

## Article

# Government Policy and Performance of Agricultural Cooperatives: A Case Study in Chitwan District, Nepal

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**Abstract:** Agricultural cooperatives are producer-owned and controlled organizations to improve farmers' livelihoods by correcting market failure. They support collective activities where individual incentives are insufficient to produce public goods. The government of Nepal has been investing economic resources in this sector, prioritizing cooperatives as part of a strategy for poverty reduction. This study examines poor farmers' access to agricultural cooperatives and the impact of membership on farm and total household income, based on a household survey of 572 households and key informant interviews of 37 cooperative managers. The ethnicity of the family and the neighborhood, smallholder land size, distance to an agricultural cooperative, distance to the nearest local market, and distance to a motorable road are key determinants that influence cooperative membership. The analysis of the effects of cooperative membership is based on propensity score matching, controlling for a large array of household and community characteristics. The estimates imply that cooperative membership may significantly affect family net crop income, but the overall effects on total family income are modest. Agricultural cooperatives appear to be focused on financial services such as savings and credit activities but are less concerned with agricultural production, and cooperatives engage in almost no marketing activities.

**Keywords:** collective action; cooperatives; civil society; poverty reduction



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## 1. Introduction. Civil Society and Cooperatives in Nepal

An agricultural cooperative is a means of collective action; a group of people takes action to enhance their livelihood options through increasing their access to a market at a lower cost [1–3]. The role of agricultural cooperatives in minimizing transaction costs is crucial [3]. In addition, collective action in cooperatives may increase members' bargaining power in input and output markets to obtain lower costs and higher prices, timely delivery of inputs, etc. [4]. Thus, cooperatives are an institutional device for smallholders to correct market failure [5,6]. Cooperatives are common in developing countries, particularly in agriculture [7,8]. Policymakers and development scholars argue that cooperatives allow agricultural smallholders to improve their living standards [5,9].

Nepal is a landlocked country in South Asia that lies between two giant economies, China and India. Nepal is the second poorest country in Asia, next to North Korea, with a 2021 per capita GDP of USD 718 [10]. Almost one-quarter of the population lives below the poverty line based on the international poverty standard of USD 1.90 per person per day [11]. Agriculture is a critical economic activity of the country, creating employment opportunities for 70 percent of the population, although its contribution to the national GDP was only 27 percent in 2018 [11]. The average farm size is only 0.9 hectares, and half of the farmers own only 15 percent of the total arable land [12]. The population involved in agriculture is generally poor, and the agricultural sector is still subsistence-oriented and not commercialized.

Nepal instituted a series of changes in cooperative policy from 1990–2020, focusing on poverty alleviation through the commercialization of agriculture. There was a significant increase in the number of cooperatives from 883 in 1992 to 9362 in 2007 [13]. The number of cooperatives increased to 34,512 with almost 6.5 million members in 2017. Approximately one-third of cooperatives are involved in agriculture [14]. Poverty was reduced in Nepal by nearly 50 percent from 1995 through 2010 [11]. Recently, the national government announced that Nepal would move forward toward a socialist economy with a strong partnership between cooperatives, government, and business [15]. This paper provides evidence on whether investments in cooperative development and the growth of agricultural cooperatives has supported poverty reduction of smallholders in Nepal.

The government of Nepal established the Department of Cooperatives under the Ministry of Agriculture in 1953. Nepal passed the Cooperative Societies Act in 1959 and the Cooperative Societies Rules in 1961. The first act and related rules established the basic structure of cooperatives, specifying how to form and legally register a cooperative [13]. Over time, the government initiated several different programs and approaches for cooperative development. However, the government put limited resources into cooperatives, frequently moving oversight of cooperatives among ministries and renaming these organizations until 1990 [16]. More important, until 1990, these units must be described as quasi-cooperatives, as they were not true cooperatives owned by their members and responsive to their needs but were controlled by the government [8,13].

The government established the National Cooperative Development Board (NCDB) in 1991 with the objective of revising the cooperative legislation and formulating member-friendly cooperative policies when the elected government came into power in 1991 [17]. The government launched the Eighth Five-Year Plan (1992–1997) prioritizing poverty reduction with the introduction of a number of policies, including cooperative development [18]. In that context, the government passed the Cooperative Act of 1992 and Cooperative Regulations in 1993 to achieve the objectives set in the plan. These acts and regulations, implemented by the Department of Cooperatives, identify cooperatives as member-owned and controlled organizations emphasizing cooperative principles [19]. Cooperatives began to function in a broader array of activities based on members' needs, including marketing of products, supplying agricultural inputs, and providing credit to members [13].

The government of Nepal recently passed the new Cooperative Act of 2017 to support cooperative development in the context of the new provincial and local governments established under the 2015 constitution [20]. The new cooperative act prohibits an individual membership in more than one cooperative with the same objectives. Prior legislation did not clearly classify the cooperatives based on their objectives in the formation and registration process. Cooperatives registered as “multipurpose cooperatives” could be involved in agricultural as well as other activities. Farmers could register as members of a single crop-based cooperative or a vegetable and fruit production cooperative with similar objectives as an agricultural cooperative. This previous ambiguous legal provision may have caused the establishment of many cooperatives with different names but with the same objectives in the same community, which eventually led to the poor performance and closure of some cooperatives. In the study area, there are cases where individuals joined more than one agriculture-related cooperative. There are only 74 functional agricultural cooperatives in the study area, while 128 agricultural cooperatives were registered between 1992–2014. Key informant interviews of the study reported that, after the enactment of the latest cooperative act, many agriculture-related cooperatives are in the process of merging with other cooperatives that have the same objectives and area coverage.

The substantial growth in the number of cooperatives since 1990 may be due in part to changes in political regime and the introduction of economic liberalization and open market policies after the restoration of democracy in 1990. These changes fueled many projects, as NGOs and civil society organizations expanded their activities at the community level [21,22]. It was widely believed that the government had failed to deliver basic services to the people prior to 1990 under the monarchy. At that time, many civil

society organizations and representatives/leaders of formal institutions like cooperatives led the political movement against absolute monarchy [23]. Even after 1990, the democratic government did not provide basic services to the people due to poor governance, and lack of political commitment and responsiveness [23]. This poor performance of the democratic government led to the formation of many civil society organizations at the community level. Maoists also began their armed rebellion in 1996, responding to public sentiments against the system [23–25].

Given the poor performance of government institutions, many ex-managers of cooperatives have established civil society organizations at the community level, seeing the opportunity for donor-driven grants and funds. More generally, outside donors have been supporting civil society organizations in Nepal with the goal of community development and poverty reduction. Nevertheless, the reputations of civil society organizations are not good among the general public due to their own partisan interests and lack of accountability and transparency [26]. In an effort to promote good governance, the government passed cooperative grant guidelines in 2016 providing grants to cooperatives contingent on the government's approval of a cooperative's proposed budget [20]. Many agricultural cooperatives have utilized such grants, though the aggregate amount of these grants is small relative to the requirements of agricultural infrastructure and activities underscored in grant guidelines. The government also offers training and related extension services for cooperative staff and members through its regional and district offices. The establishment of the National Cooperative Bank Limited (NCBL) in 2003 to provide banking services with lower costs to member cooperatives was another step towards cooperative development [27].

Khatriwada [28] argues that, despite huge investments in cooperatives, the performance of cooperatives in Nepal in terms of raising the income of smallholders is not satisfactory due to poor management of the cooperatives and limited entrepreneurial skills among members, making it difficult for them to compete in the national and global market [29]. Cooperative members must understand the rules and regulations that affect how they may grow and market their goods to make cooperatives successful [30]. It is common for local agricultural cooperatives in developed countries to work at all levels of the food value chain, including input supply, production, processing, and marketing [5,31,32].

No empirical studies are available on the role of agricultural cooperatives in income generation and poverty reduction of smallholders in Nepal. Hence, this paper focuses on two research questions: What are the individual and local area determinants of cooperative membership? How does cooperative membership affect farm income and total family income? To answer these research questions, this study collected primary data using a household survey and key informant interviews (KII) with cooperative officials in Chitwan District, Nepal. The paper comprises six sections including this introduction, which provides the context of this study. The second section discusses the theoretical framework and prior literature, and the third section presents the research methodology and describes the data. Results of the analysis are presented in the fourth section while the following section discusses the results and compares the findings with those of the previous literature. Finally, the last section presents conclusions and broader policy implications of this research.

## 2. Literature Review

The earliest cooperatives were founded in England in the late 18th and early 19th centuries. Over the past 200 years, cooperatives in developed countries have experienced both successes and failures. The producer cooperatives that exist today in developed countries are those that have been successful in providing both public benefits and targeted private returns to members. According to Olson [33], "Unless the number of individuals in a group is quite small, or unless there is a coercion or some other special device to make individuals act in their common interests, rational, self-interested individuals will not act to achieve their common or group interests" (p. 2). Olson argues, however, that the provision of selective incentives—i.e., specific benefits that can only be gained if one belongs to the

group—can induce individuals to participate in collective action. Once such a group is formed, self-monitoring devices can keep the members pointed toward their collective goals. Members will not cooperate/contribute to group work if there is no clear allocation of costs and benefits based on member contribution [33].

Cooperative members get benefits at two levels from the cooperatives. They earn income at the household level by selling their produce to the cooperative. Further, when cooperatives generate margins from efficient operations and add value to the products, these earnings are returned to members in proportion to the business they do with the cooperative or member's equity held in the cooperative [34,35]. Cooperatives can provide selective incentives such as access to their credit union. If cooperatives need working capital to expand the business, the members may make financial contributions, often in proportion to the business/transactions they do with the cooperative [36,37]. Cooperatives also can obtain capital by mergers with other cooperatives or by issuing equity capital to outsiders, who generally do not have voting rights [38]. However, the kind of investment arrangements and the level of cooperative development may vary from country to country based on cooperative rules and regulations.

Apart from economic incentives, there are other factors such as a desire for fair payment by the cooperative, community bonding, etc., that provide value to an individual member for participation in collective action [32]. Collective action may be influenced by the nature of the resource, community characteristics, the interrelationship between the community and the resource, market access, and external agencies [39]. For cooperatives to be effective, members must develop their own rules and regulations appropriate to the local context, aligned with democratic norms and values [40]. Using democratic procedures to run the cooperative allows all members, no matter their size, to have a voice, so they can address their individual and common needs. Indeed, if small producers are aware of opportunities to exercise their rights in a collective way, they may join cooperatives in order to address their needs [31,41].

Smaller and poorer farmers are less likely to join agricultural cooperatives than middle-size farmers in Uganda [42] and China [43], but they are more likely than larger farmers in Kenya [44] and Ethiopia [5], and India, except for cash crops [45,46]. Small farmers may not have sufficient income to pay the membership fee or to buy a share of a cooperative. On the other hand, in general, large farmers, except those producing coffee and bananas, do not join agricultural cooperatives. Large farmers may have higher costs if they join in collective action than if they farm independently, given that their farm assets, bargaining capacity, and technical skills provide them an advantage in the open market. However, middle-size farmers may join agricultural cooperatives because cooperatives offer them production and marketing scale they cannot achieve alone.

Education is another factor that may influence farmers' participation in agricultural cooperatives. However, findings on education are inconclusive. Studies in Ethiopia and Nigeria find that those with more education are more likely to join a cooperative [5,47–49] while studies in China and Kenya find that education alone does not ensure participation in agricultural cooperatives [44,50]. Farmers are expected to compare the benefits and services offered by the cooperatives, including higher prices, to conventional or alternative channels before joining agricultural cooperatives [51–53]. Education may enable farmers to access the information about the benefits and services offered by the cooperatives, thereby increasing their participation in agricultural cooperatives, or their greater access to information may allow them to farm independently.

Studies in Pakistan and Kenya find that gender of the household head does not have an influence on participation in collective action activities [44,49]. This is perhaps somewhat surprising since gender is expected to be associated with other factors, such as education, empowerment, knowledge, and productive assets, reflecting traditional role differences between men and women [54,55]. There may be an association between gender and cooperative membership even in the absence of a direct relationship.

Hill et al. [56] in Uganda and Nugusse et al. [48] in Ethiopia found that farmers are more likely to join cooperatives if their community has basic infrastructure such as road access and electricity. The studies show mixed findings on access to markets, and researchers use a variety of proxy variables for market access. Haque et al. [57], in a study of water shrimp communities in Bangladesh, and Nugusse et al. [48] and Abate et al. [4], in studies of agricultural cooperatives in Ethiopia, use distance to the market as a proxy, whereas Fischer and Qaim [44] and O'Brien et al. [31], in studies of smallholders in Kenya and Uganda, use distance to a collection center. Further, the size and types of the market such as the nearest local market (e.g., a "haat bazaar" in Nepal), the availability of marketing services of a collection center, distance to a cooperative office, etc. may influence the likelihood of membership, but none of the studies considered all these factors. The likelihood of farmers who are involved in non-farm employment activities joining agricultural cooperatives is mixed and inconclusive.

Credit is an important factor as an inducement to join cooperatives. Small and middle-sized farmers, who do not have access to conventional credit due to inadequate farm assets, are likely to participate in agricultural cooperatives [5,44]. However, credit is not likely to be relevant for large farmers because the maximum credit available from a cooperative is usually limited [36,51,53]. Larger farmers may also have easier access to alternative credit institutions due to the size of their landholdings and farm assets [5,44,51,53]. Nugusse et al. [48] argue that the likelihood of Ethiopian farmers joining agricultural cooperatives decreased when farmers had easy access to alternative credit through financial institutions.

The level of trust among farmers is an important determinant of membership in agricultural cooperatives. Studies on the determinants of producer group membership in rural Tanzania [58] and in Bangladesh [57] find that people are less likely to join ethnic and income heterogeneous cooperatives. Haque et al. [57] argue that people trust their own peer group more than outsiders. Wollni and Zeller [53], in a study of coffee farmers in Costa Rica, find that farmers who are already involved in unions and associations are more likely to join agricultural cooperatives. It is possible that farmers learn how such groups work and then use that knowledge to join other groups. However, a study of banana growers in Kenya finds participation in other groups/associations does not have an effect on membership in producer organizations. Zheng et al. [50], in China, found that the perceived risk of the farm operation measured in terms of expectations about price and production risk has a positive effect on the likelihood of joining agricultural cooperatives. Risk can be associated with crop types due to the perishability of the crop or climatic uncertainties. However, most studies do not ask farmers about perceived risk, nor do they consider differences in risk associated with crop types or weather variation. Likewise, many studies use factors such as farm assets, non-farm income, age of the household head, farming experience, etc., in their models and report that these factors also influence the farmers' participation in agricultural cooperatives. Finally, there are mixed findings on some determinants, including land size, education, market access, non-farm employment, and membership in other groups/associations.

Many studies have found that being a member of a cooperative has a significant and positive impact on income [31,59–61]. Almost all studies discussed here used matching techniques to control variables to measure the effect on income. Wollni and Zeller [53] found that coffee growers in Costa Rica who were cooperative members obtained higher prices for their coffee. The researchers found that coffee cooperatives had a positive impact on the incomes of medium-sized and small farmers, but large growers did not join cooperatives because they had access to the premium coffee market due to the quality of their coffee and their business skills. Anteneh et al. [62] and Mojo et al. [60], in a study of coffee growers in rural Ethiopia, found that coffee cooperatives offered a higher price than private traders, which eventually benefited both members and non-members because private businesses were compelled to increase coffee prices, as non-members would otherwise choose to sell their produce to cooperatives.

O'Brien et al. [31], using a survey of small-scale dairy farmers in Kenya and Uganda, examined the benefits of membership in four dairy cooperatives focusing on milk production, collection, and processing. The regression estimates showed that cooperative members had an USD 18 per month higher income than non-members. The authors argued that the difference in income was due to the cooperatives since there is no statistically significant difference in non-dairy income between members and non-members. The study by Bernard et al. [59] of cereals production and marketing cooperatives in rural Ethiopia found that cooperative members received a 7.2–8.9 percent higher cereals price compared to non-members. The authors suggested this might be due to the increased bargaining power of the cooperatives due to their collective volume and market access.

Fischer and Qaim [44] found that income from banana production in Kenya was 23 percent higher for the producer group members than non-members, although the authors reported that the increase in income was not primarily due to the marketing intervention but was due to expansion of the crop. The authors argued that expansion was possible due to the support provided by the producer organizations in production skills and linkages to extension services and financial institutions. In a similar study in Ethiopia, Abate et al. [4] found that that member households had nearly 6 percentage points greater output in cereal crop production (i.e., teff, wheat, and finger millet) from a given set of inputs than non-members due to more efficient use of inputs. The authors suggest that this greater efficiency for members came from the services provided by agricultural cooperatives.

In a study of marketing cooperatives in rural China, Ito et al. [43] found that farm income from watermelons was the USD 4.25 to USD 4.57 higher per day for members than non-members. This significant difference in farm income was due to the price premium rather than yield. The finding of no difference in yield between members and non-members may be due to the adoption of the production practices by non-members following nearby cooperative members [43]. Verhofstadt and Maertens [61], in a survey study in southern Rwanda with smallholders having less than 0.34 hectares of land, found cooperative members earned 40–46 percent higher farm income than non-members, and cooperative membership reduced the likelihood of being poor by 10–14 percentage points. The focus of the study was land and marketing cooperatives that were actively involved in the maize and horticultural sectors, and which purchase or rent land and allocate it to members to cultivate, and then purchase the produce from members.

Mishra et al. [63], in a survey study of tomato growers in Nepal, found that tomato farmers who have a contract agreement with their respective cooperatives for tomato production and marketing receive 70–76 percent higher net income from tomatoes than independent growers did. The authors reported that the increased net income was not due to the price but due to the services offered by the cooperatives, which increased the yield and reduced the cost of production and marketing. Likewise, studies by Ahmed and Mesfin [64] in Ethiopia and Wossen et al. [65] in Nigeria reported that agricultural cooperatives had a positive and significant effect on household income and per capita consumption expenditure.

### 3. Research Method

#### 3.1. Sampling Techniques and Sample Size

This research uses primary data collected in Nepal using a household survey and key informant interviews (KII) employing face-to-face interviews with semi-structured questionnaire methods. This study chose the Chitwan district, among 77 districts, for the surveys due to its plain topography, the number of functional cooperatives established between 1992–2014, and easy road access. Chitwan is a typical district representing the plain region in terms of agricultural practices, ethnicity, and proximity to Nepal's southern border [66]. The district comprises a total of 36 villages and two municipalities with a total population of 579,984 [67].

After selection of the district, the study omitted nine hilly villages that differed in terms of topography, cropping pattern, and ethnicity [66] from plain villages of the District. The nine villages border three hill districts (Makwanpur, Dhading, and Gorkha), and are in remote areas with limited access to roads, educational facilities, or other basic infrastructure [66]. The majority of the people who reside in these nine villages constitute Nepal's highly marginalized indigenous people called "Chepang," the largest practitioners of shifting cultivation [68]. Most lands in these villages are not appropriate for cultivation due to uneven and steep topography.

This study also omitted two municipalities because very few of their residents are involved in agricultural cooperatives or farming. The ethnicity/caste composition of these 27 villages in Chitwan District roughly represents the plain regions for the whole of Nepal [66]. The majority of the families grow at least three crops in a year, which is the common practice in the plain region of Nepal [66]. Overall, the sampling frame of this study omitted 58,219 families consisting of 47,790 families from two municipalities and 10,429 families from nine villages, out of a total of 132,318 families of Chitwan district.

There are 74 functional agricultural cooperatives registered between 1992–2014, with approximately 28,000 members across the sampled villages [69]. This study aimed to measure the impact of agricultural cooperatives on family income and net crop income. In fact, the classification "agricultural cooperative" in Nepal refers to cooperatives that are focused on the cultivation and production of cereals and crop vegetables. Cooperative members were randomly sampled from functional cooperatives based on cooperative membership lists for each village. Each village in the sample has at least one functional agricultural cooperative except Divyanagar Village. Non-members were randomly selected from those villages based on official government records, excluding those on the list of cooperative members.

Villages were grouped into quintiles based on the proportion of cooperative members. An initial sample frame was chosen consisting of 269 cooperative member households from all quintiles, 282 non-member households from the bottom two quintiles, and 289 non-member households from the upper three quintiles. The sample frame size reflects an expected response rate of 70 percent, with the target sample size chosen to allow identification of any effects that would be of substantive interest. See [70] for further details. This study identified an effective/target sample size of 191 members of households from all quintiles, 200 non-member households from the bottom two quintiles, and 204 non-member households from the upper three quintiles. The response rate for this study was 72.5 percent, and the final sample size was 572 households, including 372 non-members and 200 members.

Design weights were calculated as inverse probabilities of selection for each household interviewed based on the total population of members and non-members in each village. These sampling weights allow us to obtain accurate population estimates for the 26 villages for parameters of interest [71].

Apart from the household survey, this study interviewed either the chairperson or the manager (depending on the structure of the cooperative and availability) of 37 agricultural cooperatives for a key informant interview (KII) in order to understand their perception about the role and structure of services of the cooperatives. These cooperatives were chosen in approximate proportion to the number of cooperatives in each village but keeping at least one cooperative from each village and assuring that each chosen cooperative had members in the sample.

### 3.2. Identification Strategy

This study addresses research questions using probit and matching techniques. The probit model is used to analyze the determinants of cooperative membership and calculates propensity scores for treatment and comparison observations, using these to obtain matching estimates of the effects of cooperative membership on net crop income and total family income. This study also measures the effects on income using OLS regression to

compare the OLS and PS estimates. While the OLS estimates are based on assumptions of linearity and additivity, they may produce valid and possibly more precise estimates if these assumptions are satisfied.

The general specification of the probit model is as follows:

$$\begin{aligned} \tilde{I}_i &= \beta_i X_i + \dots + \epsilon_i \\ I_i &= 1 \text{ if } \tilde{I}_i > 0, 0 \text{ if otherwise} \end{aligned}$$

$I_i$  indicates whether a household is a member of an agricultural cooperative.  $X_i$  is a vector of variables,  $\beta_i$  is a vector of coefficients, and  $\epsilon_i$  is an error term associated with unobservable factors. The error term is assumed to be normally and independently distributed across individuals. The farmer's choice of whether to join the cooperative is a function of demographic, geographic, and village characteristics, variables taken as exogenous.

The same probit model used to estimate the factors affecting cooperative membership is used to estimate the propensity score:

$$P(X_i) = Pr \{I_i = 1|X_i\} = E\{I_i|X_i\}$$

where  $P(X_i)$  is the propensity score of a sampled observation,  $I_i$  is a treatment variable (cooperative membership), and  $X_i$  represents explanatory variables or pre-treatment variables. The propensity score is the probability of receiving treatment (i.e., cooperative membership), conditional on pre-treatment characteristics (such as education, gender, main occupation, and so on), to measure the effects of cooperative membership on income [65,72]. The calculated propensity score for each observation is used to estimate the average treatment effects of agricultural cooperatives on incomes (Average Treatment Effect on the Treated, or ATT) based on the difference in income between participants and non-participants [44,73,74]. This requires the conditional independence assumption, implying that selection into cooperative membership is based on observable and unobservable factors that are independent of the outcome [60,73–75].

Based on the propensity score, observations were limited to the common support region, where distributions of the propensity scores for treatment and comparison groups overlap. After defining the common support region, an appropriate matching technique needs to be identified. The matching technique's main objective is to achieve balance between the treatment and comparison group on all the covariates using a single dimension variable that is a function of the covariates [76,77]. After testing several alternatives, caliper matching (radius matching) with a caliper of 0.6 was adopted. Balancing tests indicated no statistically significant differences in variable means between the treatment group and the matched comparison group.

ATT is estimated as:

$$ATT = E\{E Y_i(1)|I_i = 1, P(X_i) - E Y_i(0)|I_i = 0, P(X_i)|I_i = 1\}$$

$Y_i(1)$  and  $Y_i(0)$  are treated and untreated outcomes for a particular case, treatment is denoted by  $I_i$ , and  $P(X_i)$  indicates the propensity score associated with explanatory variables. There is some controversy regarding the error variance in the estimation of treatment effects applying propensity score matching. The standard formula used for estimation of error variance may suffer from biases due to estimation of the propensity score, the requirement of a common support region, and the way samples are matched [76,78]. Therefore, in addition to calculating standard errors using conventional analytical methods, we calculated standard errors with a bootstrap method [79]. Differences between bootstrap standard errors and simple analytical standard errors are small, suggesting that the latter are not seriously biased in this case. In addition to estimating effects based on the survey sample, this study also estimates effects for the survey sample as weighted to reflect the population in the sample villages.



### 3.3. Characteristics of the Sample

Table 1 presents the characteristics of the sample used in the study. On average, family heads attended middle school, and more than half of the families were male-headed. Males are more likely to be the economic decision-makers in Nepal due to its patriarchal society. Fewer than one-fourth of families state that farming is their main source of income. The largest group of families are in the 4–5-hectare size category, corresponding to the national average at 4.8 [67]. Overall, member families have 3.83 family members who are active in the labor market, compared to 3.40 for non-members. Nepal is a multi-ethnic, multi-cultural, and multi-religious country. This study controls for ethnicity using a dummy that identifies membership in Khas ethnic groups. Hill Brahman and Chhetri were the most common castes, and these two castes are known as the Khas ethnic groups and are placed at the top of the caste system [80]. The measure of the ethnicity of the neighborhood is coded as a dummy identifying neighborhoods as homogeneous if more than 70 percent are from one ethnic group. The ethnic groups are categorized as Khas, Indigenous ethnic, or Dalit and Madhesi.

**Table 1.** Characteristics of households used for the analysis.

Variables	Member		Non-Member		Total	
	Mean	SD	Mean	SD	Mean	SD
Years of education of family head	7.78	4.64	5.73	4.72	6.44	4.79
Gender of the family head (1 = M)	0.58	0.49	0.54	0.49	0.56	0.49
Main income source (1 = farming)	0.26	0.43	0.17	0.37	0.20	0.40
Household family size (number)	4.94	1.40	4.65	1.39	4.75	1.40
Active in labor force (number)	3.83	1.13	3.40	1.26	3.55	1.23
Ethnicity of the family (1 = Khas)	0.74	0.43	0.53	0.49	0.61	0.48
Ethnicity of neighborhood (1 = homogeneous)	0.88	0.32	0.56	0.49	0.67	0.46
Land size in hectares	0.49	0.45	0.27	0.23	0.35	0.34
Livestock units (number)	2.31	7.32	1.44	3.21	1.74	5.05
Distance to agricultural cooperative (km)	0.77	0.74	1.63	0.84	1.33	0.90
Distance to the nearest local market (km)	2.71	1.55	3.83	1.66	3.44	1.71
Distance to district capital (km)	20.44	11.5	20.79	12.14	20.67	11.91
Agrovet in the village (1 = yes)	0.98	0.12	0.95	0.21	0.96	0.18
Cooperative collection center in village (1 = yes)	0.58	0.49	0.54	0.49	0.55	0.49
Distance to motorable road (km)	0.14	0.18	0.42	0.34	0.32	0.32
Distance to farmers' market (km)	9.67	11.55	10.34	11.80	10.70	11.93
Any factory/industry in village (1 = available)	0.37	0.48	0.33	0.47	0.34	0.47
ADB loan (1 = yes)	0.11	0.31	0.04	0.20	0.06	0.25
Total household income in Nepalese Rupees	436,185	318,033	397,692	356,704	411,151	343,887
Net crop income in Nepalese Rupees	41,749	142,946	10,337	34,193	21,320	90,032
Observations	200		372		572	

Source: Authors' computation based on survey data.

Most of the surveyed families reported they own less than 0.4 hectares of land, which is lower than the national average of 0.7 hectares [81] but is close to the district average at 0.46 [66]. Almost all farm families keep some livestock in Nepal, although the types of livestock vary from caste to caste. For instance, milk cows and buffalo are common

among the Brahmin and Chhetri caste across the country, and they do not keep pigs but do keep goats for meat purposes for religious and cultural reasons [82]. The majority of the surveyed families in the Chitwan district are involved in crop farming along with livestock farming. On average, families own 1.74 units of livestock measured in livestock units (approximately two or three buffalo, or 174 chickens [83]). Almost all respondents indicate that there is an agroveter, a supplier of agricultural and veterinary products, in the village. In contrast, only 58 percent of households reported that their villages had cooperative collection centers.

In the same vein, 34 percent of families reported that there was a factory or industrial production in the village. The proportion of families reporting availability of industrial production or a factory is slightly higher for members compared to non-members. Only 6 percent of families took a loan from the Agricultural Development Bank (ADB). This proportion does not include loans from cooperatives or other financial institutions. Table 1 also describes the total yearly annual income of the families, which includes income from crops, livestock, business, wages, remittances from abroad, pensions, and cooperative dividends. Overall, members have an average net crop income of 41,749 Nepalese Rupees (NPR) compared to 10,337 for non-members. It seems the profit from crops is approximately equal to the imputed value of household labor based on the number of workers in the family available for farm tasks.

The families' residences were on average 0.32 km from a motorable road and 1.33 km from an office of an agricultural cooperative. The distance to the nearest local market averaged 3.44 km, whereas a larger farmers' market was over 10 km. Overall, non-members' houses were an additional 1 km farther away from an agricultural cooperative than members.

## 4. Results

### 4.1. Determinants of Cooperative Membership

Table 2 presents results from the probit estimation predicting cooperative membership with the variables as described in the prior section. In the initial probit estimation equation, quadratic terms were included for the active labor force, land size, livestock value index, and distance to the nearest local market, but, as none of the squared terms were significant, those were dropped. Hence, a probit model of cooperative membership with 18 explanatory variables was estimated and Table 2 reports both coefficient estimates and average marginal effects.

Table 3 presents a model that replaces the measured village characteristics with dummies for the 26 villages. The availability of a cooperative collection center in the village, availability of agrovets in the village, distance to district capital from families' residence, and availability of industry in the village are common to the families in a given village, so their effects are captured by the village dummies. Village dummies also capture unmeasured differences between villages. In addition, the model omits several measures that are correlated with other measures or may be endogenous. Distance to a farmers' market was strongly correlated with other variables, whereas main occupation, the livestock index, and use of ADB services, may suffer from endogeneity in the estimation since they could be influenced by cooperative membership. This reduced equation yields some minor changes in the standard errors and average marginal effects for variables, but the sign and significance of estimates did not change.

The analyses identify several key determinants of cooperative membership: the ethnicity of a family, the ethnicity of the neighborhood, land size, and farming as a main source of income positively affect membership, while variables such as distance to an agricultural cooperative, distance to the nearest local market, and distance to a motorable road have negative effects on cooperative membership. Hill Brahmin and Chhetri castes, the socially dominant castes in Nepal (the Khas group), are more likely to become cooperative members. On average, a one-hectare increase in land ownership increases the likelihood of cooperative membership by 17.1 percentage points. The availability of a collection center in a village has a positive and significant effect on cooperative membership, although only

5 percent of members used the services of collection centers because collection centers of agricultural cooperatives did not, in fact, serve a marketing function, notwithstanding the initial expectations of members. Distance to an agricultural cooperative office is more likely to reflect the impact of the availability of other services.

**Table 2.** An extended model of probit estimation of cooperative membership with all explanatory variables.

Covariates	Coefficient	SE <sup>a</sup>	Marginal Effect
Years of education of family head	0.007	0.016	0.001
Gender of the family head (1 = M)	−0.268 *	0.151	−0.048 *
Main occupation (1 = farming)	0.473 **	0.189	0.084 **
Household family size (number)	−0.033	0.080	−0.006
Active in labor force (number)	0.060	0.086	0.011
Ethnicity of the family (1 = Khas)	0.339 **	0.160	0.060 **
Ethnicity of neighborhood (1 = homogeneous)	1.222 ***	0.190	0.217 ***
Land size in hectares	0.960 ***	0.288	0.171 ***
Livestock value index (number)	0.000	0.011	0.000
Distance to agricultural cooperatives (km)	−0.778 ***	0.106	−0.138 ***
Distance to the nearest local market (km)	−0.255 ***	0.052	−0.045 ***
Distance to district capital (km)	−0.022 *	0.012	−0.004 *
Agrovets in the village (1 = yes)	0.025	0.553	0.005
Cooperative collection center in village (1 = yes)	0.935 ***	0.207	0.166 ***
Distance to motorable road (km)	−2.939 ***	0.416	−0.522 ***
Distance to farmers' market (km)	0.025	0.015	0.004 *
Any factory/industry in village (1 = availability)	−0.302 *	0.171	−0.054 *
ADB loan (yes = 1)	0.481	0.355	0.086
Constant	0.366	0.736	
Observation	572		
Pseudo R-Squared	0.511		

\* Significant at 10 percent level \*\* Significant at 5 percent level \*\*\* Significant at 1 percent level <sup>a</sup> Standard errors are heteroscedasticity robust. Source: Authors' computation based on survey data.

Education did not have any effect on cooperative membership. In this study, most families are literate, and about half of the family heads attended middle school. Families may have a common understanding of the actual workings of agricultural cooperatives given the relatively high level of literacy in Nepal. The use of an ADB loan, a proxy for alternative credit access, did not have a significant effect on cooperative membership. This insignificant effect may be due to the small proportion of surveyed people obtaining ADB loans. A majority of the key informants representing agricultural cooperatives (chairpersons or managers) indicated that agricultural cooperatives are currently focused on savings and credit mobilization. As most of the members are poor and are smallholders, they argued that an increase in saving behavior of the members is the entry point to increase equity capital and thereby initiate income-generating options. More than 70 percent of cooperatives require that members deposit monthly savings in a cooperative account, with minimums of up to 200 Nepalese Rupees. Most informants reported that members are now

fully aware of the importance of cooperative savings for reducing their dependence on outside lenders.

**Table 3.** A probit estimation predicting cooperative membership with 25 location dummy variables.

Covariates	Coefficient	SE <sup>a</sup>	Marginal Effect
Years of education of family head	0.015	0.017	0.003
Gender of the family head (1 = M)	−0.090	0.169	−0.015
Household family size (number)	0.008	0.065	0.001
Ethnicity of the family (1 = Khas)	0.372 **	0.175	0.063 **
Ethnicity of neighborhood (1 = Homo)	1.065 ***	0.238	0.179 ***
Land size in hectares	0.983 ***	0.263	0.166 ***
Distance to agricultural cooperatives (km)	−0.809 ***	0.133	−0.136 ***
Distance to the nearest local market (km)	−0.382 ***	0.071	−0.064 ***
Distance to motorable road (km)	−3.197 ***	0.393	−0.538 ***
25 villages dummies		Control	
Constant	0.391	0.605	
Observation	545		
Pseudo R-Squared	0.534		

\*\* Significant at 5 percent level \*\*\* Significant at 1 percent level <sup>a</sup> Standard errors are heteroscedasticity robust. Source: Authors' computation based on survey data.

This analysis included three measures of market access: distance to a farmers' market, distance to a local market, and distance to the district capital. The distance to the nearest local market has a negative and significant effect on cooperative membership, and the two other measures of market access, distance to a farmers' market and the district capital, did not have significant effects on cooperative membership. Determinants such as gender of the family head, total livestock units (TLU), household family size, and the number of household members active in the labor force did not affect cooperative membership.

#### 4.2. Cooperative Membership Impact on Income

Table 4 presents an estimate of ATT, reporting both analytical standard errors and those estimated using bootstrapping (100 replications). Appendix A Figure A1 presents the distribution of propensity scores for cooperative members (the "treated" group) and nonmembers. The propensity score distributions largely overlap, so the analysis can consider a large share of the cases, implying that estimates of ATT will be robust. Observations that fall outside the common support region were dropped, for a total of 284 observations, 99 of the cooperative members, and 185 non-members, and Appendix A Table A1 shows a balancing test that was performed after caliper matching with a caliper of 0.6 to ensure similar characteristics for cooperative members and matched non-member families.

**Table 4.** Estimation of the effects of cooperative membership on income.

Outcome	Averages		OLS with Village Dummies		Caliper Matching			Bootstrapping with 100 Reps	
	Member	Non-Member	Coefficient	p-Value	ATT	SE	T-stat	SE	p-Value
Net crop income	41,749	10,337	46,746 (22,005)	0.03	37,327	19,747	1.89	21,637	0.08
Total family income	436,185	397,692	45,164 (43,619)	0.30	44,024	46,564	0.95	54,919	0.42
Observations	572		545		545			545	

Source: Authors' computation based on survey data. Figures in parentheses indicate standard errors of coefficient estimates.

The estimate of the effect of cooperative membership on net crop income was 37,328 Nepalese Rupees (NPR). This effect was marginally significant ( $p = 0.08$ ), nearly four times the net crop income of nonmembers but only about 9 percent of families' average total income (NPR 411,152). The results indicate that total annual family income was NPR 44,025 higher for cooperative members than matched non-members, slightly higher than the difference in net crop income, but this difference in income is not statistically significant. The positive effect of cooperative membership on net crop income is most likely a reflection of production activities for cereals and vegetables, which are the focus of the agricultural cooperatives; agricultural cooperatives mainly provide production services such as seeds, credit for production, training, and extension services, subsidized fertilizers, etc. to cooperative members.

Estimated model parameters show that the magnitude of effects on net crop income was quite similar in OLS estimates and PS estimates, and standard errors were similar. The effects on net crop income were statistically significant in the OLS model and close to significant in the PS model. This considerable similarity between OLS and PS estimates suggests that OLS estimates do not suffer from misspecification or biases due to failure of overlap. The effects of cooperative membership on total family income in both OLS and PS estimates are also very similar.

This study also estimated the effect estimates in the weighted sample applying design weights that make the samples representative of the full population in the 26 villages. No changes in the substantive significance of the income estimates compared to unweighted specifications were observed. In the weighted analyses, income estimates and standard errors are slightly higher than in the unweighted specifications. Theory suggests that estimates based on the unweighted sample will be more efficient if the effects of cooperative membership on income do not differ substantially across individuals. On the other hand, in the presence of heterogeneity in effects, estimates using the unweighted sample may not be representative of the full population.

## 5. Discussion

This study presents results predicting cooperative membership using almost all the explanatory variables noted in the prior literature. Some other variables were added due to their applicability in the Nepalese context. The results of this study differ from those in the literature regarding land size and credit access.

Consistent with the results of Fischer and Qaim [44] in Kenya, and Bernard and Spielman [5] in Ethiopia, this study found that smallholders are less likely to join agricultural cooperatives than are middle-size farmers, but, in contrast to their results, this study found larger landholders are more likely to join cooperatives. Earlier studies [43,45,46] found that larger farmers are likely to join cooperatives only if they are involved in cash crops like watermelon, sugarcane, cotton, etc. However, in Nepal, surveyed families in the study area did not grow cash crops due to small land size and relatively low prevailing prices for these crops. Given the small scale of most production in Nepal, even larger landholders operate on a very small scale relative to those in other counties.

The prior literature found inconclusive and inconsistent results on credit access, although none of the studies attempted to account for details regarding interest rate, loan size, and availability of alternative credit institutions. Results in Nepal are different from theirs because credit services are a point of focus of agricultural cooperatives. In Nepal, cooperatives provide credit at the neighborhood level for up to NPR 100,000 without collateral to farmer groups consisting of 5–10 members; in fact, more than 55 percent of cooperatives have provided loan amounts between NPR 50,000–100,000 to their members without collateral. Loan availability from cooperatives is the most common reason given for joining an agricultural cooperative, a response given by 80 percent of cooperative members. Farmers can obtain credit from cooperatives at an interest rate lower than the ADB and other formal financial institutions.

For many cooperatives studied in the literature, collection centers serve as a substitute for agricultural cooperative offices and even proxy for market access, but this was not the case in this study. More generally, cooperatives in Nepal were unlikely to provide marketing services for their members. Given this context, the distance to agricultural cooperatives is probably the best measure of accessibility to services such as the provision of loans, savings accounts, seed distribution, etc., that are available through the office of an agricultural cooperative. Most members who used the collection centers operated vegetable selling booths provided by collection centers. Although such sites were few, and they were available to both members and nonmembers acting as independent traders on a cash rent basis, members often received discounts. Ninety percent of cooperative officials indicated that their cooperatives did not have the necessary managerial capacity to offer marketing services, citing a variety of internal and external obstacles. They strongly argued that the government should take an active role in developing agricultural marketing infrastructure and technology in support of agricultural cooperatives.

Similar to the findings of this study, Nugusse et al. [48] in Ethiopia and Haque et al. [57] in Bangladesh found the probability of joining cooperative decreased with distance to a market. In Nepal, the distance to the district capital is probably not relevant because farmers usually sell cereal crops and vegetables to the nearest local market; then, the local trader sells those products to traders at the district capital. In addition, the local market is a popular meeting place for villagers to share information about daily affairs and buy essential goods. Farmers living near markets may be aware of the importance of agricultural cooperatives, which induces them to become members. There are few farmers' markets in the study area and most of those are near the district capital. Therefore, it is not surprising that we do not find that access to farmers' markets or the district capital influence cooperative membership.

Consistent with the findings of this study, the prior literature based on data from India, rural Tanzania, and Bangladesh suggested that people are more likely to join a group/cooperative that is homogenous because they have greater trust in members of their peer group or caste. It is possible that ethnic homogeneity increases the ability to resolve conflicts due to common culture and tradition. Furthermore, indigenous ethnic and Dalit caste members were previously excluded from mainstream politics in Nepal, so longstanding social barriers may limit their access to agricultural cooperatives. Determinants such as gender of the family head, total livestock units (TLU), household family size, and the number of household members active in the labor force did not affect cooperative membership. These findings of no effects are consistent with the literature.

The prior literature has generally found that being a member of an agricultural cooperative has a significant and positive impact on farm income and poverty reduction, particularly in rural Ethiopia, Kenya, Uganda, southern Rwanda, and China. These studies reported that cooperatives offer marketing and other production-related services to their members and, in some cases, cooperatives even operate at multiple levels of the food value chain, including production, processing, marketing, and distribution. As in Nepal, agricultural cooperatives in most African countries, in particular in Ghana, Kenya, Nigeria, Senegal, Uganda, and Rwanda, were quasi-cooperatives controlled by the governments up to 1990 [84,85]. During this period, cooperatives did not perform well in reducing the poverty of smallholders [86]. As in Nepal, the number of cooperatives grew quickly in these African countries after the 1990s due to changes in cooperative and economic policies [86]. Cooperatives in these countries have adopted a business-oriented approach and have followed cooperative principles and values [84].

Overall, our results are similar in many dimensions to those reported in the literature. Despite the similarities, it appears that agricultural cooperatives in Nepal are less developed than those in other countries. This is clearly reflected in their limited role in providing marketing services to their members, services that are often central to cooperatives elsewhere.

## 6. Conclusions and Implications

Policymakers around the world consider agricultural cooperatives as an institutional tool for poverty reduction of smallholders. The Nepalese government has invested in cooperative development for poverty alleviation through the commercialization of agriculture, especially since the 1990s. However, no empirical studies are available in Nepal, one of the least developed countries in the region, that address the role and potential scope of agricultural cooperatives in poverty reduction. This paper measures the role of agricultural cooperatives and provides strategies to support their role in improving the livelihoods of poor smallholders.

Cereal and vegetable crops were the focus of Nepal's agricultural cooperatives. This study's estimates imply that cooperative membership affects family net crop income and possibly total family income. The observed effects of cooperative membership may be due to the differences in crop production scale or the impact of cooperative membership on production activities. Insofar as agricultural cooperatives in Nepal increase the earnings of their members, our estimates of the size of this effect were smaller than suggested by studies in other countries.

Indeed, currently, Nepal's agricultural cooperatives appear to be focused on financial services such as savings and credit activities but are less concerned with agricultural production and engage in almost no marketing activities. It appears most of the members joined cooperatives in order to obtain financial services, which may be the easiest services for cooperatives to offer their members. These deficiencies in cooperative services may reduce the effects of cooperatives. Currently, it appears that most of the members joined cooperatives without understanding the broader scope of the cooperative approach to improving their livelihoods.

Many cooperative officials argued strongly in favor of an increase in the government's role in developing agricultural infrastructure and technology, thereby developing agricultural cooperatives; without such aid, they argued, cooperatives would not be able to compete in markets with products coming from India and China. Around 20 percent of cooperative managers in this study responded that they were considering converting into savings and credit cooperatives if the government would not provide greater support for the development of agricultural cooperatives. After all, they were primarily engaged in savings and credit services, notwithstanding their main stated objectives of increasing farm income through agricultural production and marketing.

Finally, this study concludes it will take some years for members to learn to work within the cooperative structure to achieve the common goal of economic gains and to reduce smallholders' poverty substantially. In addition, there should be a serious attempt from the government to assist agricultural development. Nepal is now a federal republic with three layers of government, and longstanding challenges to good governance are still substantial. What is required at this time is a new paradigm in governing formed by increasing the interconnectedness of various governmental units, civil society organizations, businesses, and cooperatives. Their overlapping roles can be difficult for government officials, but building inter-organization networks can address the challenges the nation currently faces. Networking can be built on the mission of government and civil society organizations—the improvement of the livelihood of the Nepalese people.

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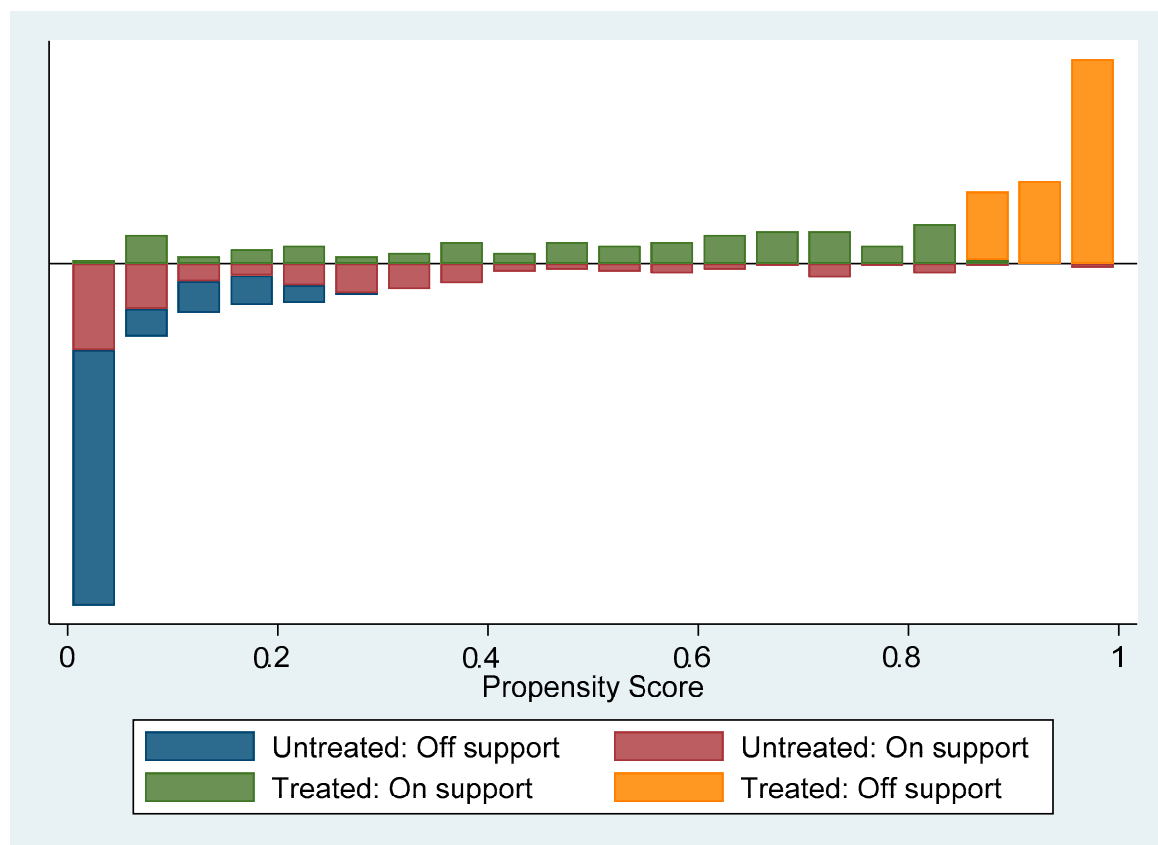
the project does not include activities that will influence or change a participant's social, behavioral, or educational outcomes or abilities.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** This study is based on primary data, which are available on request in anonymized form from the corresponding author. The data are not publicly available due to privacy considerations.

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## Appendix A



**Figure A1.** Common support region for cooperative members and non-members in a caliper matching with 0.6 bandwidth. Source: Authors' computation based on survey data.

**Table A1.** Balancing test results with unmatched and matching techniques.

Covariates	Unmatched			Caliper Matching		
	Member	Non-Member	Difference ( $p > t$ )	Member	Non-Member	Difference ( $p > t$ )
Years of education of family head	7.84	5.64	0.000	7.13	6.29	0.245
Gender of the family head (1 = M)	0.58	0.55	0.472	0.55	0.55	0.933
Household family size (number)	4.94	4.67	0.035	4.82	4.88	0.818
Ethnicity of the family (1 = general)	0.74	0.53	0.000	0.79	0.76	0.742
Ethnicity of neighborhood (1 = Homo)	0.88	0.60	0.000	0.79	0.76	0.565
Land size in hectares	0.50	0.28	0.000	0.32	0.33	0.777
Distance to agricultural cooperatives (km)	0.77	1.64	0.000	1.07	1.20	0.271
Distance to the nearest local market (km)	2.73	3.77	0.000	2.97	3.09	0.603



Table A1. Cont.

Covariates	Unmatched			Caliper Matching		
	Member	Non-Member	Difference ( $p > t$ )	Member	Non-Member	Difference ( $p > t$ )
Distance to motorable road (km)	0.14	0.42	0.000	0.20	0.18	0.571
Gardi (omitted dummy)						
Piple (1 = yes)	0.03	0.03	0.895	0.06	0.08	0.620
Bhandra (1=yes)	0.03	0.03	0.754	0.03	0.03	0.889
Birendranagar (1 = yes)	0.03	0.02	0.480	0.04	0.05	0.608
Kathar (1 = yes)	0.04	0.01	0.003	0.03	0.01	0.371
Kumrose (1 = yes)	0.03	0.01	0.248	0.03	0.02	1.746
Chainpur (1 = yes)	0.04	0.06	0.438	0.02	0.02	0.910
Khairahani (1 = yes)	0.04	0.03	0.895	0.05	0.05	1.856
Pithuwa (1 = yes)	0.04	0.03	0.895	0.05	0.08	0.426
Padampur (1 = yes)	0.04	0.06	0.438	0.05	0.04	0.866
Jutpani (1 = yes)	0.04	0.03	0.895	0.06	0.04	0.641
Mangalpur (1 = yes)	0.05	0.06	0.613	0.04	0.05	0.608
Fulbari (1 = yes)	0.05	0.06	0.613	0.05	0.03	0.577
Sardanagar (1 = yes)	0.05	0.06	0.613	0.05	0.05	0.856
Gunjanagar (1 = yes)	0.04	0.03	0.536	0.05	0.04	0.866
Megghauli (1 = yes)	0.04	0.03	0.663	0.03	0.03	0.889
Sukranagar (1 = yes)	0.05	0.03	0.468	0.04	0.02	0.492
Parbatipur (1 = yes)	0.05	0.06	0.613	0.01	0.01	0.937
Jagatpur (1 = yes)	0.04	0.06	0.438	0.04	0.04	0.872
Patihani (1 = yes)	0.04	0.03	0.895	0.02	0.02	0.910
Sibanagar (1 = yes)	0.03	0.03	0.895	0.03	0.04	0.593
Gitanagar (1 = yes)	0.03	0.03	0.895	0.06	0.03	0.396
Ayodhyapuri (1 = yes)	0.03	0.03	0.895	0.01	0.01	0.937
Kalyanpur (1 = yes)	0.04	0.05	0.438	0.01	0.02	0.498
Bagoda (1 = yes)	0.03	0.04	0.895	0.05	0.34	0.866
Observation		545.00			545.00	
Median bias		6.20			10.70	
Mean bias		19.10			17.00	
Pseudo R-Squared		0.535			0.041	
p-value of LR		0.000			1.000	

Source: Authors' computation based on survey data.

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