooperatives) renders the remedy of cluster-robust errors worse than the disease. We are aware that the suitable strategy for a data set with a reduced number of clusters and variables with a limited range of values such as ours is the application of a wild cluster bootstrap-t procedure as put forward by Cameron, Gelbach, & Miller (2008). Owing to the complexity of the method and the low intra-cluster correlations, we decide to disregard the clustered nature of the data and report throughout this report the conventional standard errors. Table C.1 in Appendix C displays the intra-cluster correlation coefficients for composite indicators of commitment, identification and participation at primary cooperative and district cooperative union level. These intra-cluster correlation coefficients range from 0,07 to 0,32 and, overall, indicate that neglecting intra-cluster correlation does not put at stake the validity of our results.

5.5.2. COMPOSITE INDICATORS

Identification, participation and commitment are, as explained, multifaceted and complex constructs. The questionnaire included several statements for each of these constructs, referring each statement to different dimensions of the construct. Hence, it is of little interest to interpret each variable individually. A simple way to analyse all variables jointly is by constructing composite indicators that combine all dimensions into one single number that, although simplified, incorporates all the information. We design composite indicators of each of the following: farmers' identification with their primary cooperative, farmers' identification with their district cooperative union, farmer's participation in the their primary cooperative, farmers' participation in their district cooperative union, farmers' commitment to their primary cooperative, and farmers' commitment to their district cooperative union.

5.5.2.1. IDENTIFICATION

The first step in composite indicator construction is developing a theoretical framework supportive of the choice of variables that renders the indicator meaningful. This exercise was already undertaken during the process of developing the questionnaire and the selection of statements. Therefore, we use all six variables measuring the farmers' identification with their primary cooperative to construct the composite indicator. Note that the composite indicator of the farmers' identification with their district cooperative union is developed following the exact same process.

It is worth recalling that the values of two of the six variables must be interpreted in the opposite direction than the remaining four. This is, high values are associated with low identification and vice versa. In order to render all variables comparable, we undertake an inversion of the scale for these two variables. The ratio of missing values is very low and, presumably, at random. Hence, no imputation of missing value is undertaken.

A critical step in the construction of an indicator is the attribution of weights. In order to avoid double counting, we group the variables into three categories so that variables that measure the same dimensions fall within the same category. Three categories are identified: shared objectives (IPC1, IPC2 and IPC5), shared values (IPC3 and IPC4), and feeling of belonging (IPC6). Equal weighting is applied across the three categories and, as a result, variables differ with regards to their individual contribution to the indicator, reducing possible double counting in the indicator. An exploration of the matrix of correlations of the six variables (Figures C.1 and C.2. in appendix C), however, does not show strong within-category correlations and dissipates our fears for double counting. We further conduct hypothesis testing to ensure that the different dimensions in the same construct are statistically different from one another. A multivariate test of means rejects with 1% confidence level that all means are the equal. Table C.2 in appendix C display the t-statistic and confidence levels of two-tailed paired t-tests for each pair of variables.

$$\boldsymbol{IDEN_{PC}} = \frac{1}{3} \times \frac{(IPC1 + (6 - IPC2) + IPC5)}{3} + \frac{1}{3} \times \frac{((6 - IPC3) + IPC4)}{2} + \frac{1}{3} \times IPC6$$

In an attempt to assess the weighting-sensitivity of the composite indicator, we also compute an alternative composite indicator by applying equal weighting across all six variables.

5.5.2.2. PARTICIPATION

The composite indicators with regards to farmers' participation in their primary cooperative and their district cooperative union are developed following a process very similar to the one described in the section above. Here too, all variables related to

participation are included in the indicators following the theoretical framework that was developed for the design of the questionnaire. As opposed to the identification indicators, all participation variables have the same scale and are directly comparable so normalisation is not required. Finally, no missing values are imputed.

For the weighting of the different variables in the composite indicators, the participation variables are grouped into three categories according to different aspects of participation: existence of participatory mechanisms (PPC1), influence power (PPC2 and PPC4), and individual effect of participation (PPC3 and PPC5). In order to avoid double counting, equal weighting is applied across these three categories, which results in unequal weighting of individual variables. To assess the weighting-sensitivity of the composite indicators, alternative indicators with equal weighting across variables are also computed. Furthermore, double counting in the composite indicators with equal weighting does not seem to be problematic after inspection of the correlation matrixes (Figures C.3 and C.4. in appendix C). We further conduct hypothesis testing to ensure that the different dimensions in the same construct are statistically different from one another. A multivariate test of means rejects with 1% confidence level that all means are the equal. Table C.3 in appendix C display the t-statistic and confidence levels of two-tailed paired t-tests for each pair of variables.

$$\boldsymbol{PART_{PC}} = \frac{1}{3} \times PPC1 + \frac{1}{3} \times \frac{(PPC2 + PPC4)}{2} + \frac{1}{3} \times \frac{(PPC3 + PPC5)}{2}$$

5.5.2.3. COMMITMENT

Regarding the weighting strategy in the case of the composite indicators of farmers' commitment to their primary cooperatives and district cooperative union, the variables are grouped into two categories: future prospects (CPC1 and CPC2) and willingness to invest (CPC3, CPC4, CPC5 and CPC6). Each of the categories is equally weighted, which translates into unequal weighting across the variables. Here, too, an alternative composite indicator applying equal weighting is computed for the sake of robustness. No normalisation or imputation of missing values are required. The matrix of correlations is also inspected and a multivariate test of means rejects the hypothesis of all means being equal. Correlation matrixes and t-statistics resulting from two-tailed paired t-test for each pair of variables can be consulted in Figures C.5 and C.6 and Table C.4 in appendix C.

$$\boldsymbol{COMMIT_{PC}} = \frac{1}{2} \times \frac{(CPC1 + CPC2)}{2} + \frac{1}{2} \times \frac{(CPC3 + CPC4 + CPC5 + CPC6)}{4}$$

5.5.2.4. ANALYSIS OF COMPOSITE INDICATORS

Once the composite indicators have been constructed following the procedure laid out above, we perform two-tailed paired t-tests to determine whether the means of the variables are significantly different across the levels of the federation. Because the Shapiro-Wilk and Shapiro-Francia normality tests fail to reject non-normality in the distribution of the indicators, we also use Wilcoxon signed-rank tests to assess the differences in means. The results of these tests, combined with the results stemming from the previous tests at individual variable level, provide an answer to the first set of research questions.

It is convenient to recall at this moment the second set of research questions. These aim at (1) determining the strength of the association between identification and participation, on the one hand, and farmers' commitment, on the other hand, and (2) identify how these relationships change with regards to primary cooperatives and district cooperative unions. As a first step to that end, we calculate the Pearson's correlation coefficients between the different composite indicators within each level of the federation.

5.5.3. CANONICAL CORRLATION ANALYSIS

The array of multivariate techniques available to assess dependence relationships is large. Many of them, however, are appropriate only to examine the relationship between one single dependent variable and a number of independent variables. Unfortunately, these methods are of little use for the study at hand, for we have commitment on our left side – i.e.: a multifaceted construct measured by means of six independent variables. Eventually, we could undertake multiple regressions, one for each of the six independent variables, but this would entail losing the perception of complexity of identification, participation and commitment, as well as risking incurring in Type I error associated with multiple hypothesis testing (Hair, Black, Babin, & Anderson, 2014). Canonical Correlation Analysis (CCA) solves these problems by allowing us to include several dependent variables and is especially appropriate to examine the relationship between two groups of variables (Sherry & Henson, 2005). We, therefore, apply canonical correlation analysis to provide a more comprehensive picture of the relationship between the different individual variables, while keeping present that they are meant to measure different aspects of one single construct. This method allows us to build on the simplicity of the analysis of composite indicators by digging deeper into the dimensionality of the association between the three different constructs.

The CCA method calculates the correlation between the two sets of variables. In this sense, the application of CCA does not imply too big a step from the previous section where we calculated the bivariate correlation between to composite indicators, which summarise two groups of variables. Whereas previously the composite indicators were developed by attributing equal weights or theory-based unequal weights, CCA develops linear combinations of dependent and independent variables in such a way that the

correlation between both sets of variables (canonical variates) is maximised. CCA provides not only one but several canonical functions based on the residual variance not explained by the previous function(s). This is, CCA first determines the pair of canonical variates having the largest correlation and proceeds by computing alternative pairs of canonical variates that maximise the correlation between both sets and that are perfectly uncorrelated with previous canonical variate(s). CCA provides thus an overall measure of the strength of the relationship between both sets of variables while also providing information on the dimensionality and contribution of the different individual variables.

Hair et al. (2014) mention a number of assumptions and requirements for the application of CCA. First, CCA assumes a linear relationship between the canonical variates. Our hypothesis goes in this line and there is no reason to believe that the relationship between identification and participation, and commitment may be non-linear. Graphic inspection of the scatter plots of the different combinations of composite indicators (see Figures 9 and 10 in Section 6.3 below) also provides some indication of linearity. Second, CCA requires homoscedasticity and absence of multicollinearity. Having studied the matrix of correlations between all the individual variables (see Section 5.5.2. on the construction of indicators), multicollinearity is not a concern. On the other hand, graphic inspection of the scatter plots of the different combinations of composite indicators (in figure 9 and figure 10) seems to point towards some, although low, level of heteroscedasticity in some cases. We cannot find, however, a theoretical mechanism that could help us understand why errors would systematically be higher at higher levels of commitment and identification or participation. We, therefore, conclude that the graphic inspection may be misguiding owing to the higher concentration of data points at the higher extreme of the scale and assume homoscedasticity. Finally, it is noteworthy that, although desirable, normality is not required according to Hair et al. (2014) and consequently, non-normality among our variables is not a source of concern.

Canonical variates are artificial and have no physical meaning. Therefore, it is important to provide a theoretical meaning as for why the different variables are treated together as one set. In order to confer a clear meaning to the canonical variates we conduct four separate canonical correlation analyses with the following pairs of canonical variates: (1) farmers' commitment to their primary cooperative and farmers' identification with their primary cooperative, (2) farmers' commitment to their primary cooperative and farmers' participation in their primary cooperative, (3) farmers' commitment to their district cooperative union and farmers' identification with their district cooperative union, and (4) farmers' commitment and farmers' participation in their district cooperative union.

6. RESULTS

6.1. DESCRIPTIVE STATISTICS

6.1.1. GENERAL CHARACTERISTICS

Among those farmers sampled, roughly half of them were women (44%) although the proportion female-to-male varies greatly across primary cooperatives. Thus, in some primary cooperatives nearly all interviewed farmers were women while the opposite is also true for other primary cooperatives. Practically all coffee farmers are smallholder farmers engaged in subsistence agriculture in small plots of land. They typically keep livestock and grow a vast range of different crops, including staple crops such as rice or maize and large variety of other vegetables and fruits. Virtually all production is primarily aimed at own consumption and only small exceeding quantities of the produce are also sold to traders at farm gate.

In this context, coffee represents the only crop that farmers grow uniquely aimed at the market. In fact, Nepal does not have a coffee tradition and many coffee farmers have never drunk coffee before or do not know how coffee – the drink – is made. Coffee farmers own typically a limited number of plants in their farms as a result of the developing nature of the coffee sector, which holds farmers back from bolder investments, and of other limitations associated with smallholder farming. 21% of the farmers own as few as less than 20 plants and only 29% of them count more than 200 plants in their farms, although there are some cases of relatively large investments counting over 1000 plants. Most farmers (35%) own between 20 and 100 coffee plants. Despite the small number of plants per farmer, 72% of the farmers stated that coffee is a very important source of income and, in a scale of 1 to 5 where 5 is *very important* and 1 *not important*, only one farmer gave a score lower than 3. Interestingly, an employee of National Coffee and Tea Development Board argued that there are no coffee farmers in Nepal but subsistence farmers who plant coffee in any small idle piece of land. Although this testimony does not provide an accurate picture of the coffee sector in Nepal as a whole, it does portray the reality of many coffee farmers in the country.

6.1.2. COMMITMENT

A general exploration of the descriptive statistics of commitment provided in Table 3 shows that farmers' commitment level is high overall. Out of the twelve statements measuring commitment towards the primary cooperatives and the district cooperative unions, nine present an average that is above four, being five the highest value allowed in the scale. Notwithstanding the general high value across the board, there are some differences between variables.

The intention of the farmers to remain a member of their primary cooperative and their wish that their primary cooperative remains a member, in turn, of their district cooperative union (captured by variable C2 in Table 3) rank especially high as compared to other variables showing commitment. These high values also reflect the high degree

of dependency of farmers on the cooperative structure. In this sense, over 60% of farmers stated that they would not be able to produce or sell coffee if they were not part of their primary cooperative. The dependency on the district cooperative union is also high, with over 50% of the farmers perceiving the district cooperative union as necessary to produce and sell coffee.

Table 3. *Differences in farmers' commitment to their primary cooperative (PC) and district cooperative union (DCU).*

	PC			DCU			
Variable	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**t-value[1]**
C1	99	4,384	(1,193)	99	4,313	(1,226)	0,6344
C2	97	4,711	(0,866)	99	4,361	(1,276)	3,4507***
C3	99	4,327	(1,182)	98	4,398	(1,164)	-0,8671
C4	99	4,424	(1,051)	99	4,172	(1,246)	2,4081**
C5	99	4,121	(1,172)	99	3,970	(1,321)	1,1772
C6	99	3,869	(1,275)	99	3,646	(1,387)	1,7463*

*Note: [1]: t-value shows the t-value resulting from the two-tailed, paired t-test with H_0: mean(PC) – mean(DCU) = 0. * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*
C1(PC)= I would keep doing business with my PC even if other options offered a higher price temporarily; C1(DCU)= I would like my PC to keep doing business with the DCU even if other options offered a higher price I temporarily; C2(PC)= I will certainly remain a member of my PC for more than 5 years; C2(DCU)= I certainly want my PC to remain a member of the DCU in the future; C3= I am willing to change my farming methods if my PC(DCU) asks me to do so; C4= I am willing to put extra effort and invest my time in my PC(DCU) if my PC(DCU) needs it; C5= I am willing to receive a lower price for my production so my PC(DCU) can grow and improve; C6= I am willing to pay a higher membership fee if that helps my PC(DCU).

Despite the long-term prospects and the dependency on the cooperative movement, the willingness of farmers to give up earnings for the improvement of their primary cooperative and district cooperative union (represented by variable C5 in Table 3) and to contribute financially to them (C6 in Table 3) is lower. This may also be influenced by the general scarcity of resources among coffee farmers. Interestingly, the variable indicating refusal to side-sell (C1 in table 3) is relatively high, showing social rejection towards this practice and high commitment. A former chairman of a district coffee cooperative union informed us that traders are still active and side-selling remains problematic in some cases. In most cases, these side-selling practices are triggered by the timing of the payment rather than by the price that traders offer. General low levels of side-selling have been achieved, he argues, as a result of strict policies at district level. He further explains that side-selling happens primarily at individual level. Once the coffee is collected by the primary cooperatives, it follows the process towards the district cooperative union. Primary cooperatives are not only required to provide the full amount of produce to the district cooperative union but also lack the capacity to develop

their own marketing strategy.

More interesting for the aim of this study are the differences between the farmers' commitment towards their primary cooperative and towards their district cooperative union. For three out of the six variables, these differences are statically significant. Note that the statistical significance here reported and discussed is computed by means of a two-tailed paired t-test. The results of nonparametric Wilcoxon sign-rank tests are very similar and preference has been given to the t-tests because of their greater power when normality holds (Ott & Longnecker, 2016). The alternative table making use of the Wilcoxon sign-rank test can be found in the appendix for the sake of comparison (Table C.5 in appendix C).

Looking at the three dimensions in which differences are statistically significant, it seems that farmers have a significantly stronger wish to continue their relationship with their primary cooperative than with their district cooperative union. Furthermore, farmers are more willing to invest their time to help their primary cooperative rather than their district cooperative union (C4 in table 3) and are more willing to contribute financially to their primary cooperative than to their district cooperative union. When looking to the other three variables in which the differences do not seem to be statistically significantly different from zero, we find that side-selling is widely rejected at both levels – farmers with regards to primary cooperative and primary cooperative with regards to district cooperative union. Moreover, the farmers' willingness to undertake changes in farming methods cannot be said to differ when it is requested by the primary cooperative or by the district cooperative union. The average is slightly higher in the case of the district cooperative union perhaps as a result of knowledge being concentrated in the district cooperative unions. Primary cooperatives are small and lack access to information and expertise while district cooperative unions are usually the target of external interventions and support and the main organisers of trainings. As a result, farmers may perceive farming knowledge as more reliable when it comes from the district cooperative union instead of from their own primary cooperative, a phenomenon already identified in the literature as reference power to explain the relationship between primary cooperatives and their federated bodies (Hogeland, 2002). Finally, the difference in farmers' willingness to give up earnings as a way to contribute to the improvement of the primary cooperative and district cooperative union is not significantly different from zero. With regards to this last point, descriptive statistics seem to point to a general preference to contribute to the success of both the primary cooperative and the district cooperative union via retained profits than via upfront financial contribution by the members.

6.1.3. IDENTIFICATION AND PARTICIPATION

The general picture of farmers' identification and participation is similar to the case of commitment. Thus, the level of farmers' identification with and participation in their primary cooperatives and district cooperative unions is high overall, most of the variables showing an average above four as displayed in Table 4. Note that statements corresponding to variables I2 and I3 in Table 4 are negatively phrased and therefore,

lower scores are associated with higher degrees of identification.

Table 4. *Differences in farmers' identification with and participation in their primary cooperative (PC) and district cooperative union (DCU).*

	PC			DCU			
Variable	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**t-value[1]**
I1	97	4,351	(1,012)	99	4,103	(1,212)	1,7139*
I2	97	3,115	(1,654)	98	2,708	(1,595)	2,1582**
I3	97	2,219	(1,495)	98	2,333	(1,526)	-0,6764
I4	98	4,357	(1,151)	99	4,071	(1,326)	2,0209**
I5	98	4,500	(1,058)	99	4,316	(1,172)	1,7502*
I6	98	4,418	(1,251)	99	4,143	(1,414)	2,1133**
P1	99	4,212	(1,091)	99	3,879	(1,438)	2,4609**
P2	99	4,313	(1,094)	99	4,091	(1,205)	1,8693*
P3	99	4,418	(1,004)	98	4,224	(1,189)	1,7603*
P4	98	4,194	(1,282)	99	3,714	(1,300)	3,2701***
P5	99	3,879	(1,402)	99	3,808	(1,352)	0,4918

*Note: [1]: t-value shows the t-value resulting from the two-tailed, paired t-test with H_0: mean(PC) – mean(DCU) = 0. * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*
I1= My PC(DCU) provides services that match my needs; I2= My PC(DCU) has goals and objectives that are other than mine; I3= My PC(DCU) invests too much time in unimportant issues; I4= I usually agree with my PC(DCU) on what needs to be done and how it needs to be done; I5= Other farmers in my PC(other PC's) have the same priorities and needs as me; I6= I feel my PC(DCU) almost as family and its problems are my problems.
P1= I feel that there are enough mechanisms available to me to get across my concerns and interests to my PC(DCU); P2= If I participate through the existing mechanisms, I can influence the decision-making at my PC(DCU); P3= Through my participation in the decision-making at my PC(DCU), I can influence decisions so my economic situation improves; P4= When I raise individual concerns to my PC(DCU), their taken seriously and addressed within a short time; P5= If I didn't participate in the decision-making of my PC(DCU), my economic situation would be worse.

With regards to the identification differences across levels, four out of the six identification variables show significantly higher scores in the case of identification with the primary cooperative. Thus, the services offered by the primary cooperative match better the needs of the farmers than those of the district cooperative union (I1 in Table

4). Furthermore, farmers share the vision and mission of the primary cooperative (I4 in Table 4), and goals and objectives with other farmers in the primary cooperative (I5 in Table 4) to a greater extent than at district cooperative union level. Finally, farmers also have a greater feeling of belonging (I6 in Table 4) to their primary cooperative than to their district cooperative union. Variable I2 represents the perception of farmers that their primary cooperative and district cooperative union have goals and objectives other than theirs and shows also statistical significance. While there is no clear explanation for this result, it may be due to the perception that primary cooperatives play a role that members cannot perform individually and as such, need to have other objectives and goals. This explanation is consistent with the score of variable I5, which measures the extent to which respondents share goals and objectives with other farmers in the cooperative. Furthermore, the fact that the statement was phrased negatively in the questionnaire led to some confusion among farmers, which may also account for the unexpected result.

The picture of participation differences is similar. Four out of the five variables measuring participation show differences across levels that are statistically different from zero. Thus, farmers perceive that there are more mechanisms available to them to participate in their primary cooperatives (captured by P1 in Table 4) but also that they are better able to influence decision-making (P2 in Table 4) and improve their personal situation as a result of their participation (P3 in Table 4) at their primary cooperative than at the level of their district cooperative union. Finally, farmers' concerns are taken more seriously and addressed more rapidly (P5 in Table 4) by their primary cooperative than by their district cooperative union.

6.2. COMPOSITE INDICATORS

Table 5 shows the mean values of the constructed composite indicators for farmers' identification with, participation in and commitment to their primary cooperatives and district cooperative unions. As expected after inspection of the descriptive statistics, the indicators show, overall, high levels of identification, participation and commitment at both levels. At primary cooperative level, all three indicators display a score higher than four. In the case of the district cooperative unions, the identification and participation levels, although high, fall below four and only the commitment indicator shows a score higher than four.

Table 5 also shows that the mean scores at district cooperative level are systematically lower than at primary cooperative level. These differences are, furthermore, statically significant at 10% confidence level and at 1% confidence level in the case of participation and commitment. It is noteworthy that these results are robust to the weighting strategy in the indicator construction and to the statistical test employed to test the differences across district. Table C.6 in appendix C displays the means and standard deviations of alternative indicators with equal weighting of variables and the results of a Wilcoxon sign-rank test.

Table 5. *Differences in farmers' participation in and commitment to their primary cooperative (PC) and district cooperative union (DCU) as indicated by the composite indicators.*

	PC			DCU			
Variable	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**t-value[1]**
IDENTIFICATION	95	4,109	(0,817)	97	3,955	(1,000)	1,8610*
PARTICIPATION	98	4,265	(0,919)	98	3,923	(1,046)	3,6249***
COMMITMENT	97	4,383	(0,722)	98	4,203	(0,919)	2,7039***

*Note: [1]: t-value shows the t-value resulting from the two-tailed, paired t-test with H_0: mean(PC) – mean(DCU) = 0. * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*

Table 5 also shows that the mean scores at district cooperative level are systematically lower than at primary cooperative level. These differences are, furthermore, statically significant at 10% confidence level and at 1% confidence level in the case of participation and commitment. It is noteworthy that these results are robust to the weighting strategy in the construction of the indicators and to the statistical test employed to test the differences across district. Table C.6 in appendix C displays the means and standard deviations of alternative indicators with equal weighting of variables and the results of a Wilcoxon sign-rank test.

Figure 9 depicts the correlation between the farmers' identification with, their participation in and their commitment to their primary cooperatives. All three coefficients show a very strong positive association between the variables, ranging between 0.64 and 0.74. Thus, higher levels of farmers' identification and participation are strongly associated with higher levels of commitment to the primary cooperatives. As an illustration of the association between identification and commitment, we gathered the testimony of the chairman of one of the sampled primary cooperative. He informed us that members are more willing to invest in their primary cooperative because they have a deeper relationship with the primary cooperative than with the district cooperative union. Furthermore, he argued that about 75% of the goals of the district cooperative union are the same as the goals of the primary cooperative but there are also some discrepancies regarding the stance towards irrigation, the costs borne by the primary cooperative or the shading provided to the coffee plants. These discrepancies, he further explains, make farmers less willing to invest in the district cooperative union.

On the other hand, the strong correlation between participation and identification may be the result of a feedback process in which farmers' that identify themselves more with the cooperative tend to also perceive their participation as higher and more effective, while simultaneously, farmers that participate more and more intensively in the decision-making of the cooperative usually feel more identified with the general values and objectives of the group.

These results may, however, be driven by few extreme observation at low levels of participation, identification and commitment. Upon deletion of the 5% lowest observations of each of the three composite indicators, the correlation coefficients drop considerably. The correlation coefficients between identification and commitment, and participation and commitment fall close to 0,45 and 0,43, respectively. In the case of the association between identification and participation, the correlation coefficient falls to 0,48. Despite the noticeable reduction of the correlation coefficients, they remain statistically significant at 1% confidence level and still denote a moderate positive relationship between the variables. Figure C.7 in appendix show these results. In the light of the results, we deem that the results are sufficiently robust.

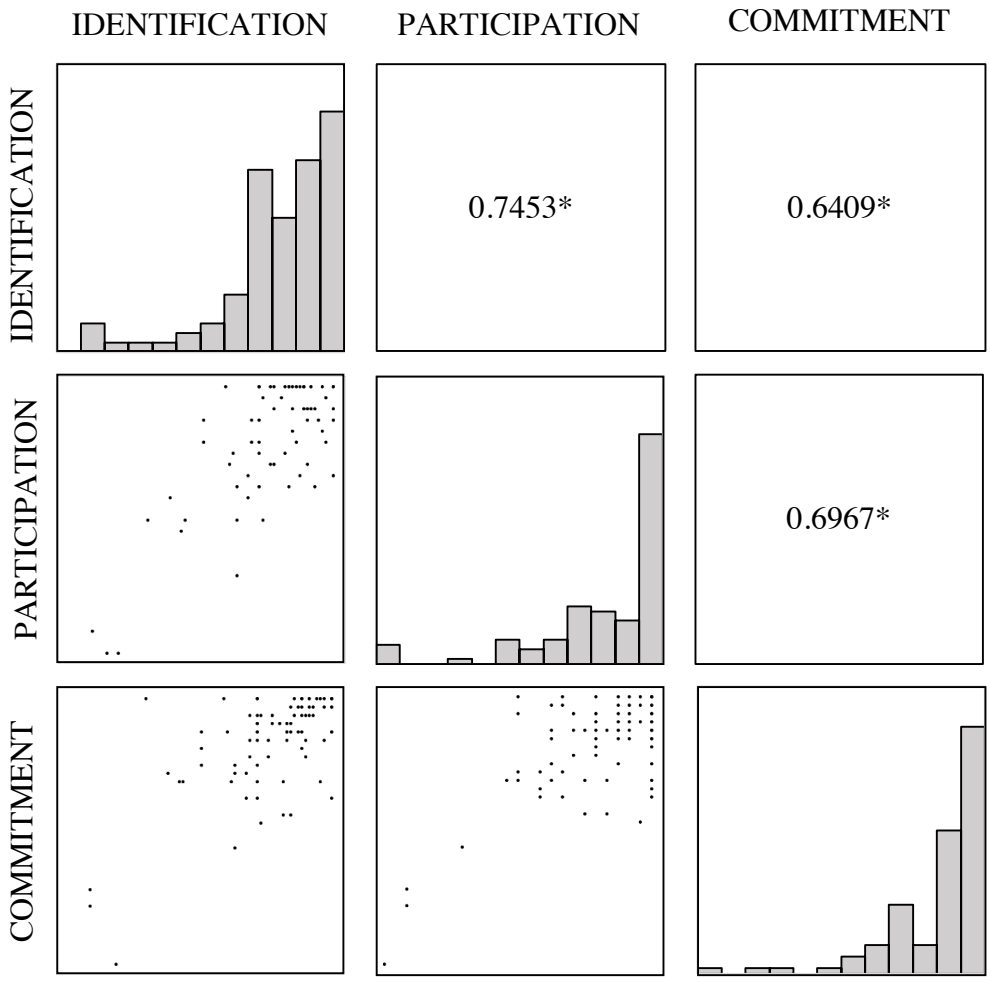

Figure 9. *Correlation between farmers' identification with, participation in and commitment to their primary cooperatives.*

*Note: The digit boxes show the correlation coefficients where * = significant at 1% confidence level. The scatter diagrams plot the values of each pair of variables along axes ranging from 1 to 5. The middle boxes show a 12-bin frequency histogram for each variable. N = 95, 98 and 97 for identification, participation and commitment, respectively.*

Figure 10 shows a very similar picture for the correlations between farmers' identification with, participation in and commitment to the district cooperative unions. Although the correlation coefficients are lower in all three cases, they still point towards a strong positive relation between the indicators. Hence, where identification and participation is high, so is, generally speaking, farmers' commitment. The same is true in the case of low identification and participation, cases in which commitment is also low.

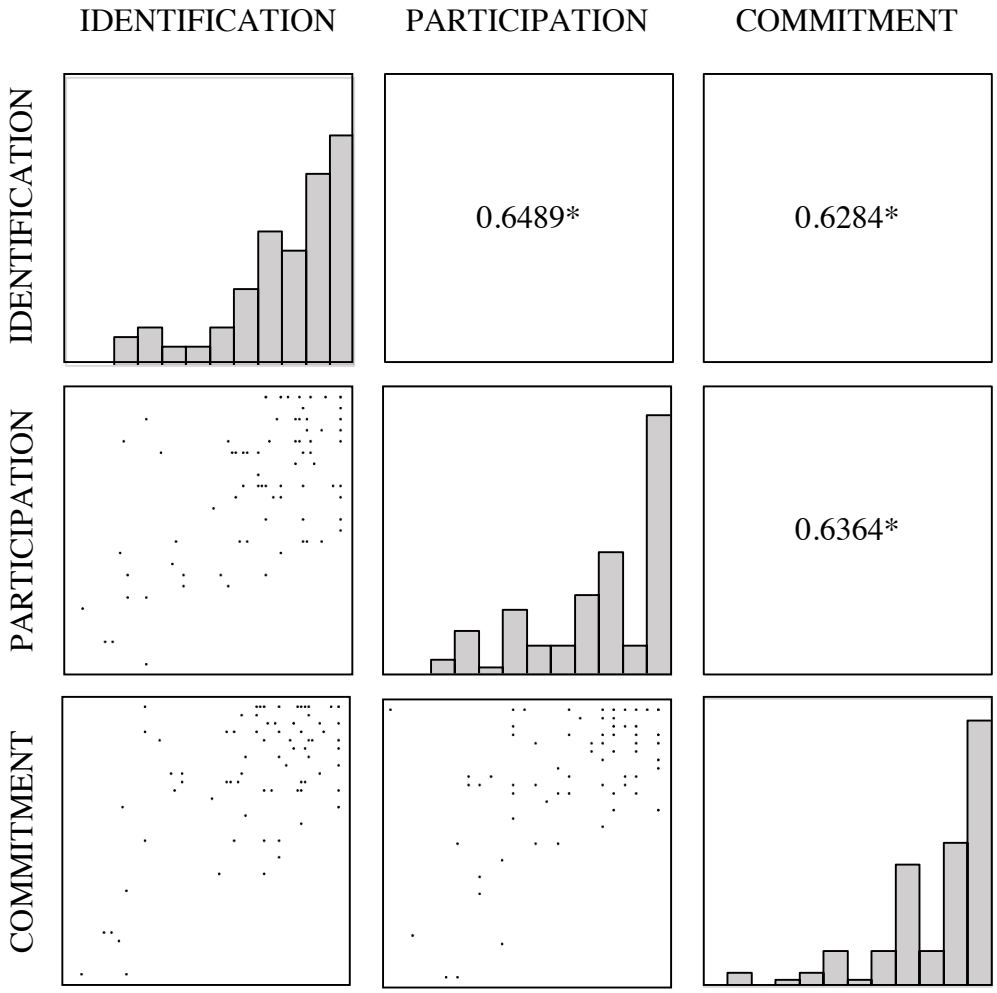

Figure 10. *Correlation between farmers' identification with, participation in and commitment to their district cooperative unions.*
*Note: The digit boxes show the correlation coefficients where * = significant at 1% confidence level. The scatter diagrams plot the values of each pair of variables along axes ranging from 1 to 5. The middle boxes show a 12-bin frequency histogram for each variable. N = 97, 98 and 98 for identification, participation and commitment, respectively.*

Although to a lower extent, there seem to be here too some observations at low levels of identification, participation and commitment that may be driving the correlation coefficients. When we discard the 5% lowest observation for each composite indicator the correlation coefficients fall to 0,43 in the case of the association between identification and commitment, and to 0,57 in the case of the association between

participation and commitment. The correlation between identification and participation decreases to 0,49. All three correlation coefficients remain, notwithstanding, statistically significant at 1% confidence level and still show a moderate positive relationship between identification and participation, and commitment. Figure C.8 in the appendix can be consulted for a more accurate picture.

Correlations are merely measures of the strength of a linear relationship between two variables and as such no causal interpretations can be derived from the study of correlation coefficients. Bearing this in mind, the strong association between the variables seems to provide some support to the theoretical thought that farmers' commitment is positively influenced by the farmers' identification with and participation in the cooperative.

In an attempt to put the magnitude of these associations into perspective, table 6 displays the correlation coefficients between the commitment composite indicators and two other variables: knowledge about the cooperative and perceived dependency on it. These correlation coefficients show a positive association between the knowledge and dependency variables, on the one hand, and commitment, on the other hand, at both primary cooperative level and district cooperative union level. However, this association seems to be considerably weaker than the association with identification and commitment and participation and commitment.

Table 6. *Correlation coefficients between knowledge about and dependency on cooperative and member commitment at primary cooperative (PC) level and district cooperative union (DCU) level.*

Variable	Commitment PC	Commitment DCU
Knowledge	0,3431* (N=96)	0,3569* (N=98)
Dependency	0,3789* (N=95)	0,3768* (N=98)

*Note: * = significant at 1% confidence level.*

6.3. CANONICAL CORRELATION ANALYSIS

In the following four subsections, we display the results of the four canonical correlation analyses undertaken: (1) farmers' commitment to their primary cooperative and farmers' identification with their primary cooperative, (2) farmers' commitment to their primary cooperative and farmers' participation in their primary cooperative, (3) farmers' commitment to their district cooperative union and farmers' identification with their district cooperative union, and (4) farmers' commitment and farmers' participation in their district cooperative union.

6.3.1. COMMITMENT AND IDENTIFICATION AT PRMARY COOPERATIVE LEVEL

CCA yields as many pairs of canonical variates (canonical dimensions) as the number of variables in the smallest set. Because both commitment and identification encompass six variables, the CCA yields here six different dimensions. However, not all dimensions need to be interpreted. Although statistical significance is the most commonly used criterion to decide which dimensions should be interpreted, Hair et al. (2014) advice to also use other criteria. Here, we look at both statistical significance and the amount of shared variance between the two canonical variates given by the canonical root (Sherry & Henson, 2005; Thompson, 1984).

In the case of farmers' commitment to and their identification with their primary cooperative, only the first canonical dimension is statistically significant. The p-value associated with the F statistic derived from the calculated Wilks' Lambda is approximately zero and, therefore, we reject the null hypothesis of the two variable sets not being linearly related. All other dimensions combined are not statistically significant at 10% confidence level. In the first dimension, the canonical variates explain 62.2% of the variance while in the following dimensions the amount explained is 18.3% and lower. Given the statistical insignificance and the low proportion of explained variance in other dimensions, only the values and conclusions with regards to the first dimension will be here reported and interpreted. The significance levels and canonical roots of all six dimensions can be consulted in Table C.7 in appendix C.

The first dimension shows a canonical correlation of 0.7887. Canonical correlation ranges from 0 to 1 and therefore, the direction of the relationship needs to be interpreted based on the data. In this case, there is little doubt that the relation between the variates is positive and, upon confirmation by the CCA, strong. We must recall at this point that the weighting of the individual variables is attributed so that the correlation between variates is maximised. Therefore, inspection of the contribution of the individual variables to the relationship identified can yield relevant insights. In order to distinguish the main contributing variables, we analyse the canonical weights and the canonical loadings of each variable. Figure 11 presents a graphic depiction of the construction of each variate and lists the variables included in each of them and Table 7 reports the values of the canonical weights and canonical loadings.

The canonical weights are the coefficients of the linear combinations of variables that form the canonical variates and that have been generated to maximise the correlation between variates. The canonical weights can be interpreted in a manner analogous to the interpretation of regression coefficients where the outcome variable is the variate. Therefore, they represent the contribution to the variate in case of one-unit increase in the observed individual variable. Higher coefficients are thus associated with higher contribution to the covariate and to the relationship between covariates. On the side of commitment, the rejection of side-selling (CPC1) and especially the willingness to devote time and effort (CPC4) are the variables that seem to contribute the most to the commitment covariate. On the side of identification, the most relevant variable contributing to identification is the farmers' perception of other farmers sharing the

same goals and objectives (IPC5). Shared vision and values with the cooperative (IPC4) and feeling of belonging (IPC6) are also significant.

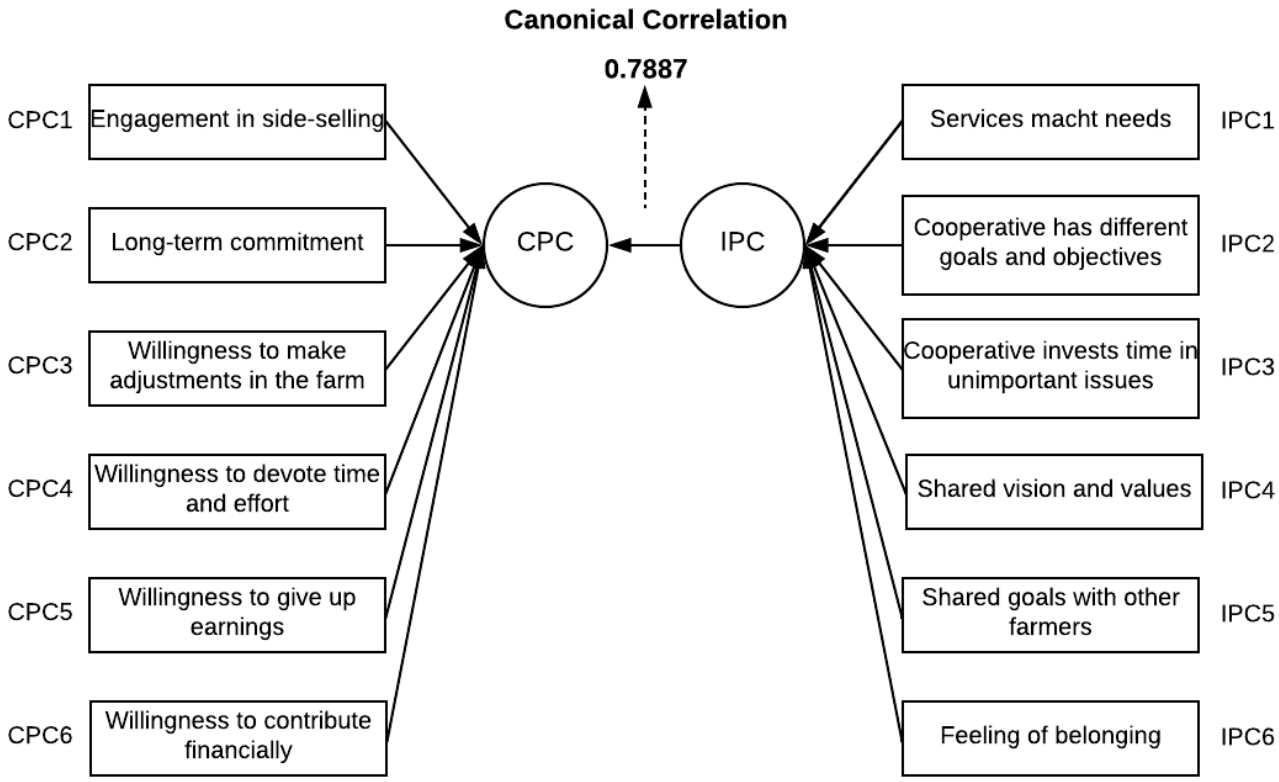

Figure 11. *Graphic representation of the construction of the canonical variates and the canonical correlation of the first dimension for the association of farmers' identification with and commitment to their primary cooperative level.*

Despite the information that the canonical weights provide us, Hair et al. (2014) warn us that small coefficients may be the result of multicollinearity among the variables and they do not necessarily mean that variables with small coefficients are irrelevant in determining the relationship. Because variables are purposefully grouped together and some degree of collinearity can be expected, it is necessary to also look at canonical loadings. The canonical loadings are the correlation coefficients between the variables and their covariate and as such they reflect the variance that each variable shares with the canonical variate. When squared, they represent the percentage of shared variance between the variable at hand and the canonical variate. Supplementing the previous insights with the information that the study of canonical loadings provides, we see that the commitment variate reflects all dimensions of commitment except for the variables of economic commitment (CPC5 and CPC6). The canonical variate can thus be here regarded as a non-economic commitment variate. Concerning the identification variate, the inspection of the canonical loadings confirms that the IPC4, IPC5 and IPC6 are the variables making the highest contribution to the canonical variate. Therefore, we can consider the identification variate as reflecting the three dimensions theoretically identified: shared objectives, shared values and feeling of belonging.

Table 7. *Contribution of individual commitment and identification variables at PC level to their respective canonical variates.*

	Dimension 1	
Variable	**Canonical weight**	**Sq. Canonical loading (%)**
CPC1	0,2569***	39,61
CPC2	0,1376	59,14
CPC3	0,0235	54,94
CPC4	0,7486***	90,63
CPC5	-0,0115	11,29
CPC6	0,0152	5,46
IPC1	0,1222	33,25
IPC2	-0,0294	2,11
IPC3	-0,0060	3,01
IPC4	0,2077**	53,22
IPC5	0,6166***	84,36
IPC6	0,2100**	44,93

*Note: * = p-value < 0,1; ** = p-value < 0,05; *** = p-value < 0,01. P-value associated with a t-test under the null hypothesis that a particular variable's canonical weight is zero. N=93.*
CPC1= I would keep doing business with my PC even if other options offered a higher price temporarily; CPC2= I will certainly remain a member of my PC for more than 5 years; CPC3= I am willing to change my farming methods if my PC asks me to do so; CPC4= I am willing to put extra effort and invest my time in my PC if my PC needs it; CPC5= I am willing to receive a lower price for my production so my PC can grow and improve; CPC6= I am willing to pay a higher membership fee if that helps my PC.
IPC1= My PC provides services that match my needs; IPC2= My PC has goals and objectives that are other than mine; IPC3= My PC invests too much time in unimportant issues; IPC4= I usually agree with my PC on what needs to be done and how it needs to be done; IPC5= Other farmers in my PC have the same priorities and needs as me; IPC6= I feel my PC almost as family and its problems are my problems.

The CCA of the relationship between farmers' commitment to and farmers' identification with their primary cooperative confirms the strong positive association at which the composite indictor analysis pointed. The CCA further shows that the factors driving this relation are (1) the perception of other farmers having the same goals and objectives, (2) the general agreement with the cooperative on what needs to be done, and (3) the feeling of belonging to the primary cooperative. It also indicates that the positive association between identification and commitment might not be relevant to an economic definition of commitment – i.e.: the farmers' willingness to give up earnings or to contribute financially to their primary cooperative.

6.3.2. COMMITMENT AND PARTICIPATION AT PRIMARY COOPERATIVE LEVEL

In the case of commitment and participation, only the first dimension is statistically significant at 5% confidence level. Although statistically significant at 10%, the second pair of canonical variates shares only 20% of the variance of the entire system, being this proportion significantly lower than the 60% shared variance in the first dimension. As a result, we opt for interpreting only the first canonical dimension. Table C.8 in appendix C reports the squared canonical roots and the significance level of the five dimensions computed.

The canonical correlation between the commitment and participation variates is 0,7804 which signals a very strong positive linear association between farmers' participation in decision-making in their primary cooperative and their level of commitment towards it. In order to provide a more in-depth interpretation of this relationship, Table 8 reports the canonical weights and loadings of all variables included in the canonical variates, which help us identify the variables contributing to it. A brief definition of these variables is shown in Figure 12 together with the canonical correlation of the first dimension.

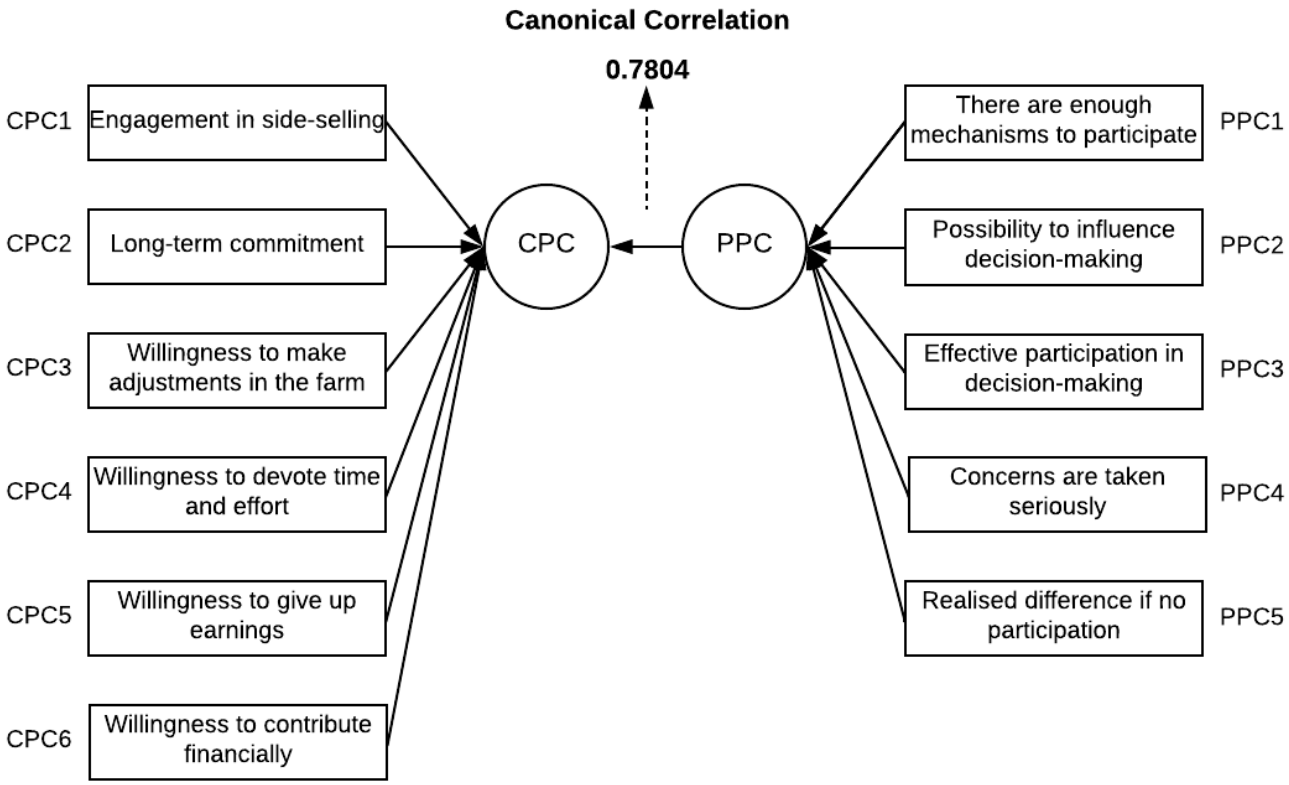

Figure 12. *Graphic representation of the construction of the canonical variates and the canonical correlation of the first dimension for the association of farmers' participation in and commitment to their primary cooperative level.*

Table 8. *Contribution of individual commitment and participation variables at PC level to their respective canonical variates*

	Dimension 1	
Variable	**Canonical weight**	**Sq. Canonical loading (%)**
CPC1	0,2726***	43,85
CPC2	0,5481***	75,81
CPC3	0,0557	43,73
CPC4	0,2651*	67,58
CPC5	0,0350	17,64
CPC6	0,1783**	19,28
PPC1	0,1719	58,20
PPC2	0,3153***	65,64
PPC3	0,5119***	68,38
PPC4	0,1719**	40,37
PPC5	0,1095*	23,28

*Note: * = p-value < 0,1; ** = p-value < 0,05; *** = p-value < 0,01. P-value associated with a t-test under the null hypothesis that a particular variable's canonical weight is zero. N=96.*
CPC1= I would keep doing business with my PC even if other options offered a higher price temporarily; CPC2= I will certainly remain a member of my PC for more than 5 years; CPC3= I am willing to change my farming methods if my PC asks me to do so; CPC4= I am willing to put extra effort and invest my time in my PC if my PC needs it; CPC5= I am willing to receive a lower price for my production so my PC can grow and improve; CPC6= I am willing to pay a higher membership fee if that helps my PC.
PPC1= I feel that there are enough mechanisms available to me to get across my concerns and interests to my PC; PPC2= If I participate through the existing mechanisms, I can influence the decision-making at my PC; PPC3= Through my participation in the decision-making at my PC, I can influence decisions so my economic situation improves; PPC4= When I raise individual concerns to my PC, their taken seriously and addressed within a short time; PPC5= If I didn't participate in the decision-making of my PC, my economic situation would be worse.

The contribution of the variables that compose the participation commitment is reasonably balanced across the different variables. Nevertheless, farmers' perception of their possibility to influence decision-making (PPC2) and more specifically, their possibility to influence decision-making in a way that their individual situation improves (PPC3) are overrepresented in the participation canonical variate. Whereas variables PPC1, PPC2 and PPC3 refer to the farmers' perception of their eventual capacity to participate, which doesn't require them to actually participate in or influence decision-making, PPC4 and PPC5 regard the result of their actual participation (when farmers raise concerns they are taken seriously and if they did not participate, their situation

would be worse, respectively). The underrepresentation of PPC4 and PPC5 points towards the interpretation of the canonical variate as an indicator of perceived participatory capacity.

With regards to the commitment canonical variate, we find a situation similar to the one in the previous section. Thus, the variables denoting economic commitment make little contribution to the variate and share less than 20% of their variance with their covariate. The remaining variables share a significant amount of their variance with the covariate with exception of CPC3 (willingness to make adjustments in the farm), which carries a very low, insignificant canonical coefficient. With a high canonical weight and loading, CPC2 (the wish to continue the relationship with the cooperative in the future) is the largest contributor to the covariate. Altogether, the commitment covariate reflects farmers' desire to continue the relation with the primary cooperative in the future including avoiding side-selling and investing time and effort.

Looking back at the canonical correlation coefficient and bearing in mind the contribution of the different variables, it seems that the perception of farmers of their capacity to participate and influence the decision-making process at their primary cooperative may be an important factor in determining their general level of commitment. Farmers' perceived capacity to participate, however, does not seem to strongly influence their willingness to invest economic resources in their primary cooperative.

6.3.3. COMMITMENT AND IDENTIFICATION AT DISTRICT COOPERATIVE UNION LEVEL

The CCA of the relation between farmers' commitment and identification is now repeated at district cooperative union level in order to identify possible differences. In the case of the commitment-identification relationship at district cooperative level, there are two significant dimensions. The first dimension shows a canonical correlation of 0,6791 and accordingly it captures 46,12% of the total variation of the entire system. The second dimension yields a correlation of 0,5021 and the canonical variates of this dimension share a significant 25,21% of the total variance. All remaining dimensions share a small proportion of the total variance of the entire system and are not significant at 10% confident level. We look at each of the two first dimensions at a time. The canonical correlations and significance level of all six canonical dimensions can be consulted in Table C.9 in appendix C.

With regards to the identification variate in the first dimension, Table 9 shows that the variable IDCU5 –i.e.: the perception that farmers in other primary cooperatives have the same priorities and needs – has a canonical weight of 0,47 significant at 1% confidence level and shares 80% of the variance of the variate. IDCU4 (shared vision and values) and IDCU6 (feeling of belonging) carry relatively small coefficients but share a significant proportion of the variance of the covariate and thus, must be acknowledged as contributing variables. On the other hand, IDCU2 (disagreement in objectives) and IDCU3 (disagreement in vision) must be regarded as the least contributing variables given their relatively small contribution and the low proportion of shared variance.

Everything considered, the first identification canonical variate can be interpreted as an indicator of farmers' identification with their district cooperative union led by the perception of homogeneity and collective action among the farmers in the district.

Table 9. *Contribution of individual commitment and identification variables at DCU level to their respective canonical variates for dimensions 1 and 2.*

	Dimension 1		Dimension 2	
Variable	**Canonical weight**	**Sq. Canonical loading (%)**	**Canonical weight**	**Sq. Canonical loading (%)**
CDCU1	0,1465	49,14	0,3845*	15,56
CDCU2	0,2727**	74,62	-0,4866**	9,77
CDCU3	0,2825*	68,26	0,5914**	19,96
CDCU4	0,2874*	71,64	-0,2941	5,47
CDCU5	-0,0485	27,24	0,1922	0,01
CDCU6	0,0315	14,76	-0,3096**	25,28
IDCU1	0,0405	48,34	0,2934	16,58
IDCU2	-0,1247	11,45	0,1580	21,27
IDCU3	-0,1211	23,08	0,4383***	35,99
IDCU4	0,1892	60,36	-0,5868***	1,30
IDCU5	0,4468***	81,45	0,4957*	10,29
IDCU6	0,1219	66,42	0,1914	5,33

*Note: * = p-value < 0,1; ** = p-value < 0,05; *** = p-value < 0,01. P-value associated with a t-test under the null hypothesis that a particular variable's canonical weight is zero. N=96.*
CDCU1= I would like my PC to keep doing business with the DCU even if other options offered a higher price I temporarily; CDCU2= I certainly want my PC to remain a member of the DCU in the future; CDCU3= I am willing to change my farming methods if my DCU asks me to do so; CDCU4= I am willing to put extra effort and invest my time in my DCU if my DCU needs it; CDCU5= I am willing to receive a lower price for my production so my DCU can grow and improve; CDCU6= I am willing to pay a higher membership fee if that helps my DCU.
IDCU1= My DCU provides services that match my needs; IDCU2= My DCU has goals and objectives that are other than mine; IDCU3= My DCU invests too much time in unimportant issues; IDCU4= I usually agree with my DCU on what needs to be done and how it needs to be done; IDCU5= Other farmers in my other PC's have the same priorities and needs as me; IDCU6= I feel my DCU almost as family and its problems are my problems.

The first commitment canonical variate once again fails to reflect the economic commitment of the farmers, being the variables CDCU5 and CDCU6 considerably underrepresented in the variate and sharing a low proportion of its variance. The first

commitment canonical variate can be consequently regarded as a non-economic commitment indicator. Looking back to the canonical correlation for the first dimension, CCA points towards a positive, moderate association between the farmers' general identification with their district cooperative union and their wish to continue the relationship with their district cooperative union although not necessary through their willingness to economically invest in it.

Many of the variables in the second pair of variates carry high canonical weights. In many cases their canonical loading is, however, very low, indicating a low proportion of shared variance with the variate and a small or no contribution to it. On the side of identification, the main contributor is IDCU3 –i.e.: the farmers' belief that their district cooperative union invests too much time in unimportant issues. IDCU2 –i.e.: the farmers' perception that the district cooperative union has objectives and goals other than theirs – seems to also contribute to the variate, although to a lesser extent. Both with positive canonical weights, the second identification canonical variate reflects rather the mismatch between farmers' and the district cooperative union's interests. On the side of commitment, the largest contributing variable is the famers' willingness to contribute financially to the district cooperative union (CDCU6), which carries a negative coefficient. CDCU3 or farmers' willingness to make changes in the farming methods, shares a smaller proportion with the variance of the variate but carries a considerably high canonical weight.

The canonical correlation of the second dimension seems to point at a negative, moderate relationship between, on the one hand, the perceived mismatch between the interests of the farmers and those of the district cooperative union, and, on the other hand, the farmers' willingness to contribute financially to their district cooperative union. Yet, this association, although intuitive, is somewhat obscured by the contribution of CDCU3 to its commitment canonical variate and it needs further investigation.

6.3.4. COMMITMENT AND PARTICIPATION AT DISTRICT COOPERATIVE UNION LEVEL

The relation between farmers' participation in and their commitment to their district cooperative union has two significant dimensions. The first dimension is significant at 1% confidence level and its pair of canonical variates shares a very high proportion (64,8%) of the total variance of the entire system. The second dimension is also worth interpreting, although the amount of variance captured by the canonical variates is much lower (23,55%). The other three dimensions are not statistically significant and their canonical roots fall below 0,01. Accordingly, only the two first dimensions will be interpreted. The canonical correlations and significance level of all six canonical dimensions can be consulted in Table C.10 in appendix C.

Table 10 reports the canonical weights and squared canonical loadings for dimensions 1 and 2. The leading contributing variable to the first participation canonical variate is PDCU2 –i.e.: farmers' perceived possibility to influence decision-making at the district cooperative union- with both a large canonical weight and canonical loading. Except for

PDCU4 –i.e.: whether raised concerns are addressed by the district cooperative union -, the remaining three participation variables seem to contribute a fair share to their canonical variate. With regards to commitment, we find that CDCU5 (willingness to give up earnings) and, to a lesser extent, CDCU6 (willingness to contribute financially) do contribute to the first commitment canonical variate as opposed to all previous cases. Despite their contribution, they are still underrepresented in the variate as compared to the four other commitment variables.

Table 10. *Contribution of individual commitment and identification variables at DCU level to their respective canonical variates for dimensions 1 and 2.*

	Dimension 1		Dimension 2	
Variable	**Canonical weight**	**Sq. Canonical loading (%)**	**Canonical weight**	**Sq. Canonical loading (%)**
CDCU1	0,2128**	55,41	-0,4156**	9,39
CDCU2	0,1403	60,02	0,6736***	22,65
CDCU3	0,3035***	68,79	-0,5385**	12,62
CDCU4	0,1628	67,68	0,1540	6,79
CDCU5	0,1645**	48,01	-0,1062	0,62
CDCU6	0,0742	20,86	0,2428	21,58
PDCU1	0,0185	33,54	0,2084*	11,00
PDCU2	0,4573***	74,32	0,3991***	3,68
PDCU3	0,2601***	67,21	-0,9249***	10,77
PDCU4	0,0184	19,59	0,5682***	36,49
PDCU5	0,2913***	55,41	0,1481	0,49

*Note: * = p-value < 0,1; ** = p-value < 0,05; *** = p-value < 0,01. P-value associated with a t-test under the null hypothesis that a particular variable's canonical weight is zero. N=97.*

CDCU1= I would like my PC to keep doing business with the DCU even if other options offered a higher price I temporarily; CDCU2= I certainly want my PC to remain a member of the DCU in the future; CDCU3= I am willing to change my farming methods if my DCU asks me to do so; CDCU4= I am willing to put extra effort and invest my time in my DCU if my DCU needs it; CDCU5= I am willing to receive a lower price for my production so my DCU can grow and improve; CDCU6= I am willing to pay a higher membership fee if that helps my DCU.

PDCU1= I feel that there are enough mechanisms available to me to get across my concerns and interests to my DCU; PDCU2= If I participate through the existing mechanisms, I can influence the decision-making at my DCU; PDCU3= Through my participation in the decision-making at my DCU, I can influence decisions so my economic situation improves; PDCU4= When I raise individual concerns to my DCU, their taken seriously and addressed within a short time; PDCU5= If I didn't participate in the decision-making of my DCU, my economic situation would be worse.

All in all, the first dimension indicates that there is a positive, very strong relationship between farmers' commitment to and their participation in their district cooperative union. Furthermore, the factor that seems to play the most important role is the farmers' perception of the possibility they have to influence decision-making, while the mere existence of participatory mechanisms may not be enough. Whether farmers' influence translates into the improvement of their individual situation seems also to be relatively less relevant in the relation between commitment and participation. Moreover, the association between participation and commitment is stronger in the non-economic dimensions of commitment.

The second participation canonical variate is dominated by the variable PDCU4 – i.e.: whether concerns taken seriously and addressed promptly. The negative and large canonical weight of PDCU3 –i.e.: whether farmers can effectively influence decision-making so that their situation improves - is surprising. Nevertheless, the small canonical loading points towards a rather small contribution to the variate by PDCU3. PDCU4 reflects the capacity of farmers to raise concerns and these being addressed by the district cooperative union while the other participation variables refer to the possibility of farmers to intervene in and influence the decision-making process. Taking into account the contributions of the individual variables, the canonical variate could be interpreted as reflecting a more direct way of participation. On the side of commitment, the second commitment canonical variate is dominated by CDCU2 – i.e.: the long-term perspective of membership – and, more interestingly, CDCU6, which reflects farmers' willingness to financially contribute to their district cooperative union. This second dimension thus indicates that there is some positive association between a more direct way of participation and the wish of farmers to continue their relationship with and their willingness to contribute financially to their district cooperative union.

6.4. COMPARATIVE ANALYSIS

We have studied the relation between farmers' identification and participation, and commitment by means different correlation coefficients: Pearson correlation between composite indicators and canonical correlation. All calculated correlations are displayed in Table 11. Overall, they show a strong positive association between, on the one hand, identification and participation, and, on the other hand, commitment. Furthermore, this strong association holds both at primary cooperative level and at district cooperative union level. We discuss here some of the differences and similarities across dimensions, levels and districts.

First, we see that the association between participation and commitment is stronger than the association between identification and commitment almost across the board. The CCA yields a slightly, and virtually negligible, lower coefficient for the participation-commitment relationship at primary cooperative level. Based on the results of the CCA above, it is also noteworthy that neither identification nor participation are strongly correlated with farmers' willingness to give up earnings or contribute financially to their primary cooperative or district cooperative union. Poverty is widespread in rural areas in Nepal and coffee grows in altitude, which usually translates into remoteness and

more acute poverty. As a result, farmers might simply not be able to contribute financially or give up earnings for the improvement of their primary cooperatives and district cooperative unions. Even if the cooperative membership may increase farmers' income and investments in the cooperative movement may yield positive profits, the opportunity cost of the investment may be too high for farmers given other pressing needs and presumably long payback period of the investment, in line with a situation similar to a poverty trap. An employee of the National Coffee and Tea Development Board provided us with some confirmation of this hypothesis by arguing that coffee farmers are among the poorest farmers in Nepal and cannot support themselves or their cooperative in making different types of investments such as irrigation systems. This might explain why the association between economic commitment and identification and participation is weaker. In fact, the correlation coefficients between the variables showing economic commitment (CPC5, CPC6, CDCU5, CDCU6) and the identification and participation composite indicators range from 0,33 to 0,41 depending on the dimension and the level considered. The correlation coefficients can be consulted in table C.11 in appendix C. Although positively related with identification and participation, the willingness to contribute economically could presumably be better understood when taking into consideration economic wealth of farmers and economic benefits of cooperative membership rather than identification and participation.

Table 11. *Calculated correlation coefficients between identification, participation and commitment at both primary cooperative level and district cooperative union level.*

	COMMITMENT - IDENTIFICATION		
		Canonical correlation	
Level	**Composite indicators**	**1st Dimension**	**2nd Dimension**
PC	0,6409***	0,7887***	N.A.
DCU	0,6284***	0,6791***	0,5021***
	COMMITMENT - PARTICIPATION		
PC	0,6967***	0,7804***	N.A.
DCU	0,6364***	0,8050***	0,4853**

*Note: * = p-value < 0,1; ** = p-value < 0,05; *** = p-value < 0,01.*

Second, we were interested in investigating whether the relation between identification and participation, and commitment is different at different levels. According to the correlation between the composite indicators, the associations between identification and commitment, and participation and commitment seem to be equally strong at both primary cooperative and district cooperative union levels. The CCA shows, however, some differences across levels. With regards to identification at primary cooperative

level, we see that there is a very strong correlation between identification and non-economic commitment and especially with farmers' willingness to invest time and effort in their primary cooperative. At district cooperative union level, this association is somewhat less strong but it provides a more balanced representation of non-economic commitment. As a result, it seems that the association between farmers' identification and non-economic commitment is strong and positive at both levels while the higher correlation at primary cooperative is driven by the stronger association between identification and willingness to invest time and effort in the primary cooperative union. Furthermore, the significance of the second dimension of the CCA at district cooperative union level shows some positive relation between identification and willingness to contribute economically to the district cooperative union as well as it denotes a more complex association between identification and commitment. The fact that this dimension is not shown by the CCA at primary cooperative level points at a lack of, or very weak, association between identification and willingness to contribute economically to the primary cooperative.

The correlations between participation and commitment are similar at both primary cooperative and district cooperative union levels. In this case, the first dimension of the CCA also shows approximately the same coefficients for both levels and their interpretation in the light of the variables' contribution to the variates is also comparable. The most important insight is, perhaps, that the canonical correlation at primary cooperative level does not show correlation between farmers' participation and their willingness to contribute economically. On the other hand, the two dimensions of the CCA at district cooperative union level do show some correlation between farmers' participation in their district cooperative union and their willingness to give up earnings and contribute financially to its improvement.

Finally, the coffee cooperative sector presents, as shown in the introduction to the case study in section 4.2, certain differences between the three coffee-producing districts included in this study. Multivariate tests of means indeed reject the hypotheses of all means being equal across the three district at 5% confidence level for each of the six composite indicators developed. When testing the differences for each pair of districts, Lamjung shows significantly lower means in terms of farmers' identification with, participation in and commitment to both their primary cooperatives and district cooperative union. On the other hand, the means of the indicators are not significantly different in the case of the other two districts: Gulmi and Syangja. These differences can be attributed, presumably, to the lower level of development of the coffee sector in Lamjung as compared to the other two districts. The results of the statistical tests can be consulted in Table C.12 in Appendix C.

Despite the differences in the identification, participation and commitment levels across districts, all districts show lower scores at district cooperative union level than at primary cooperative level, with the exception of farmers' identification in Syangja, as shown in table 12. This is, farmers participate less in and are less committed to their district cooperative unions than in and to their primary cooperative in all three districts. Furthermore, farmers also identify less with their district cooperative union in Gulmi and Lamjung. These differences across levels are not significant in most of the cases

presumably due to limited statistical power –and the resulting type II errors – because of reduced number of observations in each district. Nonetheless, the direction of the differences and the significance of some of them can be taken as geographic robustness of our findings. Lastly, the Pearson's correlation coefficients between identification and participation, and commitment are similar in all three districts both at primary cooperative level and district cooperative union level. Thus, the associations between farmers' identification with and their participation in, on the one hand, and their commitment to, on the other hand, their primary cooperative and district cooperative union are strong and positive in all three districts studied. The calculated correlations can be consulted in tables C.13 and C.14 in Appendix C.

Table 12. *Differences in identification, participation and commitment across districts.*

	DCU	Mean PC	Mean DCU	N[1]	t-value[2]	z-value[3]
IDENTIFICATION	**All**	**4,116**	**3,970**	**93**	**1,8610***	**1,318**
	Gulmi	4,274	3,927	31	3,0976***	2,457**
	Lamjung	3,764	3,509	29	1,3399	0,757
	Syangja	4,267	4,392	33	-1,4660	-04297
PARTICIPATION	**All**	**4,257**	**3,925**	**97**	**3,6249*** **	**3,029*** **
	Gulmi	4,400	3,962	30	2,6093**	2,059**
	Lamjung	3,856	3,433	30	1,9791*	1,568
	Syangja	4,461	4,293	37	1,7301*	1,706*
COMMITMENT	**All**	**4,389**	**4,180**	**96**	**2,7039*** **	**2,946*** **
	Gulmi	4,565	4,258	31	2,5709**	2,297**
	Lamjung	3,983	3,738	29	1,0524	1,577
	Syangja	4,561	4,473	36	1,2951	1,028

Note: [1]: number of observations included in the hypothesis testing. [2]: *t-value shows the t-value resulting from the two-tailed, paired t-test with H_0: mean(PC) – mean(DCU) = 0.* [3]: *z-value shows the z-value resulting from a Wilcoxon sign-rank test with H_0: mean(PC) – mean(DCU) = 0. * = p-value < 0,1; ** = p-value < 0,05; *** = p-value < 0,01.*

7. CONCLUSION & DISCUSSION

Throughout this study, we have identified high level of commitment among farmers in the coffee cooperative sector in Nepal. Farmers are, overall, highly committed to the continuance of their relationship with both their primary cooperatives and district cooperative unions and are willing to make efforts to contribute to them. Nevertheless, their willingness to contribute economically to the improvement and growth of both their primary cooperatives and district cooperative unions is lower than their willingness to contribute in other ways. These results may perhaps be better attributed to a lack of resources rather than to a lack of commitment.

The results in the previous section also show that, overall, members' commitment to their district cooperative union is lower than their commitment to their primary cooperatives. More specifically, farmers' wish to remain a member of their primary cooperative in the future is stronger than their wish that their primary cooperative remains part of the district cooperative union. Furthermore, they are also more willing to devote their time and effort to the improvement of their primary cooperative than they would be for their district cooperative union. Finally, members are more willing to contribute financially to the success of their primary cooperative if needed whereas their willingness to do so to contribute to their district cooperative union is weaker.

Although their size is relatively small, the differences are statistically significant and may be of practical importance given the critical nature of commitment for the well-functioning of cooperatives. The need for members' commitment in cooperative stem from the three principles laid out in the introduction. These require members to finance the organisation, be involved in control and monitoring with regards to the management and governance, and make use of the services that the cooperative offers. Our results show that farmers are indeed less willing to perform two of these tasks when it comes to their district cooperative union. First, there's a direct lower willingness to contribute financially, although farmers' willingness to contribute by giving up earnings is not significantly different with regards to their primary cooperative or district cooperative union. Second, their lower willingness to devote time and effort to the district cooperative union may have a direct impact on their involvement in control and monitoring, for these activities certainly require time and effort from members. On the other hand, side-selling practices are equally rejected both at primary cooperative level and at district cooperative union level. Notwithstanding this rejection towards side-selling, the weaker wish of relation continuance with the district cooperative union may also put at stake the use that some primary cooperatives make of the services that the district cooperative union offers.

Our theoretical framework posited that the hypothesised, and empirically confirmed, differences in commitment across levels are the indirect result of differences in group size. The negative effect of group size on commitment would be channelled through its impact on members' identification with and participation in the cooperative. In line with the theoretical framework, our results reveal that farmers are also less identified with and participate less in their district cooperative unions than with and in their primary cooperatives.

On the side of identification, farmers consider that their primary cooperatives offer services that match better their needs than the services offered by their district cooperative unions. Furthermore, farmers agree more often with their primary cooperative in what needs to be done and how it needs to be done than with their district cooperative union. Similarly, there is also a higher perceived homogeneity among farmers in the same primary cooperative with regards to their needs and priorities than among farmers in the entire district. Finally, farmers' general feeling of belonging is stronger at primary cooperative level than at district cooperative union level.

Regarding participation, farmers feel that there are more mechanisms available to them to get across their concerns and interests to their primary cooperatives than to their district cooperative unions. Furthermore, when they participate through the existing mechanisms, farmers perceive that they are able to influence the outcome of the decision-making at their primary cooperative to a greater extent than the extent to which they can influence the decision-making process at their district cooperative union. Their participation in decision-making at the primary cooperative further translates into the improvement of their individual situation to a greater extent than at district cooperative union level. Finally, farmers' concerns are also taken more seriously and addressed more promptly by primary cooperatives that district cooperative unions.

Our results also reveal a strong association between, on the one hand, identification and participation, and, on the other hand, commitment. Thus, where identification and participation are low, so tend commitment to be. Although similar, this relationship is slightly stronger in the case of participation and commitment. These associations between identification and participation, and commitment further hold both at primary cooperative and district cooperative union levels and they are similar in nature and magnitude across levels. Our results specify that economic commitment can be hardly predicted based on farmers' identification or participation at any of the two levels as compared to other kinds of commitment. The strong associations are thus primarily driven by other forms of commitment such as the farmers' wish of relation continuance and their willingness to devote time and effort to the cooperatives. Although Hair et al. (2014) remind us that no causal relationship should be deduced from correlation analysis, the existing theoretical knowledge and the strong correlations seem to point at the possibility of a causal relationship between identification and participation, and commitment.

The relevance of our results derives directly from the relevance of commitment in cooperative contexts. As we have argued repeated times throughout this study, commitment is a critical factor for the well-functioning of cooperatives and, therefore, it is paramount to gain a deep understanding of the factors influencing commitment. Size being one of those factors, it has been identified in the literature as negatively influencing commitment. This is, commitment tends to erode, *ceteris paribus*, when the size of the membership increases. Simultaneously, we have also argued that the cooperative movement is based on the very idea of horizontal integration and joint vertical integration as a way to generate benefits for members, since the benefits of cooperative membership, such as economies of scale or increased bargaining power,

arise, precisely, from a larger scale of operation. In this context of tension between size and commitment, measuring the commitment costs of membership growth yields important insights for the cooperative movement.

The effect of group size on commitment has been theorised and studied in abstract without reference to specific organisational forms. In practice, however, there are different organisational forms that can be put in place to structure large groups and to achieve joint vertical integration. The establishment of federations represents, in this sense, a middle point between full independence of primary cooperatives and the merge of primary cooperatives into one single cooperative. Federations allow for joint vertical integration through the creation of a federated body with large membership whereas primary cooperatives are preserved as independent units with small membership. Our results show that, despite the preservation of the small units, the commitment level of the members towards the federated body is yet lower than towards their primary cooperatives. These results indicate thus that the establishment of a federation to increase horizontal integration and achieve joint vertical integration is not innocuous with regards to members' commitment.

Within the literature on joint vertical integration, a frequently studied issue is the extent to which integration should be taken. Within the literature on federations, another recurrent question is what tasks should be performed at what level. We believe that our findings can inform both discussions. First, deteriorating commitment must be taken into account when deciding on the optimal extent of joint vertical integration. In some cases, increasing vertical integration requires simultaneous horizontal integration to render it possible (joint vertical integration). Whereas pulping (the first stage in the processing of coffee) does not require large investments and is profitable when performed by primary cooperatives, performing further processing down the value chain is only economically profitable when a minimum production is assured. Likewise, branding by a cooperative also requires a minimum marketable quantity of coffee to make economic sense. The horizontal integration that is required to further integrate down the value chain may lead to increasing costs that derive from the loss of members' commitment. Since the costs associated with low commitment can be significant, bearing in mind the commitment effect of joint vertical integration is paramount to identify the optimal level of joint vertical integration.

Second, the commitment effect of federated structures can also inform the distribution of activities and decision-making across the different levels of a cooperative federation. Centralisation of decisions can seem, at first sight, cost-efficient. However, it can lead to great costs associated with monitoring and enforcement in the implementation if commitment to the decisions made is low. Our results reveal eroding commitment towards federated bodies and imply that members may be less willing to comply to the decisions made at the level of the federation. As a result, those activities that require high level of involvement, investment or commitment from the members are perhaps more efficiently organised at primary cooperative level rather than at district cooperative union in spite of other advantages of centralisation.

Throughout this study, we have argued that our results show vanishing commitment as we move towards a higher level in the federated structure, although the reduction in commitment does not seem large in size. It is important to recall at this point the data limitations described in section 5.4. More specifically, we must bear in mind that the measurement and sampling strategies may have led to an upwards bias. As a result, the general level of farmers' commitment to both their primary cooperatives and district cooperative unions may be in reality lower than reported in this study and, therefore, results must be looked at with caution. Whether the differences in commitment across levels are also impacted by these measurement and sampling biases requires further study.

Furthermore, we have also shown a positive association between commitment, on the one hand, and identification and participation, on the other hand. The differences in identification and participation across levels are, in turned, said to be caused by differences in the size of the membership across the levels based on the literature. Nevertheless, there may be other factors influencing identification and participation. For instance, there are cooperatives with closed membership policies that require members to share a number of characteristics, such as minimum number of coffee plants, in an attempt to reduce heterogeneity among members. Governance can also be organised in different ways, ranging from a higher involvement of members in decision-making to an almost full centralisation of decision-making in the board of directors and management. Hence, the differences in identification and participation across levels may be the result of other factors than size and, in any case, we cannot argue that those differences are uniquely the result of membership size.

Member commitment is a complex construct difficult to grasp comprehensively. With this study, we have aimed to contribute to the already existing knowledge by focusing on the effect of membership size in the context of federated cooperative structures and we have used a case study on coffee cooperatives in Nepal. Given the potential benefits of federated structures, further research needs to be conducted to shed some more light on the commitment implications of the establishment of this kind of structures. More specifically, three lines of research are here proposed.

First, our case study is characterised by the developing context in which it is embedded and its incipient nature, since the coffee sector is still under development in Nepal. The extent to which the obtained results are sensitive to the context remains uncertain. Therefore, the literature on cooperatives can benefit from the mere replication of this study in high-income contexts and already consolidated cooperative sectors.

Second, our results show strong association between, on the one hand, identification and participation and, on the other hand, commitment. Furthermore, it is theorised that identification and participation are influenced by the membership size. Nevertheless, the causal links are not empirically tested in this study. Results seem to point at possible causal relationships between the variables but this requires further investigation. Research on the possible causal relationship can provide confirmation of the theoretical model or, in case of rejection, it can yield further insights on the factors determining

commitment, identification and participation and the identified strong association between them.

Lastly, we have focused on federations as a specific organisational form. Practical application of the results, however, calls for and can greatly benefit from a comparative study of the commitment impact of different organisational forms. To inform strategic decisions regarding the organisation of a cooperative, it is important to know what are the commitment consequences of a certain structure so we can evaluate cooperative structures based on their impact on member commitment.

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APPENDIX A

Full English version of the questionnaire

Federated Cooperatives: playing the scale game. A case study of coffee cooperatives in Nepal.

Questionnaire for farmers

This study aims to better understand the coordination between the different levels of the coffee cooperative movement. As such, your answer will help us to get a better idea of the challenges of the cooperatives and identify ways in which the working of cooperatives can be improved. The answers to this questionnaire are anonymous and, therefore no personal information will be recorded.

The questionnaire is made of 52 questions grouped in 4 parts. Answering the questionnaire will require 20 minutes.

Thank you very much for your time. Your answers will significantly contribute to this study.

Farmer interview nº:

District:

Primary Cooperative:

Date of interview:

Location:

PART I: General questions

1. Gender: Female / Male

2. How many coffee plants do you have currently?

- Less than 20
- Between 20 and 99
- Between 100 and 199
- More than 200

3. What was your production last year?

- Less than 350 kg
- Between 350 kg and 749 kg
- Between 750 kg and 1499 kg
- More than 1500 kg

4. How important is coffee for you as a source of income?

5. For how long have you been a member of your Primary Cooperative?

- Less than 3 years
- Between 3 and 7 years
- More than 7 years

6. How often do you attend the annual general assembly?

- Every year
- Most years
- Some years
- Few years
- Never

7. Do you belong in an organic certified producer group? Yes / No

PART II: Primary Cooperative

Please take a moment to think about your Primary Cooperative. Below some statements will be presented regarding your relation with your Primary Cooperative. For each statement, please indicate your level of agreement or disagreement by marking one of the options, where 1 shows *strong disagreement*, 2 shows *disagreement*, 3 shows *neutrality*, 4 shows *agreement* and 5 shows *strong agreement*.

		1	2	3	4	5
8.	I am familiar with my Primary Cooperative and the services it offers.	○	○	○	○	○
9.	I make use of services of my Primary Cooperative frequently.	○	○	○	○	○
10.	If I were not part of my cooperative, I would not be able to produce and sell coffee.	○	○	○	○	○
11.	My Primary Cooperative provides services that match my needs.	○	○	○	○	○
12.	My Primary Cooperative has goals and objectives that are other than mine.	○	○	○	○	○
13.	My Primary Cooperative invests too much time in unimportant issues.	○	○	○	○	○
14.	I usually agree with my Primary Cooperative on what needs to be done and how it needs to be done.	○	○	○	○	○
15.	Other farmers in my Primary Cooperative have the same priorities and needs as me.	○	○	○	○	○
16.	I feel my Primary Cooperative almost as family and its problems are my problems.	○	○	○	○	○
17.	I feel that there are enough mechanisms available to me to get across my concerns and interests to my Primary Cooperative.	○	○	○	○	○
18.	If I participate through the existing mechanisms, I can influence the decision-making at my Primary Cooperative.	○	○	○	○	○

		1	2	3	4	5
19.	Through my participation in the decision-making at my Primary Cooperative, I can influence decisions so my economic situation improves.	○	○	○	○	○
20.	When I raise individual concerns to my Primary Cooperative, their taken seriously and addressed within a short time.	○	○	○	○	○
21.	If I didn't participate in the decision-making of my Primary Cooperative, my economic situation would be worse.	○	○	○	○	○
22.	I would keep doing business with my Primary Cooperative even if other options offered a higher price temporarily.	○	○	○	○	○
23.	I will certainly remain a member of my Primary Cooperative for more than 5 years.	○	○	○	○	○
24.	I am willing to change my farming methods if my Primary Cooperative asks me to do so.	○	○	○	○	○
25.	I am willing to put extra effort and invest my time in my Primary Cooperative if my Primary Cooperatives needs it.	○	○	○	○	○
26.	I am willing to receive a lower price for my production so my Primary Cooperative van grow and improve.	○	○	○	○	○
27.	I am willing to pay a higher membership fee if that helps my Primary Cooperative.	○	○	○	○	○

PART III: District Cooperative Union

Please take a moment to think about your District Cooperative Union. Below some statements will be presented regarding your relation with your District Cooperative Union. For each statement, please indicate your level of agreement or disagreement by marking one of the options, where 1 shows *strong disagreement*, 2 shows *disagreement*, 3 shows *neutrality*, 4 shows *agreement* and 5 shows *strong agreement*.

		1	2	3	4	5
28.	I am familiar with my District Cooperative Union and the services it offers.	○	○	○	○	○
29.	I make use of the services of my District Cooperative Union frequently.	○	○	○	○	○
30.	My District Cooperative Union offers essential services that I need to produce and sell coffee.	○	○	○	○	○
31.	My District Cooperative Union provides services that match my needs.	○	○	○	○	○
32.	My District Cooperative Union has goals and objectives that are other than mine.	○	○	○	○	○
33.	My District Cooperative Union invests too much time in unimportant issues.	○	○	○	○	○
34.	I usually agree with my District Cooperative Union on what needs to be done and how it needs to be done.	○	○	○	○	○
35.	Farmers in other Primary Cooperatives have the same priorities and needs as me.	○	○	○	○	○
36.	I feel my District Cooperative Union almost as family and its problems are my problems.	○	○	○	○	○
37.	I feel that there are enough mechanisms available to me to get across my concerns and interests to my District Cooperative Union.	○	○	○	○	○

		1	2	3	4	5
38.	If I participate through the existing mechanisms, I can influence the decision-making of my District Cooperative Union.	○	○	○	○	○
39.	Through my participation in the decision-making of my District Cooperative Union, I can influence decisions so my economic situation improves.	○	○	○	○	○
40.	When I raise individual concerns to my Primary Cooperative, their taken seriously and addressed within a short time.	○	○	○	○	○
41.	If I didn't participate in the decision-making of my District Cooperative Union, my economic situation would be worse.	○	○	○	○	○
42.	I would like my Primary Cooperative to keep doing business with the District Cooperative Union even if other options offered a higher price I temporarily.	○	○	○	○	○
43.	I certainly want my Primary Cooperative to remain a member of the District Cooperative Union in the future.	○	○	○	○	○
44.	I am willing to change my farming methods if my District Cooperative Union asks me to do so.	○	○	○	○	○
45.	I am willing to put extra effort and invest my time in my District Cooperative Union if my District Cooperative Union needs it.	○	○	○	○	○
46.	I am willing to receive a lower price for my production if that helps the District Cooperative Union grow and improve.	○	○	○	○	○
47.	I am willing to pay a higher membership fee if that helps my District Cooperative Union grow and improve.	○	○	○	○	○

PART IV: General Cooperative Movement Structure.

Please take a moment to think about the general organisation of the coffee cooperative movement – i.e. farmer, primary cooperative, district cooperative union and national central union. Below some statements will be presented regarding your personal opinion regarding the structure of the cooperative movement. For each statement, please indicate your level of agreement or disagreement by marking one of the options, where 1 shows *strong disagreement*, 2 shows *disagreement*, 3 shows *neutrality*, 4 shows *agreement* and 5 shows *strong agreement*.

		1	2	3	4	5
48.	It would be very difficult for my Primary Cooperative to be independent from the District Cooperative Union.	○	○	○	○	○
49.	It would be better if decision-making, processing and services provision were more centralised in the District Cooperative Union.	○	○	○	○	○
50.	I think that the establishment of a National Central Union can bring significant benefits.	○	○	○	○	○
51.	I would like my Primary Cooperative and District Cooperative Union to invest part of their profits in the National Central Union.	○	○	○	○	○

52. The investment in the establishment of the National Central Union is the responsibility of:

- ○ Farmers
- ○ Primary Cooperatives
- ○ District Cooperative Unions
- ○ Government
- ○ Other

APPENDIX B

Key statements - variables

Label Variable	Questionnaire Statement
Identification with Primary Cooperative	
IPC1	My Primary Cooperative provides services that match my needs.
IPC2	My Primary Cooperative has goals and objectives that are other than mine.
IPC3	My Primary Cooperative invests too much time in unimportant issues.
IPC4	I usually agree with my Primary Cooperative on what needs to be done and how it needs to be done.
IPC5	Other farmers in my Primary Cooperative have the same priorities and needs as me.
IPC6	I feel my Primary Cooperative almost as family and its problems are my problems.
Participation in Primary Cooperative	
PPC1	I feel that there are enough mechanisms available to me to get across my concerns and interests to my Primary Cooperative.
PPC2	If I participate through the existing mechanisms, I can influence the decision-making at my Primary Cooperative.
PPC3	Through my participation in the decision-making at my Primary Cooperative, I can influence decisions so my economic situation improves.
PPC4	When I raise individual concerns to my Primary Cooperative, their taken seriously and addressed within a short time.
PPC5	If I didn't participate in the decision-making of my Primary Cooperative, my economic situation would be worse.
Commitment to Primary Cooperative	

CPC1	I would keep doing business with my Primary Cooperative even if other options offered a higher price temporarily.
CPC2	I will certainly remain a member of my Primary Cooperative for more than 5 years.
CPC3	I am willing to change my farming methods if my Primary Cooperative asks me to do so.
CPC4	I am willing to put extra effort and invest my time in my Primary Cooperative if my Primary Cooperative needs it.
CPC5	I am willing to receive a lower price for my production so my Primary Cooperative can grow and improve.
CPC6	I am willing to pay a higher membership fee if that helps my Primary Cooperative.
Identification with District Cooperative Union	
IDCU1	My District Cooperative Union provides services that match my needs.
IDCU2	My District Cooperative Union has goals and objectives that are other than mine.
IDCU3	My District Cooperative Union invests too much time in unimportant issues.
IDCU4	I usually agree with my District Cooperative Union on what needs to be done and how it needs to be done.
IDCU5	Farmers in other Primary Cooperatives have the same priorities and needs as me.
IDCU6	I feel my District Cooperative Union almost as family and its problems are my problems.
Participation in District Cooperative Union	
PDCU1	I feel that there are enough mechanisms available to me to get across my concerns and interests to my District Cooperative Union.

PDCU2	If I participate through the existing mechanisms, I can influence the decision-making of my District Cooperative Union.
PDCU3	Through my participation in the decision-making of my District Cooperative Union, I can influence decisions so my economic situation improves.
PDCU4	When I raise individual concerns to my Primary Cooperative, their taken seriously and addressed within a short time.
PDCU5	If I didn't participate in the decision-making of my District Cooperative Union, my economic situation would be worse.
Commitment to District Cooperative Union	
CDCU1	I would like my Primary Cooperative to keep doing business with the District Cooperative Union even if other options offered a higher price I temporarily.
CDCU2	I certainly want my Primary Cooperative to remain a member of the District Cooperative Union in the future.
CDCU3	I am willing to change my farming methods if my District Cooperative Union asks me to do so.
CDCU4	I am willing to put extra effort and invest my time in my District Cooperative Union if my District Cooperative Union needs it.
CDCU5	I am willing to receive a lower price for my production if that helps the District Cooperative Union grow and improve.
CDCU6	I am willing to pay a higher membership fee if that helps my District Cooperative Union grow and improve.

APPENDIX C

Supplementary tables and figures

List of Figures in Appendix C

List of Tables in Appendix C

Table C.1. *Intra-cluster correlation (ICC) of commitment, identification and participation composite indicators at primary cooperative (PC) and district cooperative union (DCU) level.*

INDICATOR	ICC	Asy. S.E.	95% Confidence Interval	
COMMITMENT PC	0,15368	0,10423	0,00000	0,35796
COMMITMENT DCU	0,25396	0,12849	0,00212	0,50580
IDENTIFICATION PC	0,10262	0,08936	0,00000	0,27777
IDENTIFICATION DCU	0,28254	0,13366	0,02057	0,54450
PARTICIPATION PC	0,07483	0,07817	0,00000	0,22803
PARTICIPATION DCU	0,31748	0,13855	0,04593	0,58903

Note: cluster = each of the nine primary cooperatives included in the study.

	IPC1	IPC2	IPC3	IPC4	IPC5	IPC6
IPC1	1					
IPC2	-0,0315	1				
IPC3	-0,116	0,2665**	1			
IPC4	0,3905**	-0,0303	-0,1753	1		
IPC5	0,4821**	-0,044	-0,1965	0,5886**	1	
IPC6	0,4139**	-0,0869	-0,0903	0,4894**	0,4713**	1

Figure C.1. Correlation matrix of identification variables at primary cooperative level.
*Note: ** = significant at 1% confidence level, * = significant at 5% confidence level.*

	IDCU1	IDCU2	IDCU3	IDCU4	IDCU5	IDCU6
IDCU1	1					
IDCU2	-0,0946	1				
IDCU3	-0,1267	0,423**	1			
IDCU4	0,5069**	-0,0479	-0,1186	1		
IDCU5	0,6512**	-0,0479	-0,2468*	0,6422**	1	
IDCU6	0,682**	-0,0305	-0,2076*	0,6543**	0,7065**	1

Figure C.2. Correlation matrix of identification variables at district cooperative union level.
*Note: ** = significant at 1% confidence level, * = significant at 5% confidence level.*

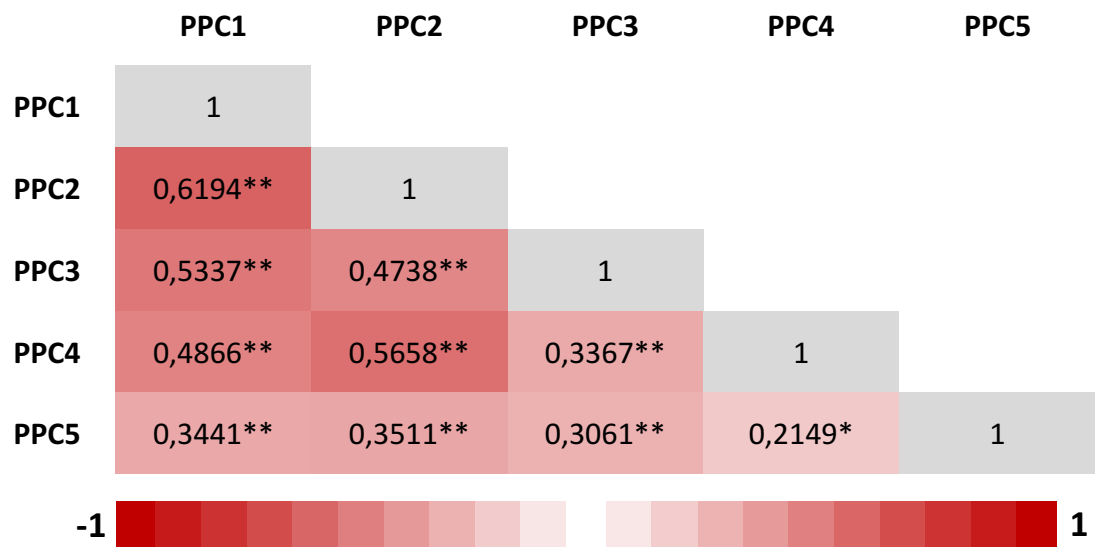

Figure C.3. Correlation matrix of participation variables at primary cooperative level.
*Note: ** = significant at 1% confidence level, * = significant at 5% confidence level.*

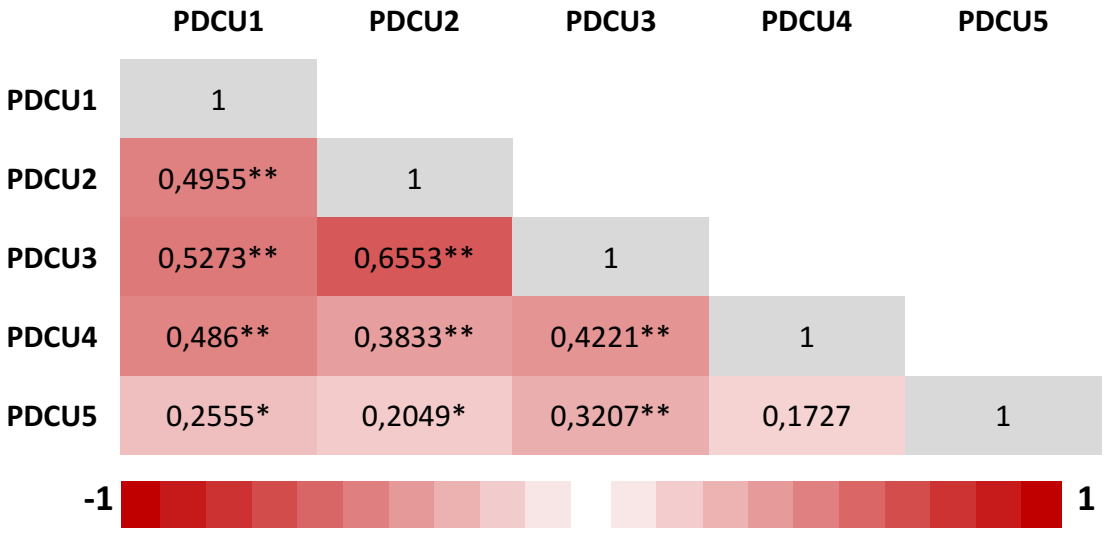

Figure C.4. Correlation matrix of participation variables at district cooperative union level.
*Note: ** = significant at 1% confidence level, * = significant at 5% confidence level.*

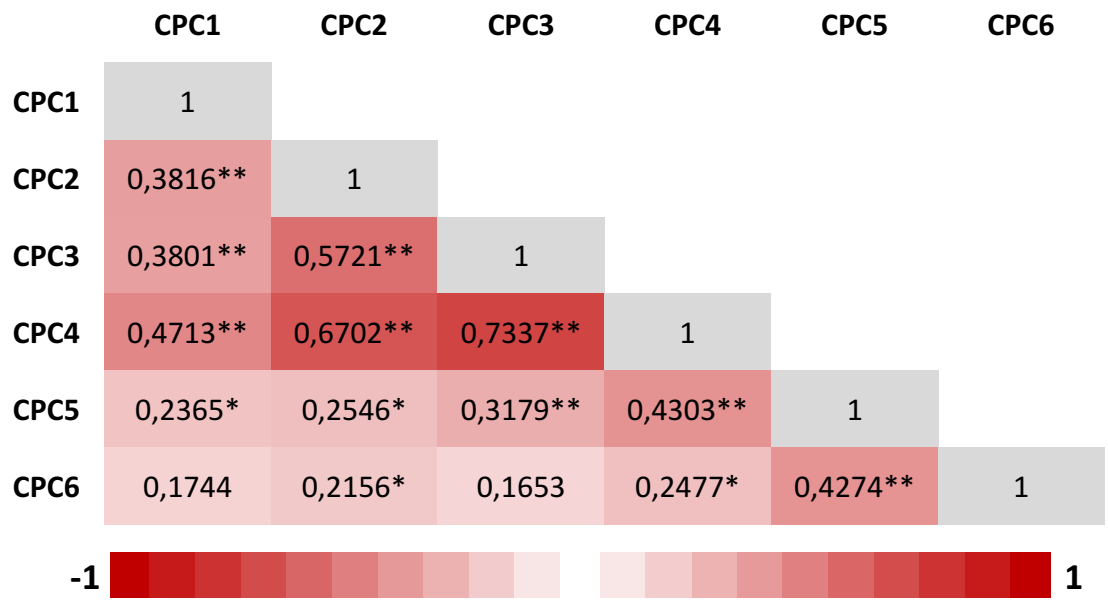

Figure C.5. Correlation matrix of commitment variables at primary cooperative level.
*Note: ** = significant at 1% confidence level, * = significant at 5% confidence level.*

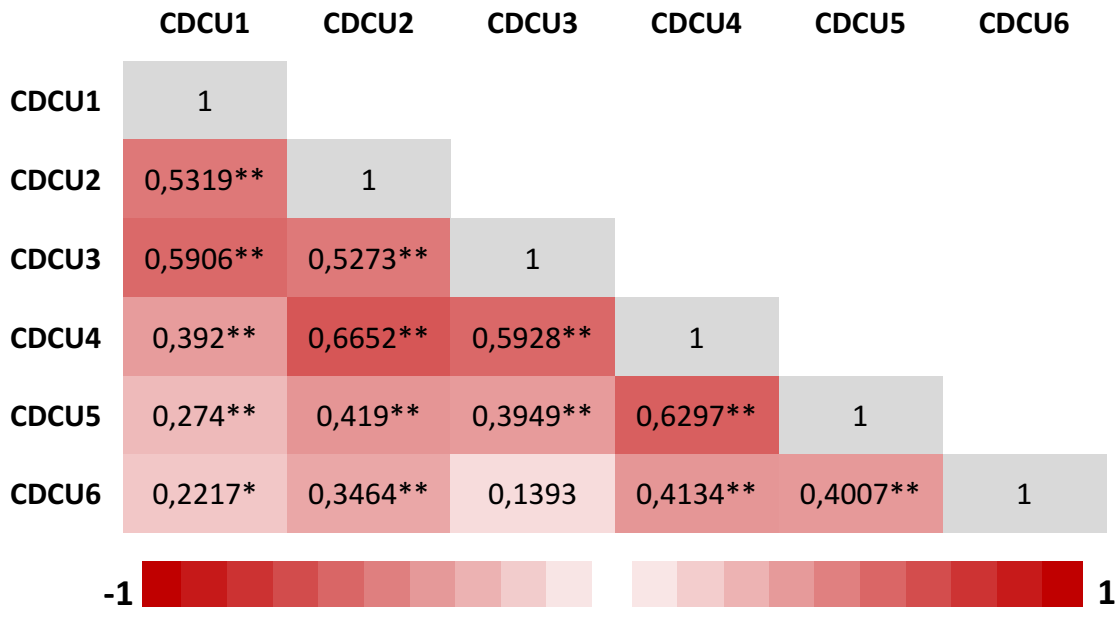

Figure C.6. Correlation matrix of commitment variables at district cooperative union level.
*Note: ** = significant at 1% confidence level, * = significant at 5% confidence level.*

Table C.2. *T-statistics associated with two-tailed, paired t-tests for each pair of identification variables both at primary cooperative (PC) level and district cooperative union (DCU) level.*

Variable	Level	I2	I3	I4	I5	I6
I1	PC	5,8748***	10,839***	0,0000	-1,3281	-0,4847
	DCU	6,6081***	8,3486***	0,0789	-2,2923**	-0,5650
I2	PC		4,5929***	-5,8516***	-6,6807***	-5,8185***
	DCU		2,1176**	-6,4854***	-8,0201***	-6,3546***
I3	PC			-10,346***	-11,301***	-10,673***
	DCU			-8,2994***	-9,2383***	-7,8984***
I4	PC				-1,4070	-0,4981
	DCU				-2,2748**	-0,6192
I5	PC					0,6742
	DCU					1,6907*

*Note: * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*

Table C.3. *T-statistics associated with two-tailed, paired t-tests for each pair of participation variables both at primary cooperative (PC) level and district cooperative union (DCU) level.*

Variable	Level	P2	P3	P4	P5
P1	PC	-1,0547	-2,0837**	0,0832	2,2876**
	DCU	-1,5725	-2,4444**	1,1567	0,4129
P2	PC		-1,0260	0,9918	2,9930***
	DCU		-1,4216	2,6765***	1,7409*
P3	PC			1,8200	3,7384***
	DCU			3,7658***	2,6556***
P4	PC				1,9179*
	DCU				-0,5312

*Note: * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*

Table C.4. *T-statistics associated with two-tailed, paired t-tests for each pair of commitment variables both at primary cooperative (PC) level and district cooperative union (DCU) level.*

Variable	Level	C2	C3	C4	C5	C6
C1	**PC**	-2,5668**	0,3807	-0,3466	1,7886*	3,2304***
	DCU	-0,1636	-0,8380	1,0324	2,3107**	4,0568***
C2	**PC**		3,6040***	3,3071***	4,5004***	5,8280***
	DCU		-0,5834	1,5360	2,5525**	4,4295***
C3	**PC**			-1,1007	1,5380	2,9143***
	DCU			2,1282**	3,0804***	4,4305***
C4	**PC**				2,5325**	3,8460***
	DCU				1,8168*	3,6521***
C5	**PC**					1,9151*
	DCU					2,1680**

*Note: * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*

Table C.5. *Differences in farmers' commitment to, identification with and participation in their primary cooperative (PC) and district cooperative union (DCU).*

	PC			DCU			
Variable	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**z-value[1]**
C1	99	4,384	(1,193)	99	4,313	(1,226)	0,906
C2	97	4,711	(0,866)	99	4,361	(1,276)	3,348***
C3	99	4,327	(1,182)	98	4,398	(1,164)	-1,055
C4	99	4,424	(1,051)	99	4,172	(1,246)	2,328**
C5	99	4,121	(1,172)	99	3,970	(1,321)	1,603
C6	99	3,869	(1,275)	99	3,646	(1,387)	2,066**
I1	97	4,351	(1,012)	99	4,103	(1,212)	1,808*
I2	97	3,115	(1,654)	98	2,708	(1,595)	2,340**
I3	97	2,219	(1,495)	98	2,333	(1,526)	-0,615
I4	98	4,357	(1,151)	99	4,071	(1,326)	2,077**
I5	98	4,500	(1,058)	99	4,316	(1,172)	1,685*
I6	98	4,418	(1,251)	99	4,143	(1,414)	2,080**
P1	99	4,212	(1,091)	99	3,879	(1,438)	1,706*
P2	99	4,313	(1,094)	99	4,091	(1,205)	1,447
P3	99	4,418	(1,004)	98	4,224	(1,189)	1,852*
P4	98	4,194	(1,282)	99	3,714	(1,300)	3,4231***
P5	99	3,879	(1,402)	99	3,808	(1,352)	1,298

*Note:[1]: z-value shows the z-value resulting from a Wilcoxon sign-rank test with H_0: mean(PC) – mean(DCU) = 0. * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*

Table C.6. *Differences in farmers' commitment to, identification with and participation in their primary cooperative (PC) and district cooperative union (DCU) as indicated by the composite indicators.*

	PC		DCU			
Indicators	**Mean**	**(SD)**	**Mean**	**(SD)**	**t-value[1]**	**z-value[2]**
COMM_UW	4,383	(0,722)	4,203	(0,919)	2,7039***	2,946***
COMM_EW	4,325	(0,725)	4,156	(0,911)	2,5108**	2,617***
IDEN_UW	4,109	(0,817)	3,955	(1,000)	1,8610*	1,318
IDEN_EW	4,027	(0,775)	3,918	(0,934)	1,3982	0,862
PART_UW	4,265	(0,919)	3,923	(1,046)	3,6249***	3,029***
PART_EW	4,204	(0,861)	3,948	(0,930)	3,3141***	2,654***

Note: COMM_UW stands for the commitment composite indicator with unequal weighting across variables. COMM_EW stands for the commitment composite indicator with equal weighting. IDEN_UW stands for unequal weighting. IDEN_EW stands for equal weighting. PART_UW stands for the participation composite indicator with unequal weighting, while PART_EW refers to a participation composite indicator with equal weighting. [1]*: t-value shows the t-value resulting from the two-tailed, paired t-test with* H_0*: mean(PC) – mean(DCU) = 0.* [2]*: z-value shows the z-value resulting from a Wilcoxon sign-rank test with* H_0*: mean(PC) – mean(DCU) = 0. * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*

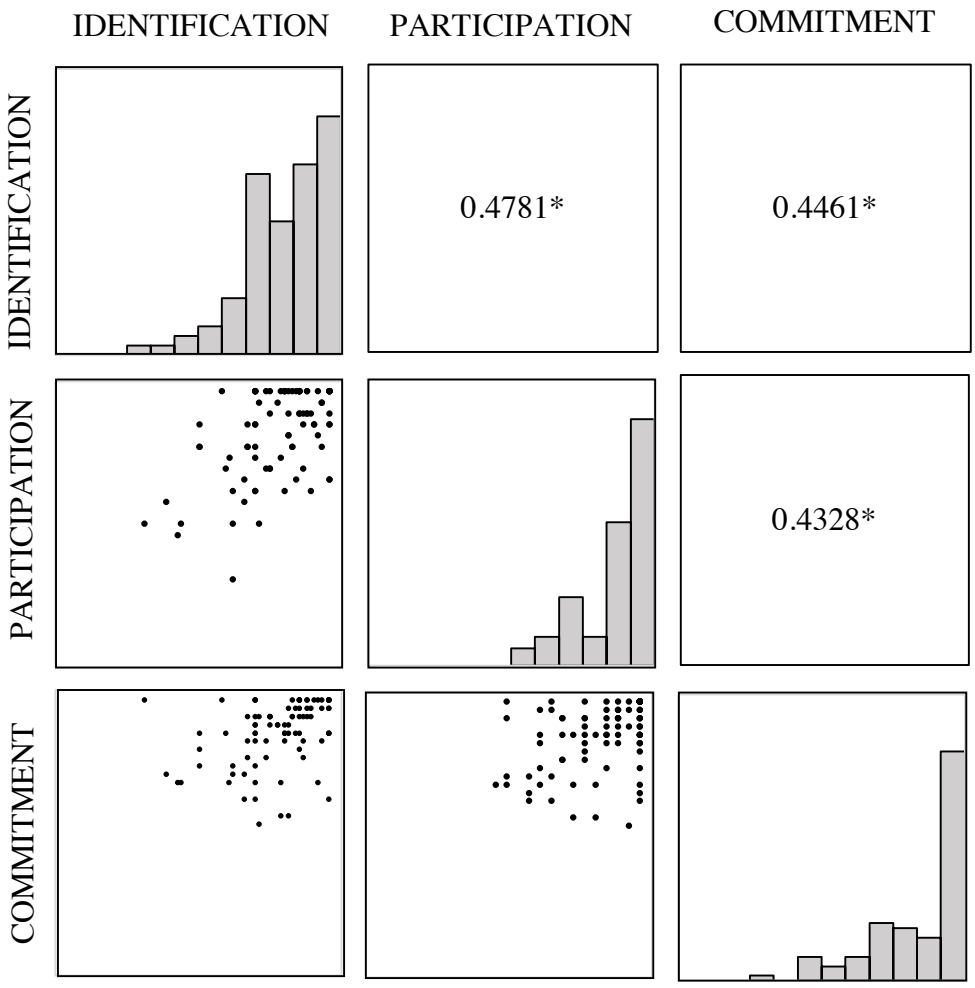

Figure C.7 *Correlation between farmers' identification with, participation in and commitment to their primary cooperatives after deletion of 5% lowest observations.*
*Note: The digit boxes show the correlation coefficients where * = significant at 1% confidence level. The scatter diagrams plot the values of each pair of variables along axes ranging from 1 to 5. The middle boxes show a 12-bin frequency histogram for each variable. N = 90, 93 and 92 for identification, participation and commitment, respectively.*

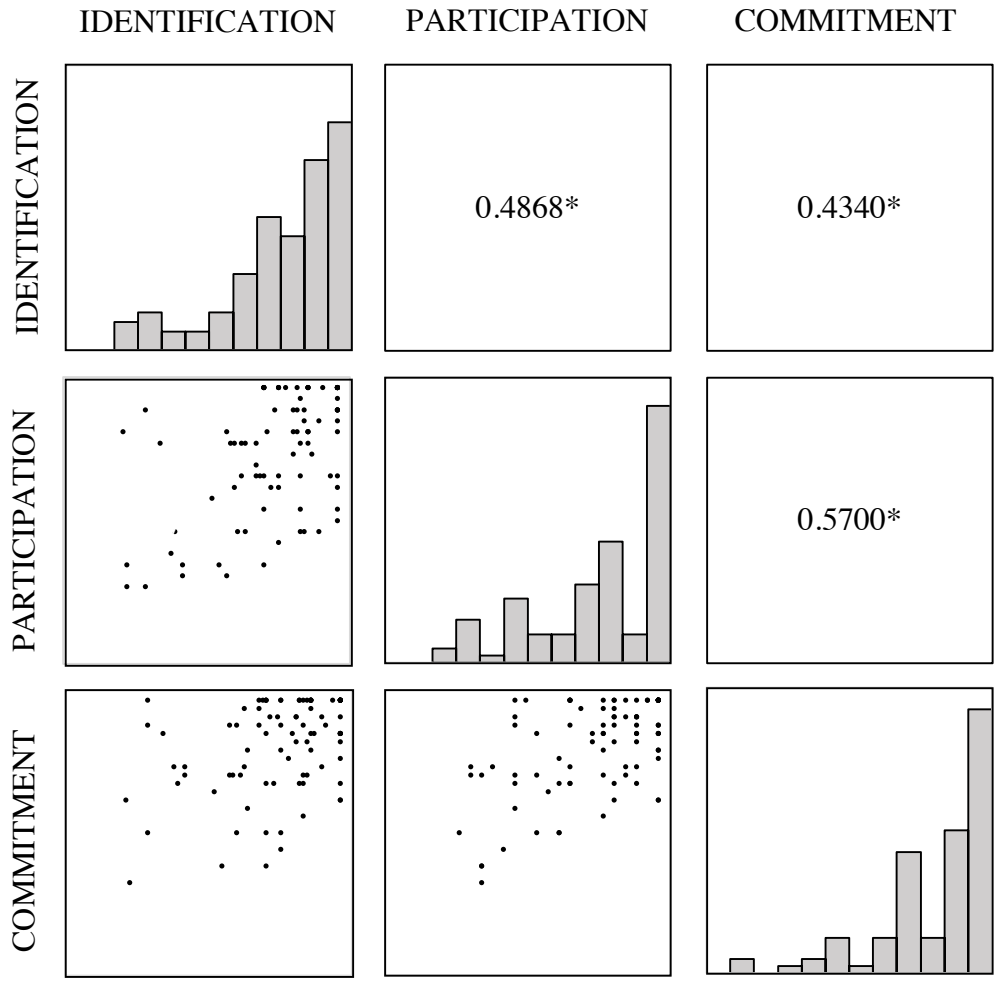

Figure C.8 *Correlation between farmers' identification with, participation in and commitment to their district cooperative unions after deletion of 5% lowest observations.*

*Note: The digit boxes show the correlation coefficients where * = significant at 1% confidence level. The scatter diagrams plot the values of each pair of variables along axes ranging from 1 to 5. The middle boxes show a 12-bin frequency histogram for each variable. N = 91, 92 and 92 for identification, participation and commitment, respectively.*

Table C.7. *Dimensionality of the commitment-identification relationship at primary cooperative level.*

Dimension	Canonical Correlation	Canonical Root (%)	F statistic[1]	Prob>F
1	0,7887	62,20	3,3757	0,0000
2	0,4279	18,31	1,0615	0,3869
3	0,2658	7,06	0,5639	0,9089
4	0,1486	2,21	0,3131	0,9701
5	0,0834	0,70	0,2340	0,9189
6	0,0631	0,40	0,3442	0,5589

Note: The canonical root is equal to the squared correlation and provides an approximation of the amount of variance explained by the canonical variates in their dimension. [1]: The F-statistic is calculated for Wilk's lambda. The p-values are the resulting p-values of a F-statistic test performed in a hierarchical fashion –i.e.: first the full model is tested first, then dimensions 2-6, 3-6, 4-6, 5-6 and 6. N = 93.

Table C.8. *Dimensionality of the commitment-participation relationship at primary cooperative level.*

Dimension	Canonical Correlation	Canonical Root (%)	F statistic[1]	Prob>F
1	0,7804	60,90	4,2592	0,0000
2	0,4523	20,46	1,5010	0,0796
3	0,2754	7,58	0,7545	0,6967
4	0,1294	1,67	0,3408	0,9145
5	0,0786	0,62	0,2769	0,7588

Note: [1]: The F-statistic is calculated for Wilk's lambda. The p-values are the resulting p-values of a F-statistic test performed in a hierarchical fashion –i.e.: first the full model is tested first, then dimensions 2-5, 3-5, 4-5, and 5. N = 96.

Table C.9. *Dimensionality of the commitment-identification relationship at district cooperative union level.*

Dimension	Canonical Correlation	Canonical Root (%)	F statistic[1]	Prob>F
1	0,6791	46,12	3,1135	0,0000
2	0,5021	25,21	1,9823	0,0041
3	0,3917	15,34	1,3959	0,1432
4	0,2269	5,15	0,8073	0,6099
5	0,1599	2,56	0,6468	0,6298
6	0,0574	0,33	0,2938	0,5891

Note: [1]: The F-statistic is calculated for Wilk's lambda. The p-values are the resulting p-values of a F-statistic test performed in a hierarchical fashion –i.e.: first the full model is tested first, then dimensions 2-6, 3-6, 4-6, 5-6 and 6. N=96.

Table C.10. *Dimensionality of the commitment-participation relationship at district cooperative union level.*

Dimension	Canonical Correlation	Canonical Root (%)	F statistic[1]	Prob>F
1	0,8050	64,80	4,8485	0,0000
2	0,4853	23,55	1,6570	0,0398
3	0,2665	7,10	0,6789	0,7710
4	0,1215	1,48	0,2563	0,9562
5	0,0483	0,23	0,1051	0,9003

Note: [1]: The F-statistic is calculated for Wilk's lambda. The p-values are the resulting p-values of a F-statistic test performed in a hierarchical fashion –i.e.: first the full model is tested first, then dimensions 2-5, 3-5, 4-5, and 5. N=97.

Table C.11. *Correlation between economic commitment variables and the identification and participation composite indicators at primary cooperative (PC) and district cooperative union (DCU) levels.*

	PC		DCU	
Variable	**Identification (N=95)**	**Participation (N=98)**	**Identification (N=97)**	**Participation (N=98)**
C5	0,3594*	0,3584*	0,3781*	0,2809*
C6	0,3376*	0,3945*	0,4180*	0,3578*

*Note: * = significant at 1% confidence level.*

Table C.12. *Differences across districts with regards to identification, participation and commitment composite indicators at both primary cooperative (PC) and district cooperative union (DCU) level.*

	LAMJUNG - GULMI	**GULMI - SYANGJA**	**LAMJUNG - SYANGJA**
IDENTIFICATION PC	-2,3700** (n=60)	0,0478 (n=66)	-2,2944** (n=64)
IDENTIFICATION DCU	-1,5557 (n=61)	-2,4613** (n=67)	-3,7676*** (n=66)
PARTICIPATION PC	-2,2808** (n=60)	-0,3395 (n=68)	-2,5023** (n=68)
PARTICIPATION DCU	-1,9694* (n=61)	-1,4552 (n=68)	-3,5409*** (n=67)
COMMITMENT PC	-3,4679*** (n=60)	0,0255 (n=68)	-3,0219*** (n=66)
COMMITMENT DCU	-2,1086** (n=61)	-1,1575 (n=68)	-3,0617*** (n=67)

*Note: t-values associated with a two-sample two-tailed t-test with H_0: mean(DCU_1) – mean(DCU_2) = 0. * = p-value < 0,1. * = p-value < 0,05. *** = p-value < 0,01.*

Table C.13. *Correlation coefficients between identification, participation and commitment at primary cooperative level broken down by district.*

Indicator	DCU	INDENTIFICATION PC	PARTICIPATION PC	COMMITMENT PC
IDENTIFICATION PC	**All**	**1**	**0,7453**	**0,6409**
	Gulmi	1	0,6453	0,4882
	Lamjung	1	0,8202	0,5892
	Syangja	1	0,5884	0,6996
PARTICIPATION PC	**All**		**1**	**0,6967**
	Gulmi		1	0,6113
	Lamjung		1	0,6023
	Syangja		1	0,7716
COMMITMENT PC	**All**			**1**
	Gulmi			1
	Lamjung			1
	Syangja			1

Note: all correlation coefficients are statistically significant at 1% confidence level.

Table C.14. *Correlation coefficients between identification, participation and commitment at district cooperative union level broken down by district.*

Indicator	DCU	IDENTIFICATION DCU	PARTICIPATION DCU	COMMMITMENT DCU
IDENTIFICATION DCU	**All**	**1**	**0,6489**	**0,6284**
	Gulmi	1	0,6669	0,4356
	Lamjung	1	0,6891	0,6253
	Syangja	1	0,3895	0,6607
PARTICIPATION DCU	**All**		**1**	**0,6364**
	Gulmi		1	0,6553
	Lamjung		1	0,6081
	Syangja		1	0,5383
COMMITMENT DCU	**All**			**1**
	Gulmi			1
	Lamjung			1
	Syangja			1

Note: all correlation coefficients are statistically significant at 1% confidence level.