

Article

Identifying Credit Accessibility Mechanisms for Conservation Agriculture Farmers in Cambodia

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Abstract: As the expected cost of conservation agriculture (CA) inputs becomes an issue for farmers, financial institutions (FIs) play an essential role in promoting CA, a set of agricultural management practices with multiple positive effects. This research aimed to determine influencing factors, to rank challenges, and identify mechanisms for farmers to access agricultural credit for adoption of CA management practices in Cambodia. It was administered by conducting a survey of 242 randomly selected households for face-to-face interviews and conducting key informant interviews from purposive samples of 28 participants in Battambang and Preah Vihear provinces. The results indicated that influencing factors, including the family, adult labor and total farm size, had a positive relationship with farmers' accessibility to agricultural credit, whereas age was negative. However, education year, farm size for main crops, on-farm income and farm experience were not significantly associated. High interest rates were the significant first-order challenge ranked, followed by document process complication, limited agricultural credit information, limited collateral security and a few other challenges. Support and improved process mechanisms to enhance credit accessibility are required to engage with multiple stakeholders, including farmers, FIs, non-government organizations (NGOs) and government officers. There has been a reduction in agricultural credit interest rates and incentives for importing CA inputs by the government, while provision of information support for agribusiness plans by NGOs which have implemented development project activities were considered as the main support mechanism. An improved process mechanism at the farmers' level needs to include access to credit with low interest rates and a straightforward documentation process, whereas the FI level requires a business plan for lending decisions. It is evident that high lending rates hinder access to agricultural credit and the improvement of support and improved process mechanisms are necessary to better promote CA practices among farmers in Cambodia.

Keywords: conservation agriculture practices; financial institutions; agricultural credit accessibility; support mechanism; process mechanism



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1. Introduction

Conservation agriculture (CA) has displayed agronomic benefits in enhancing soil fertility, greater resilience to global warming and increased yield by around 20% or more [1–3]. CA practices consist of three major principles: (1) reducing mechanical soil disturbance, (2) incorporating organic materials with a 30% crop residue from cover crops, and (3) implementing crop diversification or rotation [4]. In Cambodia, the agricultural land area was 6,099,100 ha (around 34% of the total land area) in 2021 but approximately 7250 ha or only around 0.12% is managed following either full or partial CA principles [5,6]. The expansion

of CA has been slow due to the absence of targeted policies and strategies to effectively promote it [6]. The land areas under CA practices have been estimated to increase a little more quickly if farmers could invest in CA inputs in the early stages.

As the expected cost of CA inputs becomes a challenge for farmers interested in practicing CA, agricultural credit accessibility could impact a higher adoption rate [7,8]. Thus, financial institutions (FIs) are crucial in promoting these practices by providing agricultural credit with special interest rates [9,10]. FIs are banks and microfinance institutions (MFIs) that provide agricultural credit to farmers [11–15]. FIs could contribute to address these challenges to farmers; however, high lending interest rates and cumbersome documentation processes pose challenges for CA farmers seeking access to agricultural credit [16]. Based on the National Bank of Cambodia (NBC), MFI credit contributed to supporting the agricultural sector by around 18% between 2021 and 2022, which declined by 1.3% compared to the previous year [15]. The interest rate ceiling was found to be a challenge for lending when accessing credit [17] and the rate, at a ceiling of 18% annually or roughly 1.5% per month in 2017, became one of the major causes that make it difficult for farmers to access credit [18–20]. The NBC reported that, with a regulatory interest rate ceiling of 18%, the average MFI annual interest rate was 17.6% for loans in Khmer riel (KHR) and 16.6% in U.S Dollars (USD), both relatively higher than those in 2022 [20,21]. Recent annual interest rates have nearly reached this ceiling, which provokes a significant challenge to credit accessibility for farmers. In comparison with other countries in the region, the annual interest rates of the State Bank of Vietnam changed from 9% to 15% in 2011 and the rates gradually decreased to 4% in 2020. A similar low rate was found in Thailand, as the World Bank [22] reported that the interest rates for preparing land reduced from 4.9% in 2019 to 3.1% in 2022. In Malaysia, the Public Islamic Bank of Malaysia offered a higher interest rate to customers, reaching 10.6% in 2020 [23,24], and Indonesia's lending rates reduced from 10.4% to 8.5% in the same period. MFIs charged a higher interest rate, at around 1% per year on average, than banks for providing credit [25–27]. However, the interest rates offered in these countries are still lower than those in Cambodia.

Numerous previous studies have indicated that credit processes include farming households, social capital, and credit supplies [28–31]. Agricultural credit is impacted by the credit process or credit flow. Farmers who need credit for agricultural investments could not access it due to limited information on how to acquire the credit [32–36]. FIs can contribute to a positive impact on agricultural production improvement, but farmers still face difficulties in accessing credit due to the limited number of FIs willing to channel credit [37–40]. Various mechanisms have been identified to encourage farmers to access credit, including support from policymakers by launching low-interest agricultural credit, taxation for agricultural inputs, and implementation of an inclusive financial system [41,42]. Agricultural credit would receive a boost from low interest rates, robust agricultural credit guarantees, adequate agricultural budget allocation and spending, and effective monitoring of banks' credit utilization [38]. Accessing credit by an easy process and accessible information regarding how to acquire this credit, in contrast to other types of credit, could encourage farmers to secure agricultural credit [40,43].

Accessing credit for practicing and promoting CA is influenced by various factors related to farmer characteristics and socioeconomic status, such as age, education level, family labor, total farm size, off-farm income, distance of FIs, credit length, credit processing or flows, credit interest rate, and credit size [44–48]. Specifically, age, household ownership assets and agricultural specialty all impact household income, influencing agricultural credit accessibility [44,45,49,50]. Off-farm employment has significantly impacted agricultural reform, promoted farmer entrepreneurship and increased self-employment, and demonstrated significant positive marginal effect on farm labor. Farm employment illustrates a significant component in farm production and agricultural adoption increases the probability by 1.8% per household [16,44,51]. There are also other factors contributing to access to credit for implementing CA, including limited concentration, farming experience, farm size for main crops and on-farm income. High lending rates, repayment methods,

collateral requirements, document processing and credit processing time affect the ability to access credit [52–54] and are proven to be agricultural credit challenges for farmers. For instance, costly interest rates have been discovered to be a significant factor and the complicated application process for accessing credit greatly impacts how smallholders use institutional credit, while the biggest challenge preventing the use of agricultural credit is the limited structure of the credit process [55–62]. Limited information on credit, owned production land, monthly income, and distance to lenders also pose challenges to farmers' credit accessibility. Several previous studies focused on the quantitative approach to design research but there is limited concentration on a mixed-method approach for accessing agricultural credit to promote CA management practices (Appendix A, Table A1).

In Cambodia, various challenges to promoting CA are identified, including mechanization, accessing markets, knowledge dissemination, and collaboration between farmers and other relevant stakeholders [6,63]. The major challenge for CA management practices is the anticipated cost of CA inputs for agricultural machinery and cover crops. Depending on machinery types, tractor prices range from 1748 USD (for a 19-horsepower Oggun tractor with a single-row Morrison seeder) to 2490 USD (for a 75-horsepower used tractor with a four-row Brazilian seeder) per unit, whereas the cover crop cost is around 50 USD per ha [6,41,63–65]. The average cost of CA inputs is higher than Cambodia's Gross Domestic Product per capita of 1759.6 USD per year in 2022, and 75% of Cambodia's farmers (a total of 6.8 million) are categorized as smallholder farmers with less than two hectares of land per household [66–68]. Several studies have suggested several challenges but our research focused on the expected cost of CA inputs, involving agricultural machinery and cover crops. Therefore, FIs become priority stakeholders in addressing farmers' challenges in practicing CA. Factors such as farmer demographic characteristics, the credit process, high interest rates, complicated document processing, total farm size, limited information support and farmers' knowledge have been shown as influencing factors in accessing credit for CA management practices in Cambodia [69–72].

There is still a paucity of consideration of influencing factors and ranking of challenges, including farm size for main crops, on-farm income, farmer experience, and information on credit and guarantors, which may influence farmers' decisions to access credit for a higher adoption rate of CA management practices. Recent research has mainly emphasized the agricultural credit process but determining appropriate mechanisms for accessing credit or improving credit processes for promoting these practices is insufficiently given attention to. It is also found that influencing factors and credit processes impact farmers' access to agricultural credit. In addition, only limited research has concentrated on the credit process and factors influencing credit by using a mixed-method design. By addressing this knowledge gap, we can better understand the primary factors influencing challenges to and mechanisms of agricultural credit accessibility. Therefore, this study was carried out to determine influencing factors, rank challenges, and identify mechanisms for farmers to access agricultural credit to practice CA in Cambodia.

2. Materials and Methods

2.1. Description of Study Sites

Two provinces, Battambang (BTB) and Preah Vihear (PHV), in Cambodia were purposely selected for this research (Figure 1) based on ongoing activities to promote adoption of CA practices among farmers by involving the private sector in an agricultural extension model. To enhance collaboration between the private sector and CA farmers, the Royal Government of Cambodia, through the Department of Extension for Agriculture, Forestry and Fisheries in partnership with relevant stakeholders, initiated the Metkasekor (MK) Agricultural Extension Model in 2018 (MK means "farmers' friend" in Khmer). The MK model, an early adopter-led extension service model, focuses on opening the market for private sector investment in conservation agriculture and sustainable intensification by disseminating and promoting these practices via government agents and the private sector to smallholder farmers in Cambodia. The six stages of the MK model guidelines include (1)

identification of potential agriculture cooperatives, farmers and service providers, (2) demanding creation meetings with the actors, (3) field showcase by early adopter farmers, (4) commercial demonstration led by the private sector, (5) an annual meeting to review progress of the model and (6) promotional meetings to enlarge private sector pool [73]. For this study, CA farmers refer to farmers who attended CA training conducted by technical teams for CA promotion, and the participant list was used.

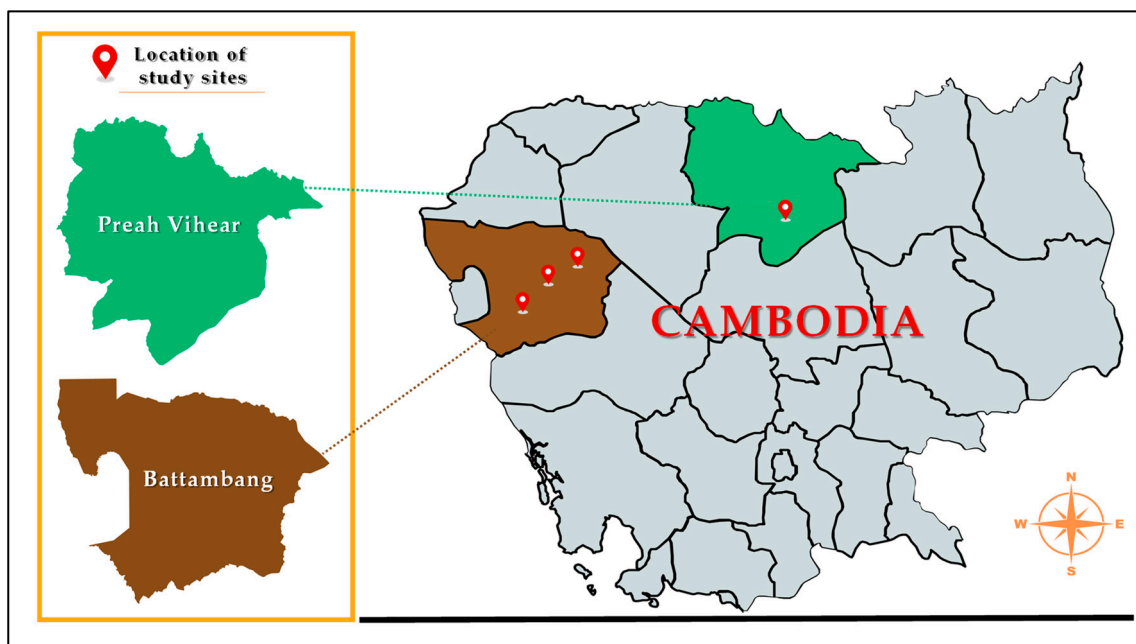


Figure 1. The location map of study sites.

The survey participants in BTB were selected for three districts: Rathank Modul, Banan, and Sangke. Only one district, Rovieng, in PHV was chosen for the survey since the MK’s activities were only recently implemented in this district in 2021. A total of 154 households participated in the CA training program in BTB and 88 households in PHV, totaling 242 households. The survey sample of CA farmers included 179 households (74%) with access to credit and 63 households (26%) without access to credit (Table 1).

Table 1. Summary of sample size and study areas.

Data Collection Methods	Provinces		Total (Household)	Access to Credit	
	BTB	PHV		Yes (%)	No (%)
Survey	154	88	242	179 (74)	63 (26)
KIIs	14	14	28	-	-
Total	168	102	270	179	63

Farmers’ access to agricultural credit with banks was equal to MFIs ($n = 80$).

Key informant interviews (KIIs) were conducted with two groups, one from BTB and another from PHV, equally consisting of 14 participants, for in-depth interviews taking around 35 min (Table 1). The demographics of participants included farmers (CA and non-CA), private sector (service providers (SPs), FIs, and technical staff of cover crops, CCs), government officers (Provincial Department of Agriculture, Forestry and Fisheries (PDAFF)), and village chiefs and NGOs engaging in activities related to the MK model.

2.2. Data Collection

The data collection followed five steps: (1) literature review, (2) questionnaire design, (3) sampling method, (4) data collection, and (5) data analysis (Figure 2). The questionnaire

captured household socioeconomic status and challenges of accessing credit. A 5-point Likert scale was used to measure the challenges of accessing credit (1 = strongly disagree and 5 = strongly agree). Comprehensive quantitative data through face-to-face survey interviews with 242 CA farmers randomly selected from a list of farmers participating in the CA training program facilitated by the MK model and the qualitative data through the KIIs with 28 participants from both provinces using a purposive sample selection process [74,75] were conducted in 2023. Heads of households were identified and a questionnaire was administered through a purposive sampling method.

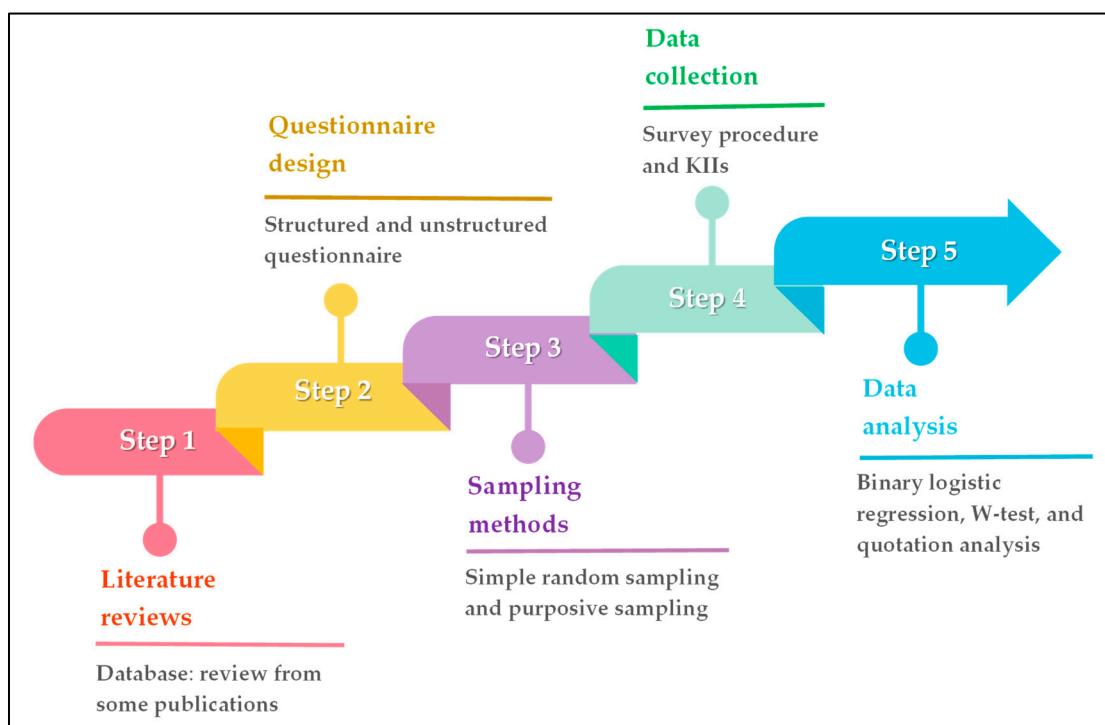


Figure 2. Flow of research methodology.

The questionnaire pre-test was conducted to check the validity of question items, with 10 responses that were not counted in the research information collection in the survey instrument. The data were gathered with consideration for population size and precision level. The final questionnaire was revised based on the validity from the pre-test results. In Equation (1), the sample size was calculated by using Krejcie and Morgan [76]. The sample size required is (n) , Z^2 is Z value or test of statistics for confidence levels, and 1.96 equals 95%, N is the population of CA farmers from participants’ lists (BTB = 190 households and PHV = 80 households), P is population proportion ($P = 50%$ equal 0.50, since this would provide maximum sample size), and e is margin of error of proportion ($e = 5%$ equals 0.05). The sample size of this research comprised 242 CA farmers, including a reserved sample of 25%, equal to 49 samples [77]. Approximately 90% of respondents were included in the present study, with the formulation used to calculate the number of respondents as $n/N \times 100$, where n equals 242 households and N equals 270 households. CA farmers who had access to formal agricultural credit totaled 160 ($n = 160$).

$$n = \frac{Z^2 NP(1 - P)}{e^2(N - 1) + Z^2 P(1 - P)} \tag{1}$$

2.3. Variables and Expectations

The statistical study was based on a binary logistic regression (BLR) respondent variable that indicates whether CA farmers had access to agricultural credit for CA manage-

ment practices. An explanatory variable indicates farmers' socioeconomic status, including age, total land size, family adult labor, education year, farm experience, on-farm income and farm size for main crops. The empirical model contained farmers' demographic characteristics (i.e., age, education level, family adult labor, farm size for main crops and on-farm income), which may hamper farmers' access to agricultural credit. This research concentrated on socioeconomic aspects that influenced farmers, and challenges to access to agricultural credit for CA management practices.

2.4. Data Analysis

Qualitative and quantitative data were collected by a mixed-method design and descriptive statistics were used as well as inferential analyses to evaluate influence factors of credit availability and challenges of obtaining credit for practicing CA. BLR was used to study influencing factors on farmers' credit accessibility with FIs and Kendall's concordance coefficient (*W*-test) employed to rank challenges, while in-depth interviews were used to determine mechanisms for accessing credit. The R-program (version R.4.3.2) was used to perform BLR and Kendall's *W*-tests, whereas qualitative data were used for quotation analysis.

2.4.1. Binary Logistic Regression Model

Assuming a dependent variable is a dummy, BLR was used [78,79]. BLR was explored to clarify connections between the dummy variable (1, 0), indicating whether farmers possess the ability to obtain financing, and there is a continuous variable that indicates if farmers are exposed to finance. The BLR model was applied to analyze factors influencing access to agricultural credit for practicing CA, which was adapted from [78–80]. This study's dependent variable were farmers who accessed credit with a value of 1, and of 0 if farmers were without credit access. The logistic model predicted the dummy (1, 0) dependent variable. The likelihood that farmers would be able to obtain credit was predicted by odds ($Y = 1$); i.e., the probability ratio that Y equals 1 to the probability that Y is different than 1 (Equation (2)):

$$\text{Odd} (Y = 1) = \frac{P(Y = 1)}{1 - P(Y = 1)} \quad (2)$$

The BLR model is described below in Equation (3), with the natural log of odds provided by logit (Y);

$$\ln \left(\frac{P(Y_i = 1)}{1 - P(Y_i = 1)} \right) = \log \text{Odds} = \text{Logit} (Y) \quad (3)$$

This was explained as Equation (4):

$$\text{Logit}(Y = 1) = \alpha + \sum \beta_1 X_1 + \sum \beta_2 X_2 + \sum \beta_3 X_3 + \dots + \sum \beta_n X_n + \varepsilon \quad (4)$$

Y is the dependent variable (credit accessibility), with 1 = farmers with access to credit and 0 = farmers without access to credit; α = intercept; $\beta_1, \beta_2, \dots, \beta_n$ = independent variable coefficients; X_1, X_2, \dots, X_n = independent variables, $P(p)$ = farmers' chances of obtaining credit (probability); $1 - P$ = likelihood that farmers are without access to credit (probability); and \ln = natural log. Explanatory variables of BLR model (X_1 = age (age), X_2 = education (edu), X_3 = family adults' labor (fal), X_4 = farm size for main crop (fsmc), X_5 = total farm size (tfs), X_6 = farm experience (fexp), X_7 = on-farm income (ofi)), model of BLR for CA farmers to access credit in research, expressed in the following form as Equation (5):

$$\text{Logit} (\text{access to credit}) = \ln \left(\frac{P}{1 - P} \right) = \alpha + \beta_1 \text{age} + \beta_2 \text{edu} + \beta_3 \text{fal} + \beta_4 \text{fsmc} + \beta_5 \text{tfs} + \beta_6 \text{fexp} + \beta_7 \text{ofi} \quad (5)$$

The ratio of log-likelihood was utilized to evaluate overall importance of BLR [79]. The inspection of a level of multicollinearity between dependent variables was conducted by

variance inflation factors (VIFs). The Akaike information criterion (AIC) was used to check model fitness and this is determined using the number of parameters and the likelihoods of continuous raw outputs [81]. Given the independent factors in a question, classification accuracy revealed the model's suitability for forecasting credit availability. BLR consisted of explanatory factors derived from survey literature and the model showed the importance of these variables in agricultural credit accessibility.

2.4.2. Kendall's W-Test

Kendall rank correlation was performed to see if there were any commonalities in data ordering when ranked by the mean [82,83]. Using data sets, Kendall's coefficient is based on a couple of patterns of concordance and discordance; correlation determines the link's tensile strength. This is not the case when using pairs of observations and Kendall's correlation coefficient. This demonstrates that given respondents' unanimity, $W = 1$ if each farmer ranked the list of concerns in the same order; $W = 0$ if there was no consensus among interviewers; hence, the respondents' answers were chosen randomly [84]. The following equation was used to calculate Kendall's statistical test Equation (6):

$$W = \frac{12S}{p^2(n^3 - n) - PT} \quad (6)$$

The average of rank sums over squares is used to calculate S . In this way, the following can be deduced from Kendall's W -statistical figure (Equation (7)):

$$S = \sum_{i=1}^N (R_i - R)^2 \quad (7)$$

where n = demarcated of concern number, p quantified of judges' number, and T has developed a coefficient to break ties in ranks. The definition of W -statistic is an evaluation of rows and sums of rankings divided by R_i 's variance by widest range of variance values (R). When CA farmers agree, this might be feasible; hence, $0 \leq W \leq 1$. This model was used to rank farmers' challenges to access agricultural credit for CA management practices. The ranking was from 1–11, with 1 being the most essential variable and 11 being the least important variable. The low mean rank indicates that the variable has a more potential challenge for agricultural credit accessibility.

2.4.3. Key Informant Interview

Key informants were selected based on current involvement with CA management practices to identify problems, solutions and mechanisms (PSM) for engaging FIs with CA farmers (Figure 3). Qualitative interviews were conducted with 28 participants, representatives from both provinces, and the interviews were carried out with ten participants from the government, six from the private sector, four from NGOs and eight farmers. Seven key informant questions (7KIQs) were conducted to collect qualitative data from participants, addressing problems and mechanisms in accessing agricultural credit (Figure 3). Open-ended questions were used to collect qualitative data to identify problems and solutions from multiple participants. This method aimed to manage issues and provide solutions and mechanisms from multiple stakeholders. Unstructured questions were conducted to collect data from participants. Participants were invited to follow research objectives—information provided to participants including topic, purpose, place, time and date. Quotation analysis and descriptive statistics were used to analyze the qualitative data. Key findings from respondents were noted during the interviews. All documents from the interviews were considered for the data analysis process on the same day they were collected. Coding was used to replace the names of respondents, which helped manage and organize the data that were analyzed manually. Key topics of this research were used for quotation analysis by

using summary tables from stakeholders' responses. General information for respondents including age and gender is presented with descriptive statistics.

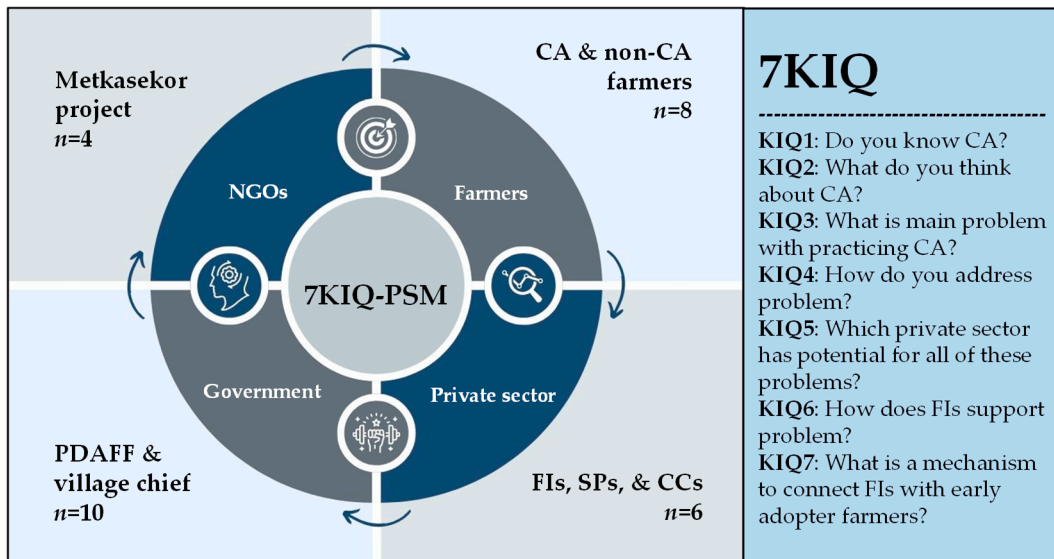


Figure 3. The use of KII to collect qualitative data from stakeholders by employing 7KIQ-PSM. CA: conservation agriculture; FIs: financial institutions; SPs: service providers; CCs: cover crops (technical staff); PDAFF: Provincial Department of Agriculture, Forestry and Fisheries; KIQ: key informant question; PSM: problems, solutions and mechanisms.

Respondent coding was used to report results of key informants from both provinces, with BTB codes KII01-KII14 and PHV codes KII15-KII28 (Figure 4).

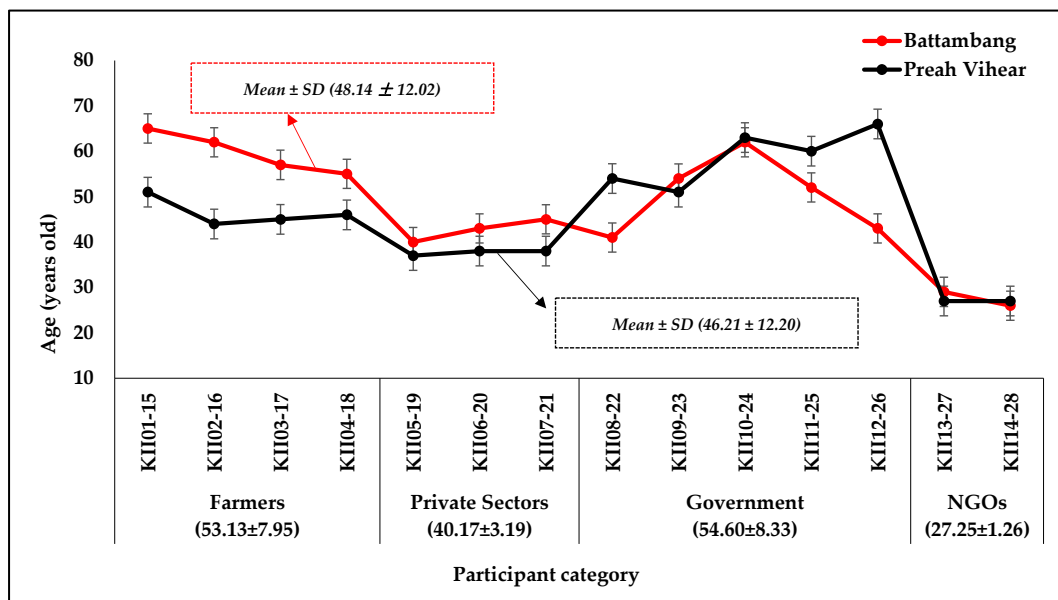


Figure 4. KII findings for five age groups and four categories of participants.

Participants' age was separated into five groups: 23–30 years old (14.29%), 31–40 years old (14.29%), 41–50 years old (25%), 51–60 years old (28.57%), and greater than 60 years old (17.86%). A proportion of 93% of the participants were male and 7% were female, with the average age of categories (years old) as follows: farmers (53.13), private sector (40.17), government (54.60), and NGOs (27.25). On average, the NGO respondents were younger than other groups and government officers were the oldest group of respondents among

in-depth interviews (Figure 4). The results included descriptive statistics for explanatory variables used in the analysis of CA farmers’ access to agricultural credit, both with and without access to credit (Table 2). Farmers who accessed credit were separated into formal credit ($n = 160$) and informal credit ($n = 28$). The demographic results revealed that farmers with access to formal credit and informal credit were on average 47 years of age with previous farming experience of approximately 22 years.

Table 2. Descriptive statistics of farmers’ characteristics ($n = 242$).

Independent Variables	Unit of Measurement	With Access ($n = 179$)		Without Access ($n = 63$)
		Formal ($n = 160$) ^a	Informal ($n = 28$) ^b	
		$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Age	Householder age (years)	47.28 ± 11.50	47.46 ± 11.16	55.40 ± 12.10
Education	Education year (years)	5.27 ± 3.29	4.53 ± 3.22	5.68 ± 3.86
Family adult labor	Household members (num)	3.25 ± 1.27	3.11 ± 1.62	2.70 ± 1.33
Farm size for main crops	Only main crops (ha)	4.75 ± 5.43	3.84 ± 3.00	5.02 ± 3.85
Total farm size	Total farm size (ha)	7.33 ± 7.98	4.86 ± 3.66	5.93 ± 7.28
Farm experience	Number of years (years)	21.93 ± 11.29	22.92 ± 13.27	28.50 ± 13.90
On-farm income	Income per year (USD)	7768.84 ± 13,085.72	6474.40 ± 7820.51	6845 ± 8186

^a Farmers with access to formal credit source; ^b Farmers with access to informal credit source; Farmers with access to both credit sources ($n = 9$); SD: Standard deviation.

On average, the age of the farmers without access to credit was 55.40 years old and their farming experience was 28.50 years (Table 2). The level of education for farmers with access to formal credit, with access to informal credit, and without access to credit was generally at the primary level. The average farm size for main crops was 4.75 ha and 3.84 ha for farmers with access to formal and informal credit, respectively. Farmers without access to credit had an average farm size of 5.02 ha of main crops. The average total farm size was 7.33 ha for farmers with access to formal credit, 4.86 ha for those with access to informal credit and 5.93 ha for those without access to agricultural credit. The mean number of working adults in the family households with access to formal credit was 3.25, 3.11 for informal credit and 2.70 for households without access to credit. The average annual on-farm income was 7768.84 USD, 6474.40 USD and 6845 USD for farmers with access to formal credit, informal credit and without access to credit, respectively.

3. Results

3.1. Influencing Factors on Agricultural Credit Accessibility for CA Management Practices

The BLR model indicated that age, family adult labor and total farm size were significantly related to farmers’ access to agricultural credit for CA management practices at $p < 0.01$ (Table 3). Age had a negative impact at $p < 0.01$, with an odds ratio of 0.950, indicating a less likely factor, and family adult labor had a positive impact at $p < 0.01$, with an odds ratio of 1.424, making it a more likely factor affecting credit accessibility. Similar to family adult labor, the total farm size also had a positive impact at $p < 0.05$, with an odds ratio of 1.189. VIF variables ranged between 1 and 5, indicating that there was a moderate correlation between the given predictor variables and the other predictor variables in the model. AIC and Mallows’ Cp were the standard for assessing a model’s accuracy [85]. The model deemed best has the lowest Delta.AICc value (Delta.AICc = 0.00). Models with Delta.AICc values less than 2 are considered reliable [86,87]. Our research found that for AICc = 263.77, Delta.AICc = 0.00, AICcwt = 0.29, AIC = 263.08, and Mallows’ Cp = 8.00, the model is the optimal model (Appendix A, Table A2).

Table 3. Influencing factors on access to agricultural credit using a binary logistic regression model ($n = 242$).

Variables	Coefficients	S.E.	Z Value	Pr (>z)	Odds	VIF
Age	−0.050 **	0.018	−2.801	0.005	0.950	1.699
Education year	−0.078	0.054	−1.427	0.153	0.925	1.182
Family adult labor	0.353 **	0.135	2.620	0.008	1.424	1.035
Farm size for main crops	−0.105	0.099	−1.056	0.290	0.899	4.219
Total farm size	0.175 *	0.081	2.137	0.032	1.189	3.900
On-farm income	−0.000	0.000	−1.092	0.274	0.999	1.259
Farm experience	−0.021	0.016	−1.288	0.197	0.979	1.629
Constant	3.151 **	0.999	3.154	0.001	23.359	-

* significant at 5% level ($p < 0.05$), and ** significant at 1% level ($p < 0.01$).

3.2. The Ranking of Challenges to Access to Agricultural Credit for CA Management Practices

CA farmers faced challenges accessing credit and the significant difference in Kendall's concordance tests at $p < 0.01$ implied a concordance in the prioritization of accessibility by respondents (Table 4). High interest rates were ranked number one as a potential challenge facing credit accessibility. This was followed by document process complication and limited agricultural credit information. The fourth-ranked challenge was limited collateral security and the other challenges were in the order of asset status, mode of repayment, limited guarantor, distance from the lender, monthly income, and owned productive land. Another issue included total landholding with an average rank of 6.91.

Table 4. A challenge ranking of agricultural credit accessibility for CA management practices.

Items	Average Rank	SD	Ranking
High interest rates	4.20	1.04	1
Document process complication	4.86	1.17	2
Limited agricultural credit information	5.41	1.17	3
Limited collateral security	6.09	1.27	4
Asset status	6.22	1.09	5
Mode of repayment	6.23	1.02	6
Limited guarantor	6.34	1.20	7
Distance from lenders	6.39	1.42	8
Monthly income	6.66	1.06	9
Owned production land	6.70	1.01	10
Total landholding	6.91	1.00	11
n	160		
Kendall's W^c	0.09 **		
Chi-square	151.49		
df	10		
p value	0.000		

The ranking was classified from 1 to 11, with 1 being the most significant in importance ranking, and 11 being the least significant ranking; ^c Kendall's coefficient of concordance; 5-point Likert scale was used as measure, ** significant at 1% level ($p < 0.01$).

The number of CA farmers accessing agricultural credit from banks was equal to MFIs ($n = 80$). The primary source of credit from banks was ACLEDA Bank Plc (65%), while the main credit source from MFIs was Prasac Microfinance Institution Plc (37%) (newly named KB Prasac Bank Plc) (Figure 5). The annual interest rates offered to smallholder farmers by the Agricultural and Rural Development Bank (ARDB), the government-owned bank established in 1998, ranged from 8% to 11% [88] which was the lowest interest rate compared to other banks and MFIs. However, only 1% of farmers are interested in accessing credit with this bank.

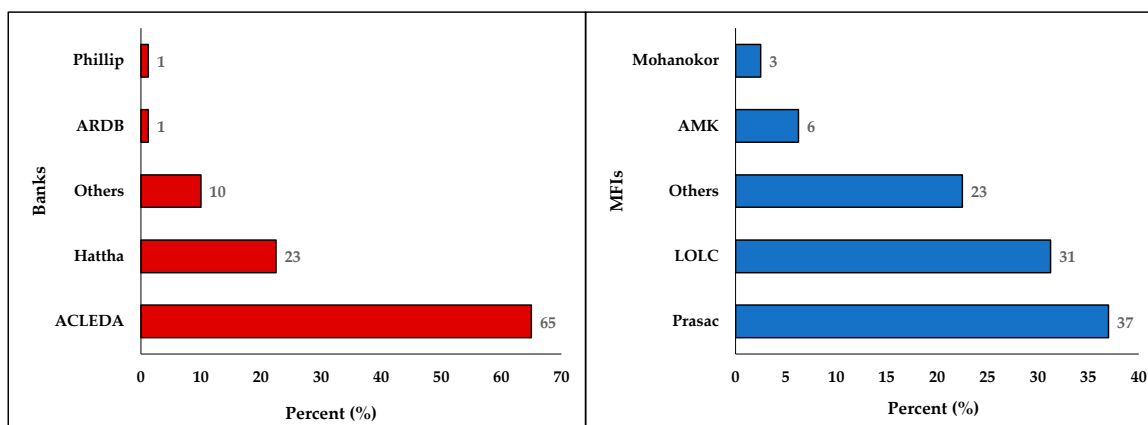


Figure 5. FI credit sources for CA farmers to access agricultural credit.

3.3. Mechanisms to Access Agricultural Credit for CA Management Practices

Key informant interviews were conducted with participants with four types of actors: farmers, government representatives, NGOs and private sector (Appendix A, Table A3). The results from key informants are discussed here and they focus on the central subject of how to gain credit for CA management practices (Figure 6). Most actors were aware of CA and believed in its multiple positive impacts on environment, soil fertility and yield increase. However, the expected cost of CA inputs was the primary challenge for practicing CA, including land preparation, agricultural machinery, and cover crops. Credit access was important for promoting CA, so FIs contributed an important role in this problem-solving. Actors specified three important challenges: costly interest rates, complicated document processes and agricultural credit information. Meanwhile, financial officers raised challenges related to business plans, asset status, monthly income, collateral security, and landholding. Accessing credit with high interest rates was found to be the major challenge, followed by the complicated documentation process, and limited information in accessing credit from FIs. The ranking of FIs was determined by factors including limited collateral security, asset status, repayment mode, limited guarantor, distance from lenders, monthly income, owned productive land and total landholding. Multiple key informants stated that:

“The expected cost of CA inputs is a major issue for practicing CA in our community. The inputs include agricultural machinery, cover crops and land preparation. If we have access to credit, high interest rates are a challenge as well as credit information and document processes required by the FIs. We cannot access credit without credit information: interest rates, maximum and minimum loan amount and the document process. If we do not have the information, it will affect the process of documenting the FI’s requirements for accessing credit (Appendix A, Table A3)”.

The private sector respondents provided some challenges in providing agricultural credit, including agribusiness plans, farm size, monthly income, family adult labor and age. Farmers’ knowledge impacted preparation of their business plans in accessing credit for practicing CA. Monthly income was also one of the influencing factors for credit accessibility. Key interviews from FIs revealed that:

“The primary obstacles to providing credit include business plans, farm size and monthly income. Limited farmers’ knowledge is an issue for credit accessibility. Most farmers cannot find information about agricultural credit by using Tonlesap app and the materials provided to promote CA is limited (Appendix A, Table A3) (KI07) (KI21)”.

Results from the qualitative interviews found that FIs played an essential role in problem-solving to promote CA management practices. Accessing credit with low interest

rates and providing an easy documentation process and information support were better solutions for farmers. Subsidies from the government and development programs of NGOs might serve as a positive influencing factor. Farmer participants confirmed that:

“FIs should provide agricultural credit with lower interest rates to encourage farmers to access it, aiming to practice CA. The government and development programs of NGOs should provide subsidies for CA management practices, for example, land preparation and cover crops at 50%. This means that 50% would be subsidized by the government and NGOs while the remaining 50% would be paid by farmers (Appendix A, Table A3)”.

“FIs would help provide agricultural credit to farmers who need them for CA management practices. Various actors including farmers, FIs and NGOs involved in project implementation should be engaged to address these issues. NGOs through their development programs should provide subsidies to all activities of farmers practicing CA, with 50% support allocated to farmers. Information support for business plans should be provided by NGOs. Policymakers should consider supporting farmers to improve agricultural credit by reducing the annual interest rates to lower than 17.6%. Government incentives, to give an example, and taxation support for agricultural input imports, should also be considered. This would impact the anticipated cost of CA inputs for agricultural machinery and cover crops (Appendix A, Table A3)”.

Key stakeholders from FIs stated that:

“To address issues, farmers should know how to create business plans, for instance, determining main crop types and required land size for crop production and estimating other expenses. Farmers should use agricultural credit for their intended purposes. In the business plan, they may allocate credit for agriculture (purchasing crop varieties), but afterward, farmers would divert it to another activity like buying a motorbike or phone. The solution provided by other financial officers included promoting CA through social media platforms like Facebook pages and YouTube. The Tonlesap app should be directly provided to farmers by FIs’ staff to support them to find donors for promoting CA through the app (Appendix A, Table A3)”.

A combination of support and improved process mechanisms in accessing agricultural credit from key informants was demonstrated in Figure 6. The support mechanism was provided by stakeholders including offering credit with low interest rates, launching policy support, simplifying documentation for credit accessibility and providing information support for farmers who want to access credit for practicing CA. Stakeholders pointed out that:

“To build mechanisms to engage FIs to promote CA production systems, FIs should provide a low interest rate for agricultural credit and credit information should be broadly shared with farmers who need credit for agriculture related activities. Farmers should understand how to create business plans required by FIs for credit accessibility (Appendix A, Table A3) (KI01) (KI02)”.

“Mechanisms for FIs to engage with CA management practices should include offering better credit terms in the agricultural sector such as lower interest rates compared to other types of credit. FIs should provide some documents and information support to farmers who need agricultural credit. The service providers should provide a better service and discounts to farmers who need their service. Incentives and subsidies from government and NGOs were valuable mechanisms to encourage FIs to work with farmers by providing information support. Policymakers should focus on agricultural credit accessibility with special interest rates (Appendix A, Table A3) (KI07) (KI21)”.

“Mechanisms to engage FIs with farmers: the service providers should import tractors, which is a requirement for farmers who want to practice CA. FIs should

provide better credit for agricultural activities as it would encourage farmers to practice CA. Special interest rates should be offered for agricultural credit. It is a mechanism by which farmers can access credit for agriculture and farmers themselves should have collateral assets and business plans for credit (Appendix A, Table A3) (KI23)”.
 “FIs should provide low interest rates for agricultural credit and follow up with farmers to ensure they are using the credit to achieve their goals or business plans. Information on agricultural credit should be provided directly to farmers via Telegram, phone call, App and training. Farmers who have small-scale operations should form groups to access services, namely, land preparation and agricultural credit (Appendix A, Table A3) (KI22)”.

Informant interviews confirmed that accessing agricultural credit, including providing credit with low interest rates and an uncomplicated documentation process for credit accessibility, should be made easy for CA farmers or borrowers. Support from actors should be heightened by policymakers and NGOs, with incentives, such as machinery importation, agribusiness plans and information support, being required. These mechanisms required cooperation among actors including farmers, private sector, government and NGOs, to promote CA. Our result found two main mechanisms, support and improved process mechanisms, which would impact farmers’ access to agricultural credit is for CA practices (Figure 6). Actors to provide the support mechanism included government, NGOs, and the private sector, while FIs as credit providers and farmers as credit users were responsible for the improved process mechanism. Social capital, including social networks, trust, and reciprocity, refers to credit information, as important for credit users in their decision-making regarding access to credit. The support mechanism included policy support for agricultural credit interest rates, incentives and subsidies from the government and NGOs, reduced taxation for the private sector to import agricultural inputs, such as agricultural machinery and cover crops, and information provision by the government and NGOs. The improved process mechanism included providing credit with low interest rates and enhancing credit accessibility for farmers. It is imperative to streamline both documentation and credit procedures, ensuring their ease and efficiency. and to develop an agribusiness plan. Farmers should be provided with the requirements and information from reliable sources in order to make decisions for accessing credit.

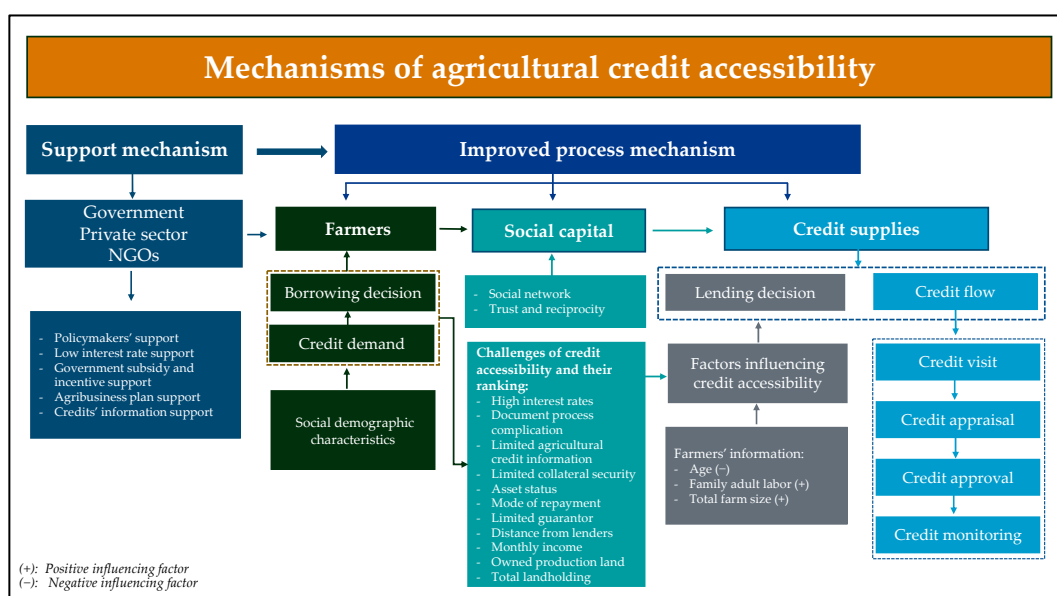


Figure 6. Combination of support and improved process mechanisms for farmers to access agricultural credit.

4. Discussion

4.1. Factors Influencing Agricultural Credit Accessibility for CA Management Practices

A few factors have been identified as influencing factors on farmers' agricultural credit accessibility to practice CA (Table 3). Age has a negative impact on credit accessibility, as reported in previous studies [89–91]. In this research, farmers with an average age of 47 years old could access credit more easily compared to those with an average age of 55 years old. This result is consistent with Chandio et al. [92], who concluded that the age of farmers had a negative effect on agricultural credit accessibility, meaning that as age increased, access to credit decreased. In addition, age impacted credit for CA practices; for instance, farmers' age was one of the most extensively studied factors influencing credit. The impact of age on access to credit is evident from both the demand and supply sides of credit, significantly influencing access to FIs [93]. Adult laborers' aged 15–64 years are referred to as belonging to the employment age by the International Labor Organization in Cambodia [94]. Information from key informants in this study demonstrated that farmers' age impacted agricultural credit accessibility. Accessing credit becomes more complicated for older farmers as applicants between 40 and 49 years old are more likely to secure full credit compared to applicants aged 30 and under [95]. In-depth interviews confirmed that the farmers were not older than 65 years old. Older farmers would have access to agricultural credit compared to younger adults, since older farmers might not seek off-farm employment opportunities, whereas younger adults would do so, so that they could afford agricultural inputs [96–98].

Family adult labor in households had a positive influence on accessing credit (Table 3). In this study, households with more adult laborers, at around three people per household, could better access credit. This result agrees with Silong and Gadanakis [50] and Mboulou [99,100], who demonstrated that, the larger the household size, the higher the likelihood of the farmer having access to agricultural credit. The positive association between family size and credit demand would be strengthened; as requirements increased, there would be more opportunities to obtain credit, especially for agriculture [101]. Similarly, research findings revealed that the hiring of employees is related to availability of financing among large-scale farmers while small-scale farmers and their families can cultivate their fields without the need to hire extra laborers [58]. Laborers provided for farming, collateral and sources of credit are all factors that substantially affect the quality of agricultural credit [54,102]. Key informant interviews pointed out that credit was impacted by family labor, while the farmers' challenge was related to lack of credit information and family labor in agriculture.

Another factor is the total farm size, which also had a positive impact on credit accessibility (Table 3). Farmers with a larger farm size of 7.33 ha per household found it easier to access credit compared to those engaged in small-scale farming with a farm size of less than two ha per household. This result aligns with that obtained by [103–105], who found that farm size had a positive impact on credit. Similar findings of a significantly positive impact of total farm size on farmers' access to credit as land size was utilized as collateral to secure credit were also reported [46,106,107]. Farmers with large, cultivated land areas were more likely to obtain credit [78,107]. Key informants reported that farmers' land size could affect agricultural credit because farmers needed to provide collateral involving land for credit accessibility. If farmers did not have the land as collateral required by FIs, obtaining credit for practicing CA would be an issue, particularly for small-scale farmers.

4.2. The Ranking of Challenges to Access Agricultural Credit for CA Management Practices

Agricultural credit accessibility posed many challenges for practicing CA (Table 4). High interest rates are the main challenge, as farmers need funding for CA inputs, such as land preparation, cover crops and agricultural machinery [108]. The ability to access credit has impacted socioeconomic benefits, enhanced CA adoption and increased agricultural production, thereby affecting farmers' living standards [109]. In Cambodia, the interest rate becomes a challenge for farmers who want to access credit for agricultural purposes,

such as land preparation and purchase of agricultural inputs. Samreth et al. [110] stated that, before the policy was implemented, there were no restrictions on lending rates, and many MFIs had charged over an 18% interest rate in 2017, which became a serious problem for limited-resource farmers who wanted to access agricultural credit. In the annual supervision report for 2023 of NBC, the interest rate on KHR loans was 12.0%, a slight drop from 12.2% in the previous year, while the average interest rates on USD loans remained relatively stable at 10.1% compared to 10.0% in 2022 [20]. At the same time, the average lending interest rate from MFIs for KHR was 17.6%, while for USD it was 16.6% [20]. ARDB provides agricultural loans with low annual interest rates of 8–11% for smallholder farmers [88]. Face-to-face interviews showed that farmers interested in accessing credit with this bank are only 1% of the total, due to limited sharing of credit information activities to farmers, preventing farmers to access loans with lower interest rates. Comparing with a neighboring country, the interest rate provided by ARDB was still higher than the prevailing rates in Thailand, where the lending annual interest rate was 3.3% in 2020 and decreased to 3.1% in 2022 [22]. The Bank of Thailand's policy offered a better mechanism for managing interest rates through support to borrowers. For example, the annual policy rate was reduced from 1.75% to 1.25% in 2003, despite the persistent high liquidity in the financial system; consequently, the interest rates remained low throughout the year [111,112]. The FI sector remains actively involved in fostering inclusive economic growth in Cambodia by providing loans for small and medium enterprises, business expansion, and agricultural activities. However, lending interest rates are higher compared to those in Thailand, Vietnam, Indonesia [22], and Malaysia [23,24]. Based on NBC [113], the purpose of imposing an interest rate ceiling is to shield consumers or borrowers from high interest rates charged by FIs and to make loans more affordable. Additionally, other consumer protections have been created to evaluate the efficiency of credit by NBC [20]. In 2023, annual interest rates were nearly at the interest rate ceiling for KHR loans, which might require support from the government. This mechanism is beneficial to farmers, who want to access agricultural credit, particularly for adoption of CA production systems.

The documentation process and information support for accessing credit were listed as challenges to farmers (Table 4). Dhakshana and Rajandran [52] stated that documentation had an impact on obtaining loans from FIs. This result also agrees with Mwonge and Naho [114], who similarly reported that the majority of smallholder farmers strongly agreed that complex documentation was the main obstacle in accessing credit. Thus, providing easier access to credit can incentivize more farmers to adopt CA, contributing to sustainable and environmentally friendly farming practices that promote soil health and water conservation, as agricultural credit has a positive and significant impact on agricultural productivity. For instance, credit has increased application of cover crops and agricultural machinery [57,78,115]. The documentation also plays a role in acquiring bank credit and positively affects accessibility [52,116]. Agribusiness plans are documents that affect banks' lending decisions for farmers. The documentation process serves as a challenging procedure for farmers, particularly regarding agribusiness plans, one of the requirements of FIs and a potential concern for practicing and promoting CA. Information from FIs significantly impacts the ability of farmers to access credit. Data from Henning et al. [117] included information about credit applications, which is more extensive than financial data typically gathered in credit research and the credit provider's final decision. It must be considered that information obtained from FIs is guided, and included the following information: credit's purpose, size, repayment length, years as a client, account status, credit history, collateral, financial data, and the number of firms on farm and industry risk associations [118]. An agriculture applicant's information includes business ownership, age, years of farming experience, and education [117,119]. Agricultural credit information impacted credit accessibility, as farmers need information to make decisions regarding credit access with low interest rates. Informants also stated that this issue was mirrored, since farmers were interested in accessing credit but interest rates became a critical challenge. This means that the likelihood of being constrained by risk and quantity grows as

interest rates rise because the demand for credit declines with an increase in the cost of borrowing [57]. There was a positive association between credit rationing and interest rates in credit demand. If farmers have access to credit with high interest rates, they would not be willing to practice CA. Key stakeholders highlighted that complicated documentation required for credit processing including business related documentation posed a potential challenge to farmers.

Farmers who would have liked to access credit for practicing CA did not attempt to access agricultural credit due to various challenges, including collateral security, asset status, guarantors and distance from FIs (Table 4). Farmers can be classified as credit-constrained, due to demand-side factors contributing to these constraints [47,120]. The primary limitation on the supply side is insufficient collateral; as a result, policies directed towards the supply side should strive to increase the ability of smallholders to possess viable collateral, such as land titles or assets [120]. Asset status is a requirement of FIs for borrowing; for example, farmers need to provide proof of accessing credit [121]. Moreover, the mode of repayment information is also a challenge for farmers when accessing credit. If the information on repayment details is insufficient, it can be a challenge for individuals or businesses seeking credit in agriculture, potentially leading to uncertainty, hesitation and reduced accessibility to financial resources [50]. The limited availability of guarantors poses a challenge to credit accessibility for farmers as FIs typically require farmers to be accompanied by guarantors [122]. Guarantors provide an essential factor in mitigating risk by assuring lenders that borrowers would repay credit. However, lenders may perceive higher risks, leading to hesitancy in extending credit when the number of available guarantors is limited [123]. The distance between lenders and borrowers can present challenges due to various reasons, including transaction costs, limited information flow, infrastructure and communication challenges, risk perception, and cultural and social factors [124,125]. For example, increased distance typically results in higher transaction costs for both lenders and borrowers as the necessity for physical travel during credit applications, document submissions and repayments introduces additional time and expenses [126].

Monthly income, owned production land and total landholding were also challenges to accessing agricultural credit. Monthly income directly influences farmers' ability to meet repayment obligations. Lenders consider the monthly income of farmers seeking credit as a crucial factor in assessing their financial stability and ability to meet repayment obligations. If the income is deemed insufficient or irregular, it can pose a challenge to accessing credit [50,127]. Owned production land and total landholding provide beneficial collateral requirements for FIs, as a common issue was that these institutions required collateral when providing agricultural credit [128]. If farmers do not have land ownership or title, they may struggle to meet these collateral requirements [100]. Credit sources lending providers require collateral for credit acquisition due to credit risk default [129].

4.3. Mechanisms to Access Agricultural Credit for CA Management Practices

Expert interviews were explored to gather information on problems, solutions and mechanisms for credit accessibility for practicing CA (Figure 6). Key findings from the stakeholder analysis included high costs of CA inputs, such as agricultural machinery and cover crops, as farmers' challenges. Access to agricultural credit is a good mechanism to promote CA as farmers would use credit to enhance their agricultural activities [130]. In this study, all participants identified high interest rates, complicated documentation processes and limited credit information as major problems in accessing credit (Appendix A, Table A3). Stakeholder analysis provides a solution to address the major issue of accessing credit. Providing special interest rates for agricultural actors would encourage farmers to access credit for promoting CA [120]. FIs were the key factor in addressing the challenges of the expected cost of CA inputs by providing low interest rates compared to credit without farming activities, documenting processes and provision of information support. More consideration to policy support for credit accessibility should be given by the government to subsidize interest rates on agricultural credit, making them more affordable for farmers.

This encourages FIs to offer credit at lower rates, thus increasing farmers' accessibility [131]. This result illustrates that the two main mechanisms for better credit accessibility include support and improved process (Figure 6).

The support mechanism encouraged engagement of FIs with CA farmers because this provided an opportunity for accessing agricultural credit and farmers would use the credit for CA purposes [132]. Engagement with FIs would enhance the number of farmers practicing CA. Costly CA inputs were challenging but connection between FIs and CA farmers can address this issue since farmers can use credit to pay for agricultural inputs. However, accessing credit with elevated interest rates remains the main issue for farmers. This mechanism engages FIs with farmers by providing agricultural credit with low interest rates compared to the annual interest rate in 2023 (17.6%). Low interest rates make credit more accessible to farmers and those with limited financial resources. This accessibility enables CA farmers to invest in essential inputs involving agricultural machinery and cover crops, which can enhance productivity and improve their livelihoods [133,134]. Documentation of the agricultural credit process should not be complicated, leading to encouragement of farmers to access credit [135]. Dhakshana and Rajandran [52] found that agricultural documentation processes also had an impact on obtaining agricultural credit. The government should provide policy support and consider making access easier by decreasing interest rates and simplifying procedures for accessing credit, especially for CA farmers [136]. Incentives should be enhanced by the government considering incentives for CA input imports, such as agricultural machinery, and providing tax support for agricultural inputs [136,137]. An agribusiness plan was a requirement from FIs to access credit. However, this was complicated to create for smallholder farmers, so NGOs or relevant actors should provide information support and business support for farmers who need it for credit accessibility [138–140]. This mechanism requires stakeholders' cooperation, including the government, NGOs, the private sector and farmers themselves.

The improved process mechanism of credit accessibility was determined based on problems, solutions and mechanisms gathered from key stakeholders, indicating that it would assist farmers in practicing CA (Figure 6). Expert interviews found mechanism processes for agricultural credit that can impact CA farmers' decision to access credit. The three components of these mechanism processes are farming households, social capital on access to credit, and credit supplies [31,141]. Farming households include the demand for credit and borrowing decisions, which could be impacted by social demographic characteristics [50]. Age of farming households plays a role in determining credit requirements and shaping lenders' assessment of a borrower's reliability [51]. Expert interviews revealed that farmers would assess credit following their demand for agricultural purposes, and then they would decide on the amount of credit they would prefer to access, since demand-side factors were equally important for addressing credit constraints of smallholder farmers [47]. Face-to-face interviews indicated that age, family adult labor, and total farm size played significant roles in determining access to agricultural credit [101,107]. Social capital was important in enhancing credit information within credit programs for farming households and reducing search costs, as it provided support in terms of information, input supply, and training, enabling users or farmers (borrowers) to utilize resources more effectively [142,143]. Social capital, referring to social networks, trust, and reciprocity, is valuable in aiding farming households to connect with, trust and support others based on their transactions [142]. Credit supplies, including bank and MFI sources to farmers, reflect their willingness to access credit [108]. FIs had two processes: lending decisions and credit flow, for providing credit. Lending decisions were influenced by various factors with a positive impact, such as family labor and total farm size, while farmers' age had a negative impact. Expert interviews showed that the improved process mechanism of credit accessibility involved client visits to establish business plans, followed by credit appraisal, credit approval and credit monitoring [144–146]. Key respondents from FIs highlighted that credit requires an agricultural business plan from the borrower because they aim to ascertain the purpose of farmers in accessing credit, and having a written business plan

would lead to higher financial performance. Most farmers use credit for various purposes, so monitoring serves as a beneficial mechanism for FIs to follow up the credit process [147]. However, this approach requires time and staff input from FIs, yet it enhances the efficiency of agricultural credit. The major issue of CA farmers with regard to credit accessibility is elevated interest rates [35,115,148]. Three aspects of the credit process mechanism are farmers, social capital on access to credit and credit supplies. Farmers should utilize credit with a specific purpose following an agribusiness plan, the requirement set by FIs for credit provision. Credit monitoring should be prioritized by FIs as it enhances efficiency of both credit providers and users. Credit requires multiple processes for borrowers to complete: client visits, credit appraisal, credit approval and credit monitoring. Farmers would practice CA by accessing credit under favorable conditions, for instance, manageable interest rates, an easy documentation process and information support.

Factors influencing agricultural credit accessibility to promote CA practices included age, family adult labor, and total farm size, whereas high interest rates were a major challenge. Two mechanisms for accessing credit were identified: the support mechanism and the process mechanism. Three important aspects of the credit process mechanism involved household farming, social networks and credit sources. Farming households encompassed demand for agricultural credit, social demographic characteristics and borrowing decisions, while social capital impacted credit accessibility and referred to social networks, trust and reciprocity. Credit supplies were formal sources needed to provide agricultural credit. Farmers would adopt CA more effectively if they could access credit, addressing the expected cost of CA inputs through this mechanism. Farmers would be willing to practice and transfer CA technologies locally if they could access credit with a special interest rate. The findings provided important insights into factors influencing farmers' access to agricultural credit and informed policymakers in providing support for promoting CA in Cambodia.

5. Conclusions

The CA farmers' agricultural credit accessibility was positively influenced by family adult labor and total farm size but negatively by farmers' age. The high interest rates were ranked as the primary challenge, among others. The research suggests two identified mechanisms: support and improved process mechanisms. The support mechanism required better engagement from the government in supporting policies, including lowering interest rates for agricultural credit and decreasing taxation on agricultural imports, whereas support for information and business plans for accessing credit come from NGOs and the private sector. The improved process mechanism highlighted the provision of credit information and reduced interest rates, and a simpler and streamlined documentation process by FIs would encourage farmers to take up agricultural credit, thereby promoting CA practices among farmers in Cambodia.

This research focused solely on CA farmers' access to agricultural credit, which limits the consideration of other farmer groups that might provide additional evidence. Another limitation might require a specific research design to address specific ranges of interest rates affordable by smallholder farmers, as high interest rates were identified as the primary challenge in this study. Farmers' behavioral intentions and mechanisms for reducing interest rates should be also studied to produce recommendations to facilitate farmers' better access to agricultural credit.

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Informed Consent Statement: The authors adhered to the protocols outlined for human research. All participants provided informed consent before participating in the study and their confidentiality was protected throughout the research process.

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Conflicts of Interest: Authors declare no conflict of interest.

Appendix A

Table A1. Summary of research methods related to agricultural credit accessibility.

No.	Country	CA ^d	Research Method			Reference
			Sampling	Quantitative	Qualitative	
1	Indonesia	No	Random	✓	-	[149]
2	Afghanistan	No	Random	✓	-	[150]
3	Nigeria	No	Random	✓	-	[151]
4	Vietnam	No	Random	✓	-	[142]
5	Nigeria	No	Random	✓	-	[47]
6	Vietnam	No	Random	✓	-	[54]
7	Ghana	No	Random	✓	-	[48]
8	Ghana	No	Random	✓	-	[32]
9	Africa	No	Random	✓	-	[152]
10	Ghana	No	Random	✓	-	[153]
11	Cambodia	Yes	Random and Purposive	✓	✓	This study

^d Farmers access to credit for conservation agriculture (CA) management practices.

Table A2. Model fitness using AIC and Mallows' Cp for the binary logistic regression model.

Model	AICc	Delta.AICc	AICcwt	AIC	Mallows' Cp
Model 1	273.87	10.10	0.00	273.77	18.99
Model 2	294.10	30.32	0.00	293.99	41.40
Model 3	286.08	22.30	0.00	285.97	32.29
Model 4	293.57	29.79	0.00	293.46	40.79

Table A2. *Cont.*

Model	AICc	Delta.AICc	AICcwt	AIC	Mallows' Cp
Model 5	290.22	26.45	0.00	290.12	36.96
Model 6	292.44	28.67	0.00	292.34	39.50
Model 7	281.64	17.87	0.00	281.53	27.38
Model 8	273.31	9.53	0.00	273.14	18.22
Model 9	265.38	1.61	0.13	265.12	9.91
Model 10	266.36	2.59	0.08	266.00	10.78
Model 11	264.42	0.65	0.21	263.94	8.74
Model 12	263.87	0.08	0.28	263.15	8.01
Model 13	263.77	0.00	0.29	263.08	8.00

AICc refers to Akaike information criterion (AIC), c indicates that the value is calculated from the AIC test corrected for small sample sizes; Delta.AICc values to the best model and Akaike Weights (AICcwt); Model: 1: Age; 2: Education year; 3: Family adult labor; 4: Farm size for main crops; 5: Total farm size; 6: On-farm income; 7: Farm experience; Model 8: Model 1 + Model 2; 9: Model 8 + Model 3; 10: Model 9 + Model 4; 11: Model 10 + Model 5; 12: Model 11 + Model 6; 13: Model 12 + Model 7.

Table A3. The participant list of key informant interviews (KIIs).

Code	Position	Category	Province
KI 01	CA farmer	Farmer	Preah Vihear
KI 02	CA farmer	Farmer	Preah Vihear
KI 03	Non-CA farmer	Farmer	Preah Vihear
KI 04	Non-CA farmer	Farmer	Preah Vihear
KI 05	Service provider	Private sector	Preah Vihear
KI 06	Cover crop staff	Private sector	Preah Vihear
KI 07	Financial institution	Private sector	Preah Vihear
KI 08	PDAFF	Government	Preah Vihear
KI 09	PDAFF	Government	Preah Vihear
KI 10	Village chief	Government	Preah Vihear
KI 11	Village chief	Government	Preah Vihear
KI 12	Village chief	Government	Preah Vihear
KI 13	CA implementer	NGO	Preah Vihear
KI 14	CA implementer	NGO	Preah Vihear
KI 15	CA farmer	Farmer	Battambang
KI 16	CA farmer	Farmer	Battambang
KI 17	Non-CA farmer	Farmer	Battambang
KI 18	Non-CA farmer	Farmer	Battambang
KI 19	Service provider	Private sector	Battambang
KI 20	Cover crop staff	Private sector	Battambang
KI 21	Financial institution	Private sector	Battambang
KI 22	PDAFF	Government	Battambang
KI 23	PDAFF	Government	Battambang
KI 24	Village chief	Government	Battambang
KI 25	Village chief	Government	Battambang
KI 26	Village chief	Government	Battambang
KI 27	CA implementer	NGO	Battambang
KI 28	CA implementer	NGO	Battambang

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