THE DETERMINANTS OF LOAN REPAYMENT CAPACITY OF THE FARM SERVICE AGENCY'S SOCIALLY DISADVANTAGED BORROWERS

by

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(Under the Direction of Cesar Escalante)

ABSTRACT

This research explores the factors influencing loan repayment capacity of socially disadvantaged farmers participating in the United States Department of Agriculture's Farm Service Agency (FSA) program. Through multiple regression analysis, the research explores the impact of financial metrics, loan conditions, and demographic elements on repayment ability among White, Black, and Hispanic farmers. Findings indicate that Black farmers demonstrate greater repayment ability, as shown by their elevated term debt coverage ratios (TDCR), even though they have lower total asset values and higher debt-to-asset ratios relative to White farmers. Hispanic farmers demonstrate comparable financial strengths, yet they face greater pressure because of increased debt loads. The research finds that structural obstacles, like reduced loan amounts, shorter loan terms, and elevated interest rates, still affect minority farmers' capacity to repay loans. The results emphasize the necessity for better financial assistance, modified lending conditions, and specific policies to boost the financial sustainability and repayment results for socially disadvantaged farmers.

INDEX WORDS: United States Department of Agriculture (USDA), Farm Service Agency (FSA), Loan repayment, Financial performance, Socially Disadvantaged farmers (SDA) , Agricultural finance.

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DEDICATION

Above all, I dedicate this thesis to God Almighty, whose unwavering grace and support sustained me even in instants when hope appeared lost. Without His presence, none of this would have been feasible. To my beloved parents, Mr. and Mrs. J.O. Akinleye, whose enormous sacrifices, absolute love, and constant prayers have influenced me into the person I am today, I am forever grateful. To my superb siblings, Bukola, Folasade, and Victor and my cherished cousin Olaitan, and my amiable cousin, Olaitan, thank you for your infinite encouragement, love, and belief in me. Special appreciation to my mentor brother, Ajao Adeleye, whose constant encouragement and guidance lifted my spirits and kept me motivated through challenging times. To my cherished childhood friends, Olatunbosun, Oluwatobiloba, and Sodiq, your friendship, loyalty, and unwavering support over the years mean more than words can express. To my dear friends and classmates Joshua, Olubunmi, and Tiwatope, thank you for sharing this remarkable journey and standing strong together through every challenge, especially our unforgettable battle with econometrics. Finally, this thesis is dedicated to socially disadvantaged and minority farmers, and to all those committed to advocating for fairness, equity, and justice. Your courage, resilience, and strength have deeply inspired this research.

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CHAPTER 1

INTRODUCTION

1.1 Background

Agriculture is a capital-intensive industry in the United States that requires both medium and long-term investments in land, machinery, and equipment. Working capital expenditure is also constantly needed to finance short-term production cycles and guarantee effective sustainability. Despite the sector's key role in the U.S. economy, access to adequate capital remains one of the highest challenges for farmers, principally socially disadvantaged farmers (SDAs). Different surveys have demonstrated that farmers consider access to enough capital as one of their biggest barriers to commencing and developing a farm business (Briggeman, Gunderson & Detre, 2022).

About 5% of U.S. farm sole proprietorships report either being turned down for loans or not applying for credit for fear of denial in recent years (Briggeman, Gunderson & Detre, 2022). A sizeable group of farmers can also be deemed credit constrained in the impression that their private demand for credit goes beyond the amount that creditors are willing to lend to them (Escalante, Maoyong & Akinleye, 2024). Even farmers who seem fit to have access to loans may be essentially constrained because they lack adequate income or collateral to succeed for a larger loan.

In recent years, there has been expanding concern among policymakers in advocating financial inclusion and improving equal chances among minority and disadvantaged groups in the agricultural sector (Ghimire, Escalante & Dodson*.,* 2020). Within the U.S. Department of Agriculture (USDA), a specific group socially disadvantaged individuals have faced historical

discrimination or unequal treatment in systems and services. Detailed events of discrimination against SDAs have encompassed the denial of loans, restricted access to credit facilities, lack of rightful defense against fraud, and absolute acts of violence and intimidation (Dhakal, Escalante & Ghimire, 2019). Historical discrimination and systemic barriers have contributed to significant income and wealth disparities between minority and non-minority farmers, resulting in financial instability and limited growth opportunities in the agricultural sector (Daniel, 2013). To address these challenges, the federal farm lending program administered by the USDA, through the Farm Service Agency (FSA), provides direct and guaranteed loans as temporary sources of agricultural credit.

The FSA, often known as the "lender of last resort," plays a vital role in filling the gaps in the commercial credit market where creditworthy farmers, particularly high-risk borrowers, are unable to obtain finances from established financial institutions such as banks and credit unions (Escalante et al., 2018). FSA loans are usually provided to emerging farmers who are unable to be eligible for conventional loans due to deficient financial assets or collateral. Furthermore, FSA lends directly to seasoned farmers who have suffered financial hindrances from natural disasters in the form of emergency loans (Dodson & Koenig, 2003). FSA's direct farm loan program presents short- to intermediate-term farm operating loans (OL), and emergency (EM) loans to household-sized farms. Federal legislation authorized that fragment of farm ownership and OL loan funds be aimed at SDA and beginning farmer (BF) applicants.

FSA describes a SDA as a participant of a group that has been subjected to racial, ethnic, or gender discrimination due to their identity as a member of the group, devoid of value to their individual qualities. SDA groups comprise women, African Americans, Hispanics, Alaskan Natives, American Indians, Asian Americans, and Pacific Islanders (Dodson & Koenig, 2003). In

accordance with the 2017 Census of Agriculture, 3.3% of all U.S. farm producers established as Hispanic or Latino, 1.7% as American Indian or Alaska Native, 0.6% as Asian, 1.3% as Black or African American, and 0.1% as Native Hawaiian or Pacific Islander. As well, 0.8% of producers reported more than one race, and women accounted for 36% of total U.S. producers (USDA FSA, 2018). Yet, these groups had overtime met with weighty difficulties to gain access to USDA programs and facilities, including loan programs, technical aid, and legal backing. Prejudice based on race and gender has contributed to these inequalities. Female farmers have traditionally faced adversities in gaining access to credit and financial aid due to structural and cultural discrimination (Daniel, 2013).

In accordance with Escalante, Epperson and Raghunathan (2009), women farmers are more prone to obtain smaller credit facilities and encounter larger rejection rates in comparison to their male equivalents. Conventional gender roles and land tenure provision of laws have also constrained women's capacity to secure collateral, inhibiting their access to credits. Racial groups, specifically Black and Hispanic farmers, have encountered structured prohibition from credit markets and opportunities to own land. Findings from Escalante et al. (2004) emphasized that Black farmers usually receive higher interest rates, and disadvantageous repayment terms. Hispanic farmers frequently face language difficulties and lack financial awareness programs, further restraining their capacity to have gain access to loan facilities (Feder & Cowan, 2013).

The concerns of these structural obstacles have been critical. SDA farmers frequently face inadequate access to financial resources and facilities, which weakens their capability to grow and expand their farming operations and invest in output-improving machinery. As researched by King, Rosenberg and Tanner (2018) and Coppess (2021), the deficiency of farmlands among Black farmers because of property seizure in the form of foreclosure and financial hardship has

augmented the income and wealth inequalities between Black and White farmers. Likewise, Hispanic and Native American farmers are frequently unable to have the magnitude and resources necessary to contend in the extensive agricultural market, indicating continued financial volatility. The aggregate percentage of the agricultural populace identified as SDA established by the FSA classification is around 7.9%, exhibiting an important sector of the farming population (Dixon et al., 2010). This emphasizes the necessity for dedicated financial provision and structural modifications to tackle historical gaps and adjust the financial performance of SDA farmers. By concentrating on some of the localities in the United States, where a high intensity of SDA farmers subsists, this study will examine the determinants impacting loan repayment capacity of SDA farmers.

Also, while the FSA retains its relevance as an important player in agricultural finance for disadvantaged classes, substitute financing options existing in the form of grants, microfinance plans, cooperative schemes, and non-governmental agricultural finance programs have surfaced as likely sources of capital for SDA farmers. However, these optional sources usually have restrictions in terms of loan volume, repayment conditions, terms, and ease of access (Feder & Cowan, 2013). Perception on how FSA loans compare to other alternative options of financing in increasing financial performance and repayment capacity will present helpful intuitions into the purpose of public-sector credit programs in agricultural finance. According to existing literature, no extensive investigation has assessed the impacts of FSA loans with other financing options on repayment capacity and financial performance. This study approaches this gap, providing a stronger perception of the efficacy of public-sector loan and credit programs in assisting agricultural borrowers. This study will investigate the impact of FSA's credit facilities on SDA farmers and thereby assessing their loan repayment performance and financial outcomes. By

evaluating loan repayment movements and financial performance indicators among different racial groups, the study aims to detect structural obstacles to loan accessibility and deliver policy recommendations for strengthening financial inclusion in the agricultural sector.

1.2 Statement of the Problem

The USDA FSA is described as the "lender of last resort" for farmers who face challenges in obtaining credit from private-sector lenders, specifically those identified as SDAs (Escalante, Maoyong & Akinleye, 2024). Despite this obligation, FSA has been the subject of several lawsuits across the United States accused of racial and gender discrimination in its loan accessibility and financial performance identifier. One famous case is *Pigford v. Glickman (2000)*, a class action claim filed by African American farmers who stated that they faced pervasive and systemic discrimination, comprising higher credit refusal rates, longer processing periods, and unwelcoming loan terms such as lower projected crop yields that led to loan rejections (Vina & Cowan, 2005, Dunne, 2006). Similarly, in *Love v. Vilsack (2001)*, female farmers claimed the presence of gender-based discrimination in FSA's lending terms, involving smaller loan amounts and shorter repayment periods compared to their male counterparts (Cheng, Lin & Liu 2015). These cases lay emphasis on established structural barriers that have altered the loan repayment models and financial performance of SDA under the FSA program.

Dhakal, Escalante and Ghimire (2019) investigated that White borrowers were more apt to receive larger loan amounts and more advantageous terms in comparison to racial minority groups, while female farmers were more likely to face excessive interest rates and shorter repayment periods. Likewise, Briggeman, Gunderson and Detre (2022) stated that racial and gender-based disproportions in loan amounts, interest rates, and repayment periods continue to exist among FSA

borrowers. In a more recent study, Escalante, Maoyong and Akinleye (2024) found that FSA's lending conditions constantly favored male borrowers, who obtained larger loan amounts and longer repayment periods in comparison to their female counterpart.

However, the existing literature has not effectively explored the relationship between loan repayment patterns and financial performance among SDA farmers under the FSA program. If FSA's loan conditions have traditionally favored specific borrower groups with a particular racial or gender uniqueness, it is rational to assume that borrowers with joint racial and minority characteristics such as African American women, Hispanic women, Asian women, and Native American women may experience even greater structural limitations in loan repayment and financial performance. These intersecting barriers could constrain financial strength and diminish loan repayment outcomes, further limiting access to prospective credit and preventing opportunities for economic expansion within the agricultural sector. This study tackles this gap by examining the determining factor of loan repayment and financial performance among SDA farmers under the FSA program, concentrating on how race, and financial strength influence repayment capacity and long-term financial firmness.

1.3 Purpose of the study

Existing research on loan repayment and financial performance under USDA FSA lending programs has mainly concentrated on racial and gender inequalities distinctly. This research seeks to investigate the determinants of loan repayment capacity of SDAs under the FSA program, concentrating on financial, race and other demographic attributes as combined factors. Some fundamental indicators will be examined to evaluate their effect on loan repayment patterns and financial performance. The study will analyze whether SDA face greater structural difficulties in

loan repayment and if differences exist among racial groups. The discovery will present understandings into how financial framework and demographic factors impact loan repayment, with the objective of apprising policy enhancements in FSA lending strategies to improve financial output for SDA farmers.

1.4 Policy Relevance

The findings from this research have major policy implications for improving the financial performance and loan repayment capacity of SDAs under the FSA program. By detecting the important factors impacting loan repayment and financial performance among SDAs, this study will present worthwhile perceptions for policymakers and FSA lending majors in tackling structural limitations and refining the efficacy of loan terms and repayment structures. A profound comprehension of the connection between demographic and structural attributes such as race, farm size and financial outputs will aid more focused policy involvements designed to improve better credit accessibility, boosting financial strength, and minimizing loan delinquency among SDAs. Moreover, the research findings could encourage the improvement of FSA's credit assessment approach to better account for the unique financial encounters faced by racially and minority disadvantaged farmers, in that way advocating greater financial inclusion and fairness within the agricultural sector.

1.5 Organization of the Study

Following this Introduction segment, Chapter 2 offers an extensive review of the literature concerning loan repayment and the financial performance of SDAs participating in the FSA program. Chapter 3 describes the research methods employed to examine loan repayment

behaviors and financial results among SDA farmers. Chapter 4 provides empirical findings, whereas Chapter 5 explores the results and their wider significance. Chapter 6 wraps up the study, highlighting essential findings and providing suggestions for policy and future investigations.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview of USDA FSA Lending Program

The USDA FSA was founded in the 1930s, even though it was formally given the name Farm Service Agency (FSA) in 1996 (USDA FSA, 2019). Ever since it started, the FSA has contributed to a vital function in strengthening producers of agricultural goods in the United States by presenting appropriate and valuable platforms and aids to farmers. The agency's objectives and goals involve maintaining a strong farming industry and agricultural economy and offering necessary assistance through local and global food aid programs (USDA FSA, 2019). While the FSA is entrusted with assisting all farmers, it has an explicit directive to resolve the financing demands of SDAs, incorporating minority and beginning farmers, who frequently encounter greater difficulties in acquiring loans because of their structural barriers and insufficient financial capabilities.

FSA's loan initiatives are developed to equip farmers who have limited credit accessibility in acquiring financing from private-sector sources, such as commercial banks and some other lending institutions, at intensive rates, terms and conditions (USDA FSA, 2018). The agency identifies that minority, and socially disadvantaged farmers frequently face comprehensive barriers in gaining access to credit due to historical prejudices and financial insecurity. Consequently, FSA farm credit initiatives provide financial support to SDA farmers to assist them to start, sustain and nurture their farming operations and procedures. The institution’s support is vital in improving access to agricultural financing and advocating financial inclusion among minority groups.

The FSA functions through five primary objectives: farm support plans, agricultural credit and financing, commodity management, operations, and public sector operations. Among these functions, the Agricultural credit and financing Program plays the core function in strengthening household-sized farms by providing several loan and credit opportunities. Priority focus is targeted on supporting beginning farmers and SDAs who encounter greater financial limitations and have restricted access to commercial credit markets and systems. Each year, the FSA allots a segment of its reserves explicitly for beginning and socially disadvantaged farmers to tackle historical discrimination and encourage equal accessibility to credit facilities (USDA FSA, 2022).

According to federal law, beginning farmers are described as those who have run a farming business for less than a decade (10 years) and do not possess the ownership of a farm that is larger than 30% of the average farm size in their county. They are required to meet all FSA loan admission criteria and requirements and enthusiastically participate in the management and operations of their farm.

A SDA farmer is characterized under the 1990 Farm Bill as a part of a group of individuals that has encountered gender, ethnic, or racial discrimination without consideration to their individual characteristics and values (United States Congress, 1990). SDA groups include African Americans, Hispanics, Alaskan Natives, American Indians, Pacific Islanders and Asian Americans. The FSA oversees two principal loan programs: the Guaranteed Loan Program and the Direct Loan Program. Both programs are crafted to facilitate farmers to initiate credit history, enhance financial strength, and ultimately advance to secure credit and loan facilities from private sector lenders exclusive of government support.

The Direct Loan Program includes FSA issuing loans to farmers without intermediary thereby with government reserves. These credit facilities are accessible to farmers who are not able to qualify

for private sector loans because of inadequate collateral, constrained credit history, or other financial limitations. Direct loans are meant to cover short-term operating costs, acquire farm equipment and machinery, or make long-term farm infrastructure improvements.

The Guaranteed Loan Program, in contrast, implies FSA presenting credit security to private-sector lenders. Under this initiative, FSA assures up to 95% of the loan amount, reducing the financial risk for lenders and encouraging them to extend credit to high-risk borrowers (Escalante, Maoyong and Akinleye, 2024). According to USDA FSA (2022), Guaranteed loans are usually larger than direct loans and have higher borrowing bounds, with a maximum size of loan for each borrower set at $1,399,000 (regulated yearly based on inflationary rates). FSA guarantees offer lenders or creditors backup support, safeguarding farmers with constrained financial capability to be able to have access to the capital that is necessary to support their farming operations and activities. FSA direct loans are limited to $300,000 as per borrower and are anticipated to assist farmers initiating financial freedom and modification aimed at ensuring access to commercial credit in the future (USDA FSA, 2022).

Direct loans can be used for many commitments, including acquiring equipment, livestock, feed and seed and fertilizers as well as overseeing the operating cost or expenses, consolidating debt, and supporting infrastructure development. Emergency loans are accessible to farmers who have undergone financial fatalities because of natural disasters, while conservation loans reinforce farmers in effecting standard conservation designs. The Land Contract Guarantee Program offers financial security to farm sellers and owners who engage in land transactions with beginning or SDA farmers, in so doing enabling land ownership among minority groups (USDA FSA, 2019).

FSA's primary objective is to assist farmers achieve financial autonomy and sustainable practices by offering provisional credit backing and assisting them to build an encouraging credit history.

The FSA seeks to switch farmers from dependents on funding from government credit to independent farmers thereby having access to private sector lending facilities (Carter & Janzen, 2020). The FSA loan programs play a vital and important function in accelerating financial inclusion, easing structural barriers, and strengthening socially disadvantaged farmers to participate in the wider agricultural economy (Escalante, Maoyong & Akinleye, 2024).

The FSA lending program portrays a meaningful impact on U.S. agriculture by assisting minority and socially disadvantaged farmers to gain accessibility to capital and financial services and initiatives. However, challenges persist in guaranteeing that lending terms and conditions are equitable, fair and that loan accessibility is not determined by race or other social features. Attending to these concerns requires continuing assessment and modification of FSA lending procedures to make sure that all farmers, without regards to their social or economic circumstances, have equitable access to loan or credit programs and financial prospects (Ghimire, Escalante & Dodson, 2020)

2.2 Review of Literature

Loan repayment is a fundamental factor of financial performance and an important determinant of creditworthiness in the agricultural sector. It indicates the capability of farmers to fulfill their debt responsibilities and uphold long-term financial strength. Perceptions of the determining factors affecting loan repayment among farmers are necessary for planning successful credit programs and advancing financial better outcomes. Socially disadvantaged farmers, specifically those under the FSA program, encounter distinctive issues in loan repayment because of structural barriers and economic limitations (Escalante, Maoyong & Akinleye, 2024). Several factors, including

economic conditions, loan size, farm characteristics, financial performance, and borrower demographics, have been identified as key determinants of loan repayment capacity.

Economic conditions and market volatility considerably impact loan repayment among farmers. According to Escalante et al. (2018), decreasing commodity prices and bad weather conditions, such as droughts, poses a negative impact on farm revenues and increases the chances of loan delinquency.

Dixon et al. (2010) accentuated that farmer in the Southeastern United States encounters higher financial tensions than those in the Midwest due to their greater vulnerability to drought and market variabilities. Lower farm incomes during periods of market uncertainty lower the funds available for debt repayment, increasing the risk of default. However, Carter, Song & Escalante (2017) argued that farmers with diversified production activities are better equipped to manage market volatility and maintain stable cash flows, which strengthens loan repayment capacity even during economic downturns.

The size and structure of loans directly affect repayment capacity. Larger loans normally increase financial pressure as more income must be allocated toward interest and principal payments. Ahrendsen et al. (2011) found that larger loan balances raise financial vulnerability and decrease the probability of preserving non-delinquent borrower status. In contrast, smaller loans, specifically operating loans, provide more financial flexibility and enhance repayment capacity. However, dependence on short-term loans for operating costs increases repayment risk during periods of income instability (Mishra, El-Osta & Johnson, 2009).

Koenig, Dodson and Sullivan (1999) highlighted that the structure of FSA loans plays a decisive role in loan repayment capacity. They found that guaranteed loans, which are less flexible, tend to create greater repayment challenges during economic downturns compared to direct loans.

Farm size and production diversity extensively impact loan repayment outcomes. Larger farms with more diversified production activities tend to have higher financial strength and greater ability to meet loan obligations. Dixon et al. (2010) noted that Midwestern farms, embodied by larger farm sizes and more concentrated crop production, have shown stronger repayment performance in comparison to smaller and more diversified Southeastern farms.

Diversification helps buffer against market shocks, but smaller farms often lack the scale to benefit from these advantages. Ahrendsen et al. (2011) highlighted that production diversity improves income steadiness and enhances repayment capacity by reducing dependence on single-market outcomes. However, Phillips and Katchova (2003) argued that highly diversified farms sometimes face increased production costs and management difficulty, which could offset the benefits of diversification in improving repayment capacity.

Race and gender inequalities notably impact loan repayment among SDA farmers. Minority farmers, specifically African Americans and Hispanics, have over time faced discrimination and limited access to loan and credit facilities, influencing their repayment capacity (Escalante, Song & Dodson, 2016). Ahrendsen, Dixon and Dodson (2005) stated that minority farmers encounter higher interest rates and less satisfactory loan terms and conditions, which reduces repayment capacity. Male farmers manage to have higher repayment capacity than their female counterparts due to superior accessibility to financial wealth, land possession, and farming equipment and machineries. Carter, Song and Escalante (2017) recounted that female farmer encounters greater financial limitations due to constrained access to resources and smaller farm sizes, which shrink their ability to meet debt obligations efficiently.

Escalante et al. (2004) found that Black and Hispanic borrowers were charged higher interest rates and presented with shorter loan maturity periods compared to White borrowers, which increased

financial burden and decreased repayment capacity. On the other hand, Dhakal, Escalante and Ghimire (2019) found that while male farmers mostly received more favorable loan terms, some minority male borrowers were still at a disadvantage compared to their White counterparts. This suggests that race and gender intersect to create complicated patterns of discrimination and financial constraint among minority farmers.

Financial performance indicators, such as the TDCR, ROE and ROA are important predictors of loan repayment capacity. A higher TDCR implies greater cash flow in relation to debt obligations, which improves repayment capacity. On the contrary, a high debt-to-asset ratio implies greater financial leverage and higher repayment risk. Escalante, Song and Dodson (2016) found that declining ROA and increasing debt-to-asset ratios among FSA borrowers were linked to lower repayment performance, especially during periods of economic recession and adverse weather conditions. Koenig, Dodson and Sullivan (1999) reported that profitability levels among minority farmers were usually lower than those of White farmers due to inadequate access to high yield farming inputs and financial assets. This diminished the ability of minority farmers to generate adequate revenue for debt repayment. However, Carter, Song and Escalante (2017) argued that enhancing access to financial literacy and market-oriented training programs could consolidate repayment capacity by augmenting farm productivity, yield and profitability.

Access to credit is a major determinant of loan repayment capacity. Farmers with higher credit scores and better financial management practices are more likely to access favorable loan terms and maintain higher repayment performance (Koenig, Dodson & Sullivan, 1999). Escalante, Song and Dodson (2016) found that targeted loan programs for minority and female farmers have improved credit access but have not necessarily translated into improved repayment performance due to basic structural barriers. Jett (2011) stated that many socially disadvantaged farmers have

limited knowledge of loan programs, which affects their ability to access credit. The Government Accountability Office (GAO, 2019) emphasized that only 13% of all farms with debt were operated by SDA farmers, demonstrating reduced participation in agricultural credit markets. This suggests that improving outreach and financial education programs for minority farmers could enhance loan repayment capacity and financial inclusion.

Structural barriers, such as limited landownership, restricted market access, and discrimination in lending practices, continue to affect repayment performance among socially disadvantaged farmers. Carter, Song and Escalante (2017) argued that addressing these structural barriers requires a multi-faceted approach that includes targeted financial support, improved access to credit, and policy reforms to ensure equitable lending practices. Expanding government-backed loan programs and improving outreach to minority farmers can address some of the structural barriers to credit access and enhance long-term repayment capacity.

Phillips and Katchova (2003) indicated that policy interventions aimed at improving farm productivity and financial management skills among minority farmers could strengthen repayment capacity and reduce financial vulnerability. Escalante, Song and Dodson (2016) emphasized that adapting loan terms to account for market volatility and providing flexible repayment schedules during periods of economic stress can help sustain borrower performance and improve long-term financial stability.

Loan repayment performance among SDA farmers is influenced by a combination of economic, financial, and structural factors. Market conditions, farm size, production diversity, financial performance, and borrower demographics play a critical role in determining repayment capacity. While government-backed loan programs and targeted financial support have improved credit access, structural barriers and market volatility continue to challenge repayment performance.

Addressing these challenges through improved financial literacy, enhanced access to credit, and policy reforms can strengthen repayment capacity and improve long-term financial stability among SDAs.

CHAPTER 3

METHOD

3.1 Data and Variable Description

3.2 Data

This study relies on data from the USDA FSA national dataset, covering direct loans issued between 2004 and 2014 (USDA FSA, 2018). The USDA FSA dataset provides detailed information on loan terms, borrower demographics, financial performance, and structural attributes of farms operating under the direct loan program. The dataset is comprehensive and representative of FSA's lending activities, making it suitable for analyzing loan repayment and financial performance among the SDAs (Escalante, Brooks & Epperson, 2018).

The dataset includes key borrower attributes such as age, gender, race/ethnicity, marital status, and farm size. Financial performance indicators captured in the dataset include the operating expense ratio, current ratio, debt-to-asset ratio, and net farm income. The loan attributes recorded include loan amount, interest rate, loan maturity, and participation in FSA programs. The choice of single proprietorships as the unit of analysis is justified because the borrower, as the sole owner, is directly responsible for the farm's financial decisions and loan repayment outcomes (Escalante, Brooks & Epperson, 2018).

3.3 Variables Description

This study employs these key indicators: financial performance measures, structural and demographics attributes. These will be analyzed to assess loan repayment patterns and the financial

performance of SDA farmers based on their demographic and financial characteristics. The term debt coverage ratio serves as the dependent variable, while the explanatory variables are grouped into three categories: financial performance measures, structural and demographic factors, and loan attributes.

a. The financial performance measures considered in this study follow the approach of Escalante et al. (2024). The following section will provide their definition and formulas.

Term Debt Coverage Ratio (TDCR): TDCR assesses Repayment Capacity and is calculated using data obtained from a business or farm operations Cash-Flow Statement. TDCR measures the ability of a farm to cover its debt obligations from operational cash flow. A higher TDCR indicates better repayment capacity, whereas a lower TDCR signals higher financial vulnerability and an increased risk of default. A value lower than "1.0" indicates that a business or farm lacked the cash available to make timely payments on intermediate and long-term debts. These would have needed to be addressed by acquiring more debt, selling off existing inventory, or liquidating assets.

Term debt coverage can be calculated as:

$$\text{TDCR} = \frac{Net\ operating\ income}{Total\ debt\ service} \qquad \text{Eq. 3.1}$$

Liquidity Ratio: The liquidity ratio, also known as current ratio, is a measure that assesses a farm's capability to meet short-term financial obligations. A liquidity ratio below 1 indicates that the farm lacks adequate capital to meet its short-term liabilities if they were to become due concurrently. On the contrary, a liquidity ratio greater than 1 implies that the farm is tending to remain solvent in the short term. Though, the current ratio mirrors only a snapshot of the farm's liquidity status at

a definite moment and may not fully apprehend the farm's overall solvency, which can be more precisely measured through cash flow projections and related financial indicators.

The current ratio is calculated as:

$$\text{Liquidity Ratio} = \frac{Total\ current\ farm\ assets}{Total\ current\ farm\ liabilities} \qquad \text{Eq. 3.2}$$

A ratio of 1.5 would mean that for every $1.00 a business or farm operation owes in current liabilities it has $1.50 in current assets (if liquidated) to pay for those current liabilities. The current ratio is a relative measure, not an absolute dollar amount, and lenders typically prefer a ratio between 1.5:1 and 2:1 or higher (Investopedia, 2019). It indicates the liquidity condition of the borrowers.

Debt-asset ratio, also referred to as the debt ratio, is a leverage ratio that shows the percentage of assets financed through debt. A higher ratio implies a greater scale of leverage and financial risk. Lenders frequently use the debt-asset ratio to evaluate the level of debt, the borrower's ability to repay it, and the prospect of granting additional loans to the farm. Therefore, the debt-asset ratio shows the leverage conditions of the borrower. This ratio is measured as a percentage. The higher the percentage the more of a farm asset is owned by the bank or in short, the more debt the farm has. Any ratio higher than 30% puts a business or farm at risk and reduces the borrowing capacity that the farm has. A farm that has a high Debt-To-Asset ratio such as a .51 (51%) has 51% of the farm assets essentially owned by the bank and may be considered "highly leveraged". (Michigan State University Extension, 2011)

It can be calculated as:

$$\text{Debt to Asset ratio} = \frac{Total\ liabilities}{Total\ assets} \qquad \text{Eq. 3.3}$$

Return on Assets (ROA): ROA is a crucial financial metric that assesses a company's profitability in comparison to its overall assets. It offers insights into how well a company is utilizing its resources to create profits. A greater ROA indicates efficient use of assets, reflecting strong performance, whereas a lower ROA may suggest areas for enhancement in asset management or profitability strategies. A deeper insight into ROA can assist stakeholders in assessing operational efficiencies and making informed choices for future expansion. ROA is an indicator of Profitability and is calculated using data obtained from a farm operations Income Statement. Return on assets is expressed as a percentage. The higher the percentage, the greater the return on all assets invested in the business. The owner must determine whether this return justifies the investment of labor, management, and capital compared to other opportunities.

(Michigan State University Extension, 2011).

It is calculated as:

$$\text{ROA} = \frac{Net\ income}{Total\ assets} \qquad \text{Eq. 3.4}$$

Return on Equity (ROE): ROE is an essential financial indicator that assesses a company's profit in relation to the shareholders' equity that has been invested. It shows how efficiently a business is using its equity to produce profits. An elevated ROE indicates effective use of shareholder equity, showcasing robust financial performance, whereas a diminished ROE may reveal possible flaws in profitability or capital utilization approaches. ROE is a profitability metric calculated from data obtained from a farms' Income Statement. ROE is represented as a percentage, with a higher value signifying improved returns on the equity put into the farm operations. The essential question for the business owner is if the return warrants the investment of labor, management, and equity,

particularly when contrasted with alternative investment choices. (Michigan State University Extension, 2011). This is calculated as:

$$\text{ROE} = \frac{Net\ income}{Shareholder's\ equity} \qquad \text{Eq. 3.5}$$

The net income margin is a financial measure that shows how much of a farm's or business's revenue becomes profit after covering all expenses. It is calculated as a percentage, and the higher this percentage, the better. Essentially, the Net Income Ratio tells us how much income remains after all costs are deducted. For a business or farm to be considered financially strong, this ratio should be at least 20%. A ratio below 10% might suggest that the business is either spending too much on expenses or not making enough income through production and sales. If the margin is lower than desired, the business or farm should look into ways to reduce costs, improve marketing strategies, or increase efficiency and productivity to boost profits (Michigan State University Extension, 2011).

It is calculated as:

$$\text{Net income margin} = \frac{Net\ income}{Total\ revenue} * 100 \qquad \text{Eq. 3.6}$$

The Asset Turnover Rate (ATR) is measured as a percentage, the higher the percentage the stronger the business or farm. The Asset Turnover Rate essentially measures the efficiency of how farms' capital is being used. The ability to have high yields or production with lower input costs or overall expenses can generate a higher Asset Turnover Rate. An Asset Turnover Rate of 45% - 50% or higher means the farm or business is on strong footing with rate less than 30% - 35% means the

business or farm needs to look at methods to decrease their expenses and increase its production and may be more susceptible to market fluctuation. (Michigan State University Extension, 2011). It is calculated as:

$$\text{ATR} = \frac{Total\ revenue}{Total\ assets} \qquad \text{Eq. 3.7}$$

Earnings retention ratio (ERR): The ERR measures the proportion of a company's net earnings that is reserved for plowing back or reinvested in the farm business rather than distributing them to shareholders as dividends. A higher earnings retention ratio signals that a company is prioritizing growth and sustainable investments over immediate returns to shareholders, which could indicate a strategy focused on long-term development. On the contrary, a lower ratio might imply a system of higher dividend payouts. Realizing the earnings retention ratio is necessary for assessing a company's growth potential and financial strategy, providing awareness into how effectively a company is capitalizing on its earnings to promote expansion (Briggeman et al., 2022).

It is calculated as:

$$\text{ERR} = \frac{Retained\ earnings}{Net\ income} \qquad \text{Eq. 3.8}$$

Working capital ratio (WCR): The WCR specifically measures the amount of capital the business or farm has with relation to the farm or business' size. This ratio is measured as a percentage. The higher the percentage the more cash you have available to meet the short-term needs of the business or farm without the use of additional financing. Having a ratio above 25% puts a farm or business on strong footing. Anything less than that makes the farm or business at risk of needing financing to make it through the year due to market instability (Michigan State University Extension, 2011). It is calculated as:

$$\text{WCR} = \frac{Current\ assets}{Current\ liabilities} * 100 \qquad \text{Eq. 3.9}$$

b. Structural and Demographic attributes

Structural attributes, such as farm size, income size, capture the operational and financial structure of the farm, which directly impacts repayment capacity. Including these attributes follows Escalante, Maoyong and Akinleye (2024), who demonstrated that structural factors significantly influence variations in loan repayment among agricultural borrowers. Demographic attributes, such as race and income, provide additional context on borrower characteristics, offering a more comprehensive understanding of repayment behavior.

Total Assets: Total assets represent the sum value of all the resources owned by a business or farm that holds economic value. This includes assets like cash, equipment, land, and other property. Total assets offer a clear snapshot of what a company or individual owns at a specific moment and are commonly used in financial analysis to evaluate financial health and stability. The USDA Economic Research Service uses total assets as a measure of farm size (USDA Economic Research Service, 2023).

Non-farm income: Non-farm income shows the borrower's income from sources other than farming, which could influence their overall financial capacity and loan repayment ability. The USDA economic research considers this as an income size measure different from the income generated in the farm business (USDA Economic Research Service, 2023).

Age: This indicates the borrower's age; it is a continuous variable (expressed in years) to differentiate younger agricultural borrowers from older ones.

Marital Status Dummy: The marital status dummy implies the marital status of the farm loan borrower. It equals 1 if the borrower is married and 0 if they are not married.

Sex (Male) Dummy: The male dummy variable is a gender identifier for the official borrower of the FSA loan. It equals 1 if the borrower is male and 0 if the borrower is female.

Race dummies: Utilizing racial data (the variables of interest of this study), three dummy variables are generated for each category of race. The White American dummy variable equals 1 when the borrower is White and zero if otherwise. Similarly, the Black or African American dummy variable equals 1 when the borrower is Black or African American and zero if otherwise and lastly, the Hispanic dummy variable equals 1 if the borrower identifies as Hispanic and zero if otherwise.

3.4 Methodology

The multiple regression approach was chosen for this study because it effectively estimates the impact of various explanatory variables on loan repayment performance while controlling for other influencing factors. This method is particularly suitable as it allows for isolating the individual effects of key variables and other structural factors on repayment capacity, measured by the TDCR. The study specifically examined the impact of Non-Farm Income, Marital Status (Married), Sex (Male), Age, Age Square, Total Assets, Liquidity Ratio, Debt-to-Asset Ratio, ROA, ROE, Net Income Margin, ATR, ERR, Credit Score and WCR on loan repayment performance. Multiple regression analysis has been widely used in agricultural finance research to assess the determinants of loan repayment performance (Kaur, 2022).

The analysis was performed using Stata, a statistical software widely used for data management and regression analysis. This software was chosen for its robust capabilities in handling large datasets and conducting complex statistical analyses. The FSA borrower's dataset, containing these financial and demographic variables, was cleaned and pre-processed to ensure data accuracy and completeness. After the dataset was prepared, regression models were specified for each racial group, allowing us to examine how the explanatory variables affected loan repayment capacity.

To ensure the validity of the regression results, a test for correlation and multicollinearity was conducted. For instance, farm size and income showed potential correlation. This issue was addressed by assessing variance inflation factors (VIF) and correlation coefficients to confirm that multicollinearity was within acceptable limits, ensuring the robustness of the model's estimates. The use of VIF to detect and control multicollinearity is a well-established practice in regression analysis (O'Brien, 2007; Graham, 2003), further reinforcing the reliability of the model's outcomes.

3.5 Econometric Analysis

3.5.1 Model Specification

According to (Ghimire, Escalante and Dodson, 2020), The general form of the multiple regression model is defined as:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \ldots\ldots + \beta_k X_{ik} + \varepsilon_i \qquad \text{Eq. 3.10}$$

where Y_i is the dependent variable, X_i are the independent variables for the observation unit i, β represents the regression coefficients of the standardized variables that need to be estimated, and ε_i denotes the unobservable error terms which are assumed to be normally distributed.

3.5.2 Model Specification by Racial Subgroups

This section specifies the multiple regression models used for White, Black, and Hispanic borrower subgroups to identify the unique factors influencing TDCR.

We are going to include the independent variables that explain the factors that determine the financial performance and loan repayment capacity of borrowers written in this model form:

$$TDCR_i = \beta_0 + \beta_1 \log(\textit{Non-Farm Income}) + \beta_2 \textit{Marital Status} + \beta_3 \textit{Male} + \beta_4 \textit{AgeSq} + \beta_5 \log(\textit{Total Assets}) + \beta_6 \textit{Liquidity Ratio} + \beta_7 \textit{DebtToAssetsRatio} + \beta_8 \log(\textit{ROA}) + \beta_9 \log(\textit{ROE}) + \beta_{10} \textit{Net Income Margin} + \beta_{11} \textit{Asset Turnover Ratio} + \beta_{12} \textit{Earnings Retention} + \beta_{13} \textit{Credit Score} + \beta_{14} \textit{Working Capital} + \varepsilon_i$$

Eq. 3.11

CHAPTER 4

FINDINGS

4.0 Descriptive summary statistics

In this study, the FSA provided a direct lending dataset from 2004-2014, which was comprised of 108,563 loan observations. Table 4.1 contains the summary statistics of the variables used in this analysis, which only includes 16,511 of the original observations, as covariates with missing values and outliers were excluded. Moreover, this study's dataset is confined solely to sole proprietorships. The estimation model will be applied to three subsets of borrowers classified according to their racial/ethnic affiliation, namely, WHITE, BLACK, and HISPANIC borrowers.

4.1.1 Summary Statistics for Variables Used in the Model for ALL

The mean TDCR of 1.74 suggests that, on average, respondents have more than enough funds to cover their term debt obligations. This finding aligns with Carter and Janzen (2020), who emphasized that a TDCR above 1.0 indicates a strong ability to service debt, reducing financial risk and improving long-term sustainability. A higher TDCR implies that farmers have excess cash flow after meeting their loan payments, which can be reinvested into their farming operations for growth and expansion. While nonfarm income has a mean value of $29,261.16, This may limit the ability of the farmers to expand, reducing the revenue generated from their agricultural activities. The result shows that more than half of the respondents are married at 59.4%, this could be due to the emphasis on marriage by religious belief, socio-cultural belief and practices and the institutional arrangements.

Most of the respondents are male at 70.5% as shown in the result, this may be because farming required strength and is more demanding, as a result there are more male farmers than female (Escalante, Brooks & Epperson, 2018). The average age of the respondents is 40.13 years, indicating that most are in their prime working years, balancing physical capability with farming experience. Their maturity and financial awareness may enhance their ability to manage debt repayment effectively. This aligns with Carter and Janzen (2020), who found that financially experienced farmers tend to make better loan repayment decisions, ensuring long-term financial stability.

The total assets of respondents, including land, machinery, and personal property, have a mean value of $724,935.80, which is moderate relative to their financial obligations. White farmers have the highest assets ($732,137.30), followed by Hispanic ($632,173.60) and Black farmers ($322,627.50). In principle, these assets should be sufficient for debt repayment, provided they were not acquired through debt (Dodson & Koenig, 2003).

The mean liquidity ratio is at 2.32 as it follows the normal industry requirement of 2.0 as studied by Escalante, Brooks and Epperson, (2018). This indicates that the farmers will have enough cash to carry out their farming activities in the short term. The debt to asset ratio reflects the amount of debt owed as a percentage of total assets among the farmers. A debt to asset ratio of 49.38% indicates that the debt owed by the farmers accounts for nearly half of their total assets. This agrees with findings from Carter and Janzen (2020), who found that debt accounts for bulk of the assets owned by the farmers.

The mean ROA of 4.33% and ROE of 5.01% are relatively low compared to industry standards. Generally, a ROA of at least 5% is considered healthy, while ROE values above 10% indicate strong profitability (King, Rosenberg & Tanner, 2018). However, the values observed in this study

fall below these thresholds, suggesting that farmers may struggle to generate sufficient returns from their assets and equity, which could limit their ability to repay debts and reinvest in their farming operations.

Additionally, industry benchmarks indicate that the average ROE for the agricultural sector is approximately 15.33%, further highlighting the inefficient financial performance of respondents in this study (Damodaran, 2021). A lower ROA suggests that assets are not generating enough revenue, while a lower ROE implies lower returns for farm owners and investors.

The net income margin of 3% indicates that the farming activities are not profitable, this will reduce the ability of the farmers to generate revenue and undermine the ability to meet their basic needs and to pay back their debt.

The mean ATR of 0.44 indicates that for every unit of assets, farmers generate 0.44 times that amount in revenue. In agricultural finance, an ATR above 0.40 is generally considered efficient, as it reflects how effectively a farm converts its assets into revenue (Ghimire, Escalante & Dodson, 2020). However, the ATR can vary based on farm size, capital structure, and operational efficiency. A lower ATR suggests that a farm may have underutilized assets or higher capital investment relative to revenue generation, while a higher ATR indicates better asset productivity.

The mean ERR of 0.45 implies that 45% of net income is reinvested into farm operations, which is important for financial sustainability and debt repayment. Farms with higher ERR tend to reinvest more into capital improvements and expansion, while lower retention could indicate higher withdrawals for personal or non-farm expenses (King, Rosenberg & Tanner, 2018).

The mean credit score of 2.53 suggests that farmers maintain moderate creditworthiness, influencing their ability to secure financing at favorable rates. Higher credit scores typically reduce

borrowing costs and improve loan accessibility, while lower scores may indicate greater financial risk (Barry & Ellinger, 2022).

The mean WCR of 0.16 measures the farm's capacity to meet short-term financial obligations. Industry benchmarks suggest that a WCR of 2.0 or higher is preferable for maintaining financial flexibility and avoiding liquidity constraints (University of Minnesota Extension, 2023). A WCR below this level suggests limited short-term liquidity, meaning farmers may rely more on external financing or experience cash flow challenges.

Table 4.1. Descriptive Statistics for ALL

Variables	Mean	Standard Deviation
Dependent Variable		
Term debt coverage ratio	1.74	2.62
Explanatory Variables		
Nonfarm income ($ '000)	29261.16	43227.75
Marital status(married)	(59.4)	-
Sex (male dummy) (%)	(70.5)	-
Age (year)	40.13	13.37
Agesquare	1789.16	1198.74
Total assets ($ '000)	724935.8	903584.7
Current/liquidity ratio	2.32	5.31
Debt to asset ratio (%)	49.38	23.2
Return on assets (%)	4.33	12.54
Return on equity (%)	5.01	25.27
Net income margin (%)	0.034	9.81
Asset turnover ratio	0.44	1.02
Earnings retention	0.45	6.74
Credit score	2.53	0.97
Working capital ratio (%)	0.16	21.63

Source: Author's Computation (FSA Borrowers Dataset)

4.1.2 Summary Statistics for Variables Used in the Model for WHITE

From the results, the mean TDCR of 1.73 indicates that, on average, respondents have more than enough cash flow to cover their term debt obligations. According to Barry and Ellinger (2022), a TDCR above 1.0 signifies a strong debt repayment capacity, reducing financial strain and improving long-term financial sustainability. However, while high TDCR generally indicates lower financial risk, it may also suggest that farmers allocate a significant portion of their earnings toward debt repayment, potentially limiting funds available for reinvestment in their farming operations. The mean non-farm income of $29,228.49 appears modest when considering inflationary pressures and increasing living costs. Limited non-farm income may constrain respondents' ability to cover essential household expenses, leaving a minimal surplus for reinvestment in agricultural operations. According to Cheng, Lin and Liu (2015), higher nonfarm income enhances financial stability by diversifying income sources, thereby reducing reliance on farm revenue for debt repayment. A constrained nonfarm income stream may, therefore, restrict opportunities for farm expansion, limit capital investment, and ultimately lower the potential revenue generated from agricultural activities. The data shows that 59.5% of respondents are married. This high percentage may be attributed to religious beliefs, socio-cultural norms, and institutional arrangements emphasizing the importance of marriage in rural communities. 70.5% of the respondents are male, reflecting the physically demanding nature of farming, which often leads to a higher prevalence of male farmers compared to females. This gender disparity underscores the labor-intensive requirements of farming activities (Barry & Ellinger, 2022).

The average age of respondents is 39.97 years, suggesting that most participants are in their prime working years. This age group is mature and capable of engaging in various farming activities to support their families and generate income. The total assets mean value of $732,137.30 is modest,

considering it includes both farm and non-farm assets like land, machinery, and individual property. In a debt crisis, the liquidation of these assets may not sufficiently cover outstanding debts, indicating potential financial vulnerability.

The mean liquidity ratio of 2.33 suggests that respondents have sufficient short-term assets to meet their immediate financial and farming obligations, indicating strong short-term financial health. A liquidity ratio above 2.0 is generally considered favorable in agricultural finance, as it implies that farmers can cover their current liabilities with existing assets without immediate reliance on external financing (King, Rosenberg & Tanner, 2018). This financial position enhances operational flexibility, allowing farmers to manage unexpected expenses and maintain stable cash flow for farm operations. The mean debt-to-asset ratio of 49.57% indicates that nearly half of respondents' total assets are financed through debt, suggesting a significant reliance on borrowed capital. A higher debt-to-asset ratio generally signals increased financial leverage, which can be beneficial for growth but also poses financial risks, especially during economic downturns or periods of low farm income (Mishra, El-Osta & Johnson, 2009). Farmers with higher debt burdens may face greater challenges in securing additional financing and meeting repayment obligations, particularly if asset values decline or interest rates rise. The mean ROA of 4.43% and ROE of 5.14% suggest modest profitability levels, indicating that farmers' assets are not generating substantial returns. According to Escalante, Maoyong and Akinleye (2024), ROA above 5% and ROE exceeding 10% are typically considered strong indicators of financial performance in the agricultural sector. The observed values fall below these benchmarks, implying limited profitability and constrained revenue generation. As a result, farmers may struggle to accumulate sufficient income for debt repayment and reinvestment in their operations, potentially leading to increased financial vulnerability. The mean net income margin of 8% indicates limited

profitability in farming activities, reflecting their earnings relative to revenue. In agricultural finance, a higher net income margin suggests greater financial efficiency and sustainability, while a lower margin implies that a significant portion of revenue is consumed by operating costs (Barry & Ellinger, 2022). This constrains respondents' ability to meet financial obligations independently, increasing their dependence on external financing to sustain operations and expand their farming businesses. Persistently low margins may also hinder long-term investment in productivity-enhancing technologies, further limiting growth potential.

The mean ATR of 0.44 falls within the typical efficiency range of 0.35 to 0.50 for agricultural operations (Damodaran, 2021). This suggests that farmers are utilizing their assets at a reasonable level to generate revenue. While this may indicate prudent asset management, it could also reflect capital-intensive operations where high asset values contribute to a lower turnover rate (Carter, Song & Escalante, 2017). A higher ATR generally signifies greater operational efficiency, whereas a lower ATR may be associated with farms that require significant capital investment, limiting the rate of revenue generation. Similarly, the ERR of 0.44 indicates that respondents retain 44% of their net income for reinvestment, suggesting that a substantial portion of earnings is allocated to non-reinvestable expenses. According to Cheng, Lin and Liu (2015), higher ERR is essential for long-term financial stability, as it allows farmers to build reserves for future investments and debt repayment. A lower ERR may constrain financial flexibility, making it challenging to expand operations without external funding.

The mean credit score of 2.52 suggests that respondents have a relatively strong credit profile, enhancing their likelihood of securing loans from agricultural credit institutions. A higher credit score generally reflects better financial management and lower perceived lending risk, which can result in more favorable loan terms and improved access to credit facilities (Barry & Ellinger,

2022). This implies that lenders view these farmers as relatively creditworthy, increasing their chances of obtaining financial support for farm expansion and operational needs.

Conversely, the WCR of 0.16 indicates limited liquidity, suggesting that respondents may struggle to cover short-term financial obligations without relying on external financing. Industry benchmarks recommend a WCR of at least 2.0 for maintaining financial stability and ensuring smooth operational cash flow (University of Minnesota Extension, 2023). A low WCR restricts farmers' ability to self-finance farm activities, limiting their capacity to expand operations, invest in productivity-enhancing technologies, and withstand financial shocks.

Table 4.2. Descriptive Statistics for WHITE

Variables	Mean	Standard Deviation
Dependent Variable		
Term debt coverage ratio	1.73	2.58
Explanatory Variables		
Nonfarm income ($ '000)	29228.49	43393.67
Marital status (married) (%)	(59.5)	-
Sex (male dummy) (%)	(70.5)	-
Age (year)	39.97	13.2488
Agesquare	1772.97	1182.92
Total assets ($ '000)	732137.3	907209.9
Liquidity ratio	2.33	5.28
Debt to asset ratio (%)	49.57	23.12
Return on asset (%)	4.43	12.44
Return on equity (%)	5.14	25.18
Net income margin (%)	0.078	3.23
Asset turnover ratio	0.44	1.03
Earnings retention	0.44	6.66
Credit score	2.52	0.97
Working capital ratio (%)	0.16	21.89

Source: Author's Computation (FSA Borrowers Dataset)

4.1.3 Summary Statistics for Variables Used in the Model for BLACK

The mean TDCR of 2.06 suggests that respondents have sufficient capability of funds to meet their debt obligations, reflecting a strong repayment capacity. A TDCR above 1.0 generally indicates sufficient cash flow to cover loan payments, reducing default risk (Ahrendsen et al., 2011).

The mean non-farm income of $31,408.97 appears relatively modest, particularly in the context of rising inflation and increasing living costs. Limited nonfarm income restricts financial diversification, making respondents more reliant on farm income for debt repayment and household expenses. According to Barry and Ellinger (2022), higher non-farm income enhances financial stability and resilience, allowing farmers to invest in expanding farm operations and improving productivity. The lower levels observed in this study suggest that respondents may struggle to scale their agricultural activities, potentially limiting their long-term financial sustainability.

The percentage of married respondents of 50% highlights the balanced distribution in marital status. Marriage is often emphasized due to socio-cultural and institutional factors, which may influence household income dynamics and financial decisions. The result shows that 75% of respondents are male. This can be attributed to the physical demands of farming, which traditionally see higher male participation due to strength and endurance requirements. The mean age of respondents is 47.67 years, suggesting that most farmers fall within the mature and experienced age group. Research indicates that older farmers tend to have greater experience, better financial management skills, and more established farm operations, which can enhance efficiency and decision-making abilities (Allen, Delong & Saunders, 2004). However, an aging farming population may also pose challenges, such as reduced physical labor capacity and a lower likelihood of adopting innovative farming technologies (Ahrendsen et al., 2011). This demographic trend may influence both productivity levels and long-term farm sustainability.

The mean total assets of $322,627.50 encompass both farm and non-farm assets, including land, equipment, and housing. A lower asset base may limit financial security, as respondents may struggle to leverage their assets for additional credit or liquidity during financial distress.

According to Daniel (2013), asset ownership plays a critical role in farm resilience, and a constrained asset base could restrict debt repayment capacity and business expansion opportunities.

The mean current liquidity ratio of 1.61 reflects limited cash availability to cover short-term financial obligations, potentially hindering farmers from making timely investments in essential farm inputs. Industry benchmarks generally recommend a liquidity ratio above 2.0 for financial stability, as a lower ratio indicates a higher reliance on external financing to sustain operations (Coppess, 2021).

Additionally, the mean debt-to-asset ratio of 41.64% indicates that nearly 42% of respondents' total assets are financed through debt, exposing them to financial risk in the event of economic downturns. A higher debt-to-asset ratio suggests increased leverage, which can be beneficial for growth but also heightens vulnerability if asset values decline or interest rates rise (Blanchflower, Levine & Zimmerman, 2003). Farmers with limited asset value relative to debt may face constraints in securing additional credit and managing long-term financial stability.

The negative ROA of -1.03% and ROE of -2.21% suggest that respondents are incurring losses rather than generating returns from their assets and equity investments. This indicates operational inefficiencies and financial distress, implying that farmers' assets are not being utilized effectively to generate sufficient revenue (Briggeman et al., 2022). Negative ROA and ROE could also reflect high operating costs, low market prices for farm products, or suboptimal financial management strategies (Barry & Ellinger, 2022).

Similarly, the net income margin of -0.19 indicates that farming operations are unprofitable, meaning that expenses exceed revenue. This financial strain limits farmers’ ability to reinvest in their operations, expand production, or repay existing debt obligations (Damodaran, 2021).

Sustained negative profitability could force farmers to rely heavily on external financing, reduce operational efficiency, or exit farming altogether.

The ATR of 0.36 suggests that farmers generate $0.36 in revenue for every dollar invested in assets, which falls within the general efficiency benchmark of 0.35 to 0.40 for agricultural operations (King, Rosenberg & Tanner, 2018). The ERR of 1.10 suggests that farmers retain a portion of their earnings for reinvestment. However, this level may still fall short of supporting sustainable reinvestment in farming activities or strengthening financial resilience (Barry & Ellinger, 2022). ERR is crucial for financial stability, as it allows farmers to expand operations and reduce dependence on external financing.

The credit score of 2.92 suggests that respondents may have access to credit from financial institutions, as scores within the range of 2.5 to 3.5 are generally considered acceptable for loan approval in agricultural financing (Barry & Ellinger, 2022). The ability to secure favorable credit terms often depends on both creditworthiness and financial stability, making asset levels and income streams crucial determinants of borrowing capacity.

The WCR of -0.14 is negative, reflecting a lack of sufficient funds to manage operational expenses without relying on external credit. This suggests significant financial challenges, as respondents struggle to cover immediate costs and sustain farming activitie**s.**

Table 4.3. Descriptive Statistics for BLACK

Variables	Mean	Standard Deviation
Dependent Variable		
Term debt coverage ratio	2.06	4.37
Explanatory Variables		
Nonfarm income ($ ‘000)	31408.97	35174.78
Marital status (married) (%)	(50%)	-
Sex (male) (%)	(75%)	-
Age (year)	47.67	17.05
Agesquare	2562.69	1667.13
Total assets ($ ‘000)	322627.5	376114.1

Liquidity ratio	1.61	5.57
Debt to asset ratio (%)	41.64	26.44
Return on asset (%)	-1.03	15.30
Return on equity (%)	-2.21	28.66
Net income margin (%)	-0.19	1.95
Asset turnover ratio (%)	0.36	0.69
Earnings retention	1.10	10.75
Credit score	2.92	0.84
Working capital ratio (%)	-0.14	1.16

Source: Author's Computation (FSA Borrowers Dataset)

4.1.4 Summary Statistics for Variables Used in the Model for HISPANIC

The mean TDCR of 1.87 for Hispanic respondents exceeds the standard industry benchmark between 1.25 to 1.50, suggesting that they generate more than enough income to cover their term debt obligations (Michigan State University Extension, 2011). This places them in a relatively strong financial position regarding debt repayment.

The mean nonfarm income of $29,000.11 is below the industry benchmark, which suggests that nonfarm income should contribute at least 35% - 50% of total household earnings for financial stability (Mishra et al., 2021). This indicates that respondents may face challenges in meeting their basic needs and investing in farming activities, potentially limiting their ability to expand operations or increase revenue.

Marital status shows that 64.9% of respondents are married. This may be influenced by cultural and societal norms that emphasize the importance of marriage, especially in family-oriented agricultural communities (Dhakal et al., 2019).

The percentage of male respondents, 58.1%, reflects the physically demanding nature of farming activities, which often leads to more male participation compared to females in these roles. The average age of 45.4 years indicates that most Hispanic respondents are middle-aged, an age group

typically associated with the experience and maturity needed for effective farming but also the need for financial stability to support families and farm operations (Coppess, 2021).

The mean total assets of $632,173.60 reported in this study are moderate compared to the national average of $2.11 million for U.S. farms in 2022 (USDA Economic Research Service, 2023). While the USDA defines small family farms based on a Gross Cash Farm Income (GCFI) of less than $350,000 (USDA Economic Research Service, 2023), asset values within this category can vary. The mean total assets observed suggest that the farms in this study likely fall into the small to mid-sized farm range. However, the relatively low asset base might not be sufficient to sustain farming activities or repay debt during financial distress.

The current liquidity ratio of 3.05 exceeds the industry benchmark of 2.0, indicating that most respondents have sufficient short-term assets to cover their short-term liabilities, ensuring financial stability in the short term (Ghimire, Escalante & Dodson, 2020).

The debt-to-asset ratio of 41.47% falls within the typical agricultural industry range of 40-60%, indicating a reliance on external financing (King, Rosenberg & Tanner, 2018). While this suggests a manageable debt load, it also highlights potential financial vulnerability, as a significant portion of assets is leveraged. The ROA of 2.83% and ROE of 3.03% fall below the agricultural industry benchmark of 5-10% for ROA and 10-15% for ROE, suggesting suboptimal financial performance (Michigan State University Extension, 2011). These figures indicate that farming activities among Hispanic respondents are not generating strong returns on assets or equity, reflecting inefficiencies in asset utilization and limited profitability.

The net income margin of -5.17% indicates that respondents are operating at a loss, meaning their expenses exceed revenue. This is concerning, as industry benchmarks suggest a healthy net income margin for farms typically falls within the 5-20% range (Dixon et al., 2010). Negative margins

reduce the ability to reinvest in farming operations, limit financial resilience, and undermine debt repayment capacity, making long-term sustainability more challenging.

The ATR of 0.49 indicates how efficiently assets generate revenue. Industry benchmarks suggest that ATR in agriculture generally ranges between 0.40 and 0.80, depending on farm size and type (Carter, Song & Escalante, 2017). This value falls within the expected range, reflecting the relationship between asset investment and revenue generation. However, variations in farm structure, capital intensity, and market conditions may influence this measure.

The ERR value of -0.15 indicates that respondents are allocating more income to external obligations than reinvesting in their farming operations. Negative ERR suggests a reliance on external financing or personal withdrawals exceeding business profitability, which may hinder long-term financial sustainability (Barry & Ellinger, 2022).

A credit score of 2.67 falls within the range of 1 to 5, suggesting that respondents have a fair level of creditworthiness and may access credit facilities under standard lending conditions (Ahrendsen et al., 2011). This level of credit access could support operational financing.

Finally, the working capital ratio of 0.26 indicates constrained liquidity, reflecting limited funds available for daily operations and short-term obligations. According to Escalante, Maoyong and Akinleye (2024), a lower WCR suggests financial vulnerability, making it challenging for farmers to sustain operations without relying on external credit.

Table 4.4. Descriptive Statistics for HISPANIC

Variables	Mean	Standard Deviation
Dependent Variable		
Term debt coverage ratio	1.87	2.67
Explanatory Variables		
Nonfarm income ($ ‘000)	29000.11	36288.59
Marital status (married) (%)	(64.9%)	-

Sex (male dummy) (%)	(58.1%)	-
Age (year)	45.4	14.55
Agesquare	2274.80	1417.79
Total assets ($ '000)	632173.6	1014282
Liquidity ratio	3.05	8.09
Debt to asset ratio (%)	41.47	25.22
Return on asset (%)	2.83	15.59
Return on equity (%)	3.03	27.83
Net income margin (%)	-5.17	107.33
Asset turnover ratio	0.49	0.88
Earnings retention	-0.15	6.86
Credit score	2.67	1.20
Working capital ratio (%)	0.26	2.10

Source: Author's Computation (FSA Borrowers Dataset)

4.5 This section discussed the Multiple regression result of the factor affecting TDCR among ALL, WHITE, BLACK and HISPANIC racial groups.

Table 4.5. Multiple Regression Result of the factors affecting TDCR among different groups in America

VARIABLES	**(1) ALL**	**(2) WHITE**	**(3) BLACK**	**(4) HISPANIC**
Log (Non-Farm Income)	0.320***	0.321***	0.118	0.0126
	(0.0205)	(0.0207)	(0.250)	(0.240)
Marital Status (Married)	-0.0777	-0.0744	-0.884	-0.382
	(0.0510)	(0.0513)	(0.551)	(0.712)
Sex (Male)	0.247**	0.208*	4.763***	0.487
	(0.124)	(0.125)	(1.341)	(1.675)
Age square	5.34e-05***	5.65e-05***	0.000196	4.30e-06
	(1.96e-05)	(2.00e-05)	(0.000159)	(0.000207)
Log (Total Assets)	-0.110***	-0.109***	-0.284	0.784
	(0.0262)	(0.0266)	(0.249)	(0.544)
Liquidity Ratio	0.0751***	0.0809***	-0.0623**	0.0140
	(0.00494)	(0.00507)	(0.0306)	(0.0327)

Debt to Assets Ratio	-0.0123***	-0.0120***	-0.0392**	-0.0256*
	(0.00146)	(0.00148)	(0.0149)	(0.0148)
Log (Return on Assets)	0.214***	0.213***	-0.626	1.969***
	(0.0543)	(0.0547)	(0.696)	(0.706)
Log (Return on Equity)	0.117***	0.109***	1.631***	-0.0293
	(0.0364)	(0.0366)	(0.476)	(0.472)
Net Income Margin	2.917***	2.967***	-0.606	3.490**
	(0.169)	(0.171)	(1.537)	(1.726)
Asset turnover Ratio	0.347***	0.340***	0.964***	0.0891
	(0.0477)	(0.0495)	(0.310)	(0.192)
Earnings Retention	0.828***	0.877***	-1.559	-4.739**
	(0.129)	(0.130)	(1.089)	(2.242)
Credit score Total Overall	-0.336***	-0.326***	-0.586	-1.007***
	(0.0286)	(0.0288)	(0.384)	(0.315)
Working Capital Ratio	0.00433	0.00404	-0.257	-0.448*
	(0.0155)	(0.0156)	(0.184)	(0.260)
Constant	-0.504	-0.608*	5.930	-7.809
	(0.360)	(0.364)	(3.708)	(6.983)
Observations	16,511	16,310	114	87
R-squared	0.153	0.154	0.452	0.368

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Author's Computation (FSA Borrowers Dataset)

4.5.1 Multiple Regression Result of the factors affecting TDCR among different groups in America (ALL)

The factors affecting TDCR among different groups were estimated using their multiple regression model. A p-value of 0.0000 ($p<0.05$) for all the categories indicates that there is goodness of fit in the model. 14 variables were used in estimating the model, these are Non-Farm Income, Marital Status, Sex, Age square, Total Assets, Liquidity Ratio, Debt to Asset Ratio, ROA, ROE, Net Income Margin, ATR, ERR, Credit Score, and WCR. Out of which 12 are significant. These are Non-Farm Income, Sex, Age square, Total Assets, Liquidity Ratio, Debt to Asset Ratio, ROA, ROE, Net Income Margin, ATR, ERR and Credit Score.

As shown in the results (Table 4.5), a 1% increase in non-farm income leads to a 0.320 increase in the TDCR, significant at the 1% level. As shown in the results (Table 4.5), a 1% increase in non-farm income leads to a 0.320 increase in the TDCR, significant at the 1% level. This indicates that higher non-farm income enhances a farmer's ability to repay term debts. Furthermore, the analysis shows that Black borrowers have a higher average non-farm income, which may partly explain their relatively stronger repayment capacity compared to other racial groups. This finding aligns with the analysis by Escalante, Maoyong and Akinleye (2024), who emphasized the importance of non-farm income in improving repayment capacity. The implication is that additional income from nonfarm sources provides farmers with greater financial flexibility, thereby increasing their capacity to meet long-term debt obligations. Being male will lead to a 0.247 increase in TDCR compared to being female, significant at 5%. This indicates that male farmers have a higher ability to repay their debt in the long term compared to female farmers. This aligns with findings by Daniel (2013), who reported that male farmers often have better access to credit and resources, enhancing their repayment capacity compared to female farmers.

The result in Table 4.5 shows that a unit increase in age squared leads to a 0.000053 increase in TDCR, significant at the 1% level. The positive and significant coefficient for age squared suggests that as respondents grow older, their ability to repay debt improves more rapidly. This may be due to increased experience and better financial management skills acquired over time. Older farmers are also more likely to have diversified income streams, stronger relationships with financial institutions, and a more established asset base, which enhances their repayment capacity. For example, a farmer who is 10 years older is likely to have a more stable farm operation and improved access to credit, contributing to better financial performance and debt management (Wongnaa & Awunyo-Victor, 2013).

Total assets result indicates that a 1% increase in total assets leads to a 0.110 decrease in TDCR. This suggests that an increase in total assets contributes to a reduction in TDCR among respondents. This may be due to the presence of idle, obsolete, or unnecessary farm assets that inflate total asset values but do not contribute effectively to revenue generation. Assets such as outdated machinery, underutilized land, or depreciating equipment may increase total asset figures without enhancing financial performance. This finding aligns with Barry and Ellinger (2022), who noted that fixed assets with low liquidity could impede timely debt repayment. Additionally, the ATR result further supports this observation, as a lower ATR indicates inefficient utilization of assets in generating revenue. When farms accumulate assets that are not actively contributing to production, their ability to cover debt obligations weakens. Consequently, the presence of underperforming assets may reduce operational efficiency and contribute to a declining TDCR, as observed in the results.

The liquidity ratio result indicate that a unit increase in the liquidity ratio leads to a 0.0751 increase in the TDCR, significant at the 1% level. This suggests that as farmers improve their liquidity, their capacity to repay long-term debt also increases. This finding aligns with the analysis by the University of Minnesota Extension (2024), which emphasizes that a strong liquidity position enhances a farm's ability to meet debt obligations among ALL racial groups.

Debt-to-asset ratio, as shown in the results, a unit increase in the debt-to-asset ratio leads to a 0.0123 decrease in TDCR. This implies that as debt obligations increase relative to assets, the ability of respondents to repay their debt in the long-term declines. This finding aligns with Mishra, El-Osta and Johnson (2009), who examined farm debt repayment capacity and found that higher debt levels relative to assets can strain financial stability, reducing a farmer’s ability to service debt effectively. According to Subedi and Giri (2024), a debt-to-asset ratio exceeding 55% is often

considered a threshold indicating financial stress among farm businesses. Maintaining debt levels below this threshold is crucial for sustaining financial performance and repayment ability.

However, the effect of the debt-to-asset ratio on TDCR can go in either direction. A positive effect may indicate that the firm is still operating within an optimal debt level, where borrowing is strategically used to enhance productivity and revenue generation. At this stage, debt financing contributes to growth without significantly increasing financial risk. On the other hand, a negative effect suggests that respondents may have surpassed their optimal borrowing capacity of 55% (Subedi and Giri, 2024), At this point, additional borrowing may lead to higher transaction costs, increased debt servicing burdens, and reduced financial flexibility, ultimately weakening debt repayment capacity. This outcome reflects a situation where excessive leverage has begun to negatively impact financial stability, aggravating the firm's risk position and limiting its ability to manage long-term debt obligations effectively.

A unit increase in ROA leads to a 0.214 increase in the TDCR. This indicates that an increase in ROA enhances the respondent's ability to repay their long-term debt. This is likely because a positive ROA signifies business profitability, enabling farmers to secure the necessary funds to meet their long-term debt obligations (Damodaran, 2021).

ROE as shown in the results states that a unit increase in ROE leads to a 0.117 increase in the TDCR. This indicates that an increase in ROE contributes to an improved TDCR among respondents. This finding aligns with Escalante et al. (2018), who found that increased ROE contributes to higher TDCR across all three racial groups.

A unit increase in Net Income Margin leads to a 2.917 increase in TDCR. This indicates that an increase in Net Income Margin enhances the respondent's ability to repay long-term debt. This

finding aligns with Escalante et al. (2018), who found that an increased Net Income Margin enables farmers across all racial groups to secure the necessary funds to repay their long-term debt.

ATR result show that a unit increase in the ATR leads to a 0.347 increase in the TDCR. This finding suggests that as farmers utilize their assets more efficiently to generate revenue, their ability to meet long-term debt obligations improves. This could be because a higher ATR signifies better operational efficiency, which may translate into higher revenue and better debt servicing capacity (King, Rosenberg & Tanner, 2018).

ERR result show that a unit increase in Earnings Retention leads to a 0.828 increase in the Term Debt Coverage Ratio (TDCR). This suggests that retaining more earnings enhances the farmer's ability to repay debts over the long term. (Briggeman, Gunderson & Detre, 2022) found out that retained earnings serve as an internal source of funding, reducing dependency on external borrowing and enhancing financial stability.

Credit Score result show that a unit increase in the credit score leads to a 0.336 decrease in the TDCR. This negative relationship suggests that respondents with higher credit scores may be securing more loans due to their favorable credit standing, which could reduce their immediate debt coverage ratio. Additionally, it may indicate that farmers with higher credit scores are leveraging their credit to invest in business expansion, which could temporarily lower funds available for debt repayment (Escalante, Maoyong & Akinleye, 2024).

4.5.2. Multiple Regression Result of the factors affecting TDCR among different groups in America (WHITE).

The factors affecting TDCR among different groups were estimated using their multiple regression model. A p-value of 0.0000 ($p<0.05$) for WHITE categories indicates that there is goodness of fit

in the model. 14 Variables were used in estimating the model, these are Non-Farm Income, Marital Status, Sex, Age square, Total Assets, Liquidity Ratio, Debt to Asset Ratio, ROA, ROE, Net Income Margin, ATR, ERR, Credit Score, and WCR, out of which 12 are significant. These are Non-Farm Income, Sex, Age square, Total Assets, Liquidity Ratio, Debt to Asset Ratio, ROA, ROE, Net Income Margin, ATR, ERR and Credit Score.

As shown in the results (Table 4.5), a 1% increase in non-farm income leads to a 0.321 increase in the TDCR, significant at the 1% level. This indicates that higher nonfarm income enhances a farmer's ability to repay term debts. This finding aligns with the analysis by Escalante et al., (2018), who emphasized the importance of nonfarm income in improving repayment capacity. The implication is that additional income from nonfarm sources provides farmers with greater financial flexibility, thereby increasing their capacity to meet long-term debt obligations across WHITE racial groups.

Being male will lead to a 0.208 increase in TDCR compared to being female, significant at 10%. This indicates that male farmers have a higher ability to repay their debt in the long term compared to female farmers. This aligns with findings by Escalante, Epperson and Raghunathan (2009), who reported that male farmers, particularly among the White racial group in America, often have better access to credit and resources, enhancing their repayment capacity compared to female farmers.
Age square refers to the lifetime effect of age on TDCR among the respondents. In other words, it captures the impact of age on TDCR over time. The result in Table 4.5 shows that a unit increase in age square leads to a 0.000056 increase in TDCR, significant at 1%. The positive and significant coefficient for age squared suggests that as respondents grow older, their ability to repay debt improves more rapidly. This may be due to increased experience and better financial management skills as they age. This finding aligns with Kaur (2022), who reported that older farmers,

particularly among the White racial group in America, tend to have improved debt repayment capacity due to accumulated experience and financial stability.

Total Assets as shown in the result indicate that a 1% increase in total assets leads to a 0.109 decrease in TDCR, suggesting that greater asset accumulation is associated with lower debt repayment capacity. A possible explanation for this inverse relationship is that while higher total assets reflect increased wealth, they may also correspond to increased fixed costs, maintenance expenses, and financial commitments, which can constrain available cash flow for immediate debt repayment. Additionally, asset accumulation does not necessarily translate into liquid financial resources. Farmers may hold idle, obsolete, or underutilized assets that inflate total asset values but do not contribute significantly to revenue generation. This finding aligns with Briggeman, Towe and Morehart (2009), who highlighted that increased asset accumulation, particularly among certain demographic groups, can sometimes limit financial flexibility and strain repayment capacity.

Furthermore, the relationship between total assets and TDCR should be examined in conjunction with the ATR. A low ATR alongside high total assets suggests that respondents may not be efficiently utilizing their assets to generate revenue, reinforcing the observed decline in debt repayment capacity.

The liquidity ratio result indicates that a unit increase in the liquidity ratio leads to a 0.0809 increase in the TDCR, significant at the 1% level. This suggests that as farmers improve their liquidity, their capacity to repay long-term debt also increases. A possible reason for this positive relationship is that higher liquidity allows farmers to cover unexpected expenses and maintain stable financial operations, reducing the need to take on additional short-term debt that could otherwise constrain their ability to service long-term obligations. This finding aligns with

Escalante et al. (2018), who emphasized that a strong liquidity position enhances a farm's ability to meet debt obligations, particularly among the White racial group in America.

The Debt-to-Asset Ratio result show that a unit increase in the debt-to-asset ratio leads to a 0.0120 decrease in TDCR, suggesting that higher debt obligations relative to assets are associated with reduced long-term debt repayment capacity. A possible reason for this negative relationship is that as debt levels rise, financial strain increases, requiring a larger portion of earnings to be allocated toward interest and principal repayments. This reduces the available cash flow for long-term debt servicing and other operational investments. However, the effect of the debt-to-asset ratio on TDCR can be context-dependent. At moderate levels, debt can provide financial leverage that supports farm expansion and productivity, but excessive borrowing beyond optimal levels may lead to increased financial vulnerability. This finding aligns with Koenig, Dodson and Sullivan (1999), who analyzed farm debt repayment capacity and found that a high debt-to-asset ratio can undermine financial stability, particularly among White farmers in the U.S., by limiting their ability to manage and repay long-term debt effectively.

A unit increase in ROA leads to a 0.213 increase in the TDCR. This indicates that an increase in ROA enhances the respondent’s ability to repay their long-term debt. A possible reason for this positive relationship is that higher profitability improves cash flow, allowing farmers to allocate more funds toward debt repayment while maintaining financial stability. This finding aligns with Escalante et al. (2018), who highlighted that improved farm profitability strengthens long-term debt repayment capacity, particularly among the White racial group in America.

The ROE result show that a unit increase in ROE leads to a 0.109 increase in the TDCR. This indicates that an increase in ROE contributes to an improved TDCR among respondents. A possible reason for this positive relationship is that higher ROE reflects greater profitability and

efficient use of equity capital, which strengthens financial stability and reduces reliance on external borrowing. As a result, farmers with higher ROE have more retained earnings and improved cash flow, enabling them to service their long-term debt more effectively. This finding aligns with Escalante et al. (2018), who found that increased ROE contributes to higher TDCR among the White racial group in America.

A unit increase in Net Income Margin leads to a 2.967 increase in the TDCR. This indicates that an increase in Net Income Margin enhances the respondent's ability to repay long-term debt. A possible reason for this positive relationship is that a higher Net Income Margin reflects stronger profitability and operational efficiency, allowing farmers to accumulate more cash flow. This financial surplus reduces the need for additional borrowing and increases their ability to meet long-term debt obligations. This finding aligns with Ghimire, Escalante and Dodson (2020), who found that an increased Net Income Margin enables farmers, particularly among the White racial group in America, to secure the necessary funds to repay their long-term debt.

The ATR results show that a unit increase in the ATR leads to a 0.340 increase in the TDCR. This finding suggests that as farmers utilize their assets more efficiently to generate revenue, their ability to meet long-term debt obligations improves.

This could be because higher ATR signifies better operational efficiency, which may translate into higher revenue and better debt servicing capacity among the WHITE racial group (Escalante, Brooks & Epperson, 2018).

The ERR result show that a unit increase in ERR leads to a 0.877 increase in the TDCR. This suggests that retaining more earnings enhances the farmer's ability to repay debts over the long term. Briggeman, Gunderson and Detre (2022) found out that retained earnings serve as an internal

source of funding, reducing dependency on external borrowing and enhancing financial stability among the WHITE racial group.

Credit Score Total Overall is a numerical representation of creditworthiness, indicating a borrower's ability to repay debts based on their financial history and risk profile. The results show that a unit increase in the credit score leads to a 0.326 decrease in the TDCR. This negative relationship suggests that respondents with higher credit scores may be securing more loans due to their favorable credit standing, which could reduce their immediate debt coverage ratio. Additionally, it may indicate that farmers with higher credit scores are leveraging their credit to invest in business expansion, which could temporarily lower the funds available for debt repayment (Ross, 1997).

4.5.3. Multiple Regression Result of the factors affecting TDCR among different groups in America (BLACK)

The factors affecting TDCR among different groups were estimated using their multiple regression model. A p-value of 0.0000 ($p<0.05$) for BLACK categories indicates that there is goodness of fit in the model. The model has a R-square value of 0.452. This indicates that the independent variables contributed 45.2% to the changes that took place in the dependent variable. In other words, the predictors accounted for 45% of the variation that took place in the model. 14 variables were used in estimating the model, these are Non-Farm Income, Marital Status, Sex, Age square, Total Assets, Liquidity Ratio, Debt to Asset Ratio, ROA, ROE, Net Income Margin, ATR, ERR, Credit Score, and WCR. Out of which 5 are significant. These are Sex, Liquidity Ratio, Debt to Asset Ratio, ROE and ATR.

Being male leads to a 4.763 increase in TDCR compared to being female, with statistical significance at the 1% level. This suggests that male farmers exhibit a higher ability to repay their long-term debt compared to female farmers. Several factors may contribute to this disparity, including greater access to financial resources, land ownership, and farming equipment. Additionally, male farmers are more likely to engage in labor-intensive farming activities that enhance productivity and income, thereby improving their repayment capacity.

However, beyond access to resources, historical and institutional biases have contributed to financial disparities between male and female farmers. Studies, such as Escalante, Epperson and Raghunathan (2009), highlight those African American women farmers have faced systemic discrimination in credit access, loan approvals, and financial assistance, limiting their ability to invest in productivity-enhancing inputs. Such structural challenges may further explain the observed gender gap in debt repayment capacity among socially disadvantaged farm borrowers.

The liquidity ratio results indicate that a unit increase in the liquidity ratio leads to a 0.0623 decrease in the TDCR, significant at the 5% level. This suggests that as liquidity increases, the ability of Black farmers to repay long-term debt decreases. A possible reason for this negative relationship is that higher liquidity may encourage Black farmers to prioritize short-term operational expenses or retain cash reserves as a financial safety net, rather than allocating funds toward debt repayment. This finding aligns with Carter and Janzen (2020), who noted that minority farmers, including Black farmers, often retain liquid assets to mitigate financial uncertainty, which can reduce their immediate debt repayment capacity.

The Debt-to-Asset Ratio results indicate that a unit increase in the debt-to-asset ratio leads to a 0.0392 decrease in the TDCR, significant at the 5% level. This suggests that as debt obligations increase relative to assets, Black farmers' ability to repay long-term debt declines. A possible

reason for this negative relationship is that higher debt levels increase financial strain, as more income must be allocated toward interest and principal payments, reducing funds available for long-term debt servicing.

Additionally, Black farmers may face higher borrowing costs or limited access to favorable loan terms, further exacerbating repayment challenges.

Research by Ghimire, Escalante and Dodson (2020) found that minority borrowers, including Black farmers, often receive loans with higher interest rates and shorter maturities, which can strain their financial stability and reduce their ability to service debt effectively.

The ROE results indicate that a 1% increase in ROE leads to a 1.631 increase in the TDCR, significant at the 1% level. This suggests that as ROE increases, Black farmers' ability to repay long-term debt improves. A plausible reason for this positive relationship is that higher ROE reflects stronger financial performance and increased profitability, allowing farmers to accumulate earnings that can be used for debt repayment. Additionally, since Black farmers historically face limited access to external credit, they may rely more on internal capital like ROE to service their long-term debt obligations. This finding aligns with Escalante et al. (2018), who found that Black farmers with higher profitability and strong equity positions have better financial resilience, reducing reliance on external borrowing and improving debt repayment capacity.

The ATR result indicates that a 1 unit increase in the ATR leads to a 0.964% increase in the TDCR, significant at the 1% level. This suggests that as Black farmers improve asset efficiency, their ability to repay long-term debt strengthens. A possible reason for this positive relationship is that higher asset turnover signifies better operational efficiency and revenue generation, leading to increased cash flow available for debt repayment. This finding aligns with Carter and Janzen

(2020), who found that minority farmers, including Black farmers, often rely on optimizing asset utilization to overcome financial constraints and enhance debt repayment capacity.

4.5.4. Multiple Regression Result of the factors affecting TDCR among different groups in America (HISPANIC)

The factors affecting TDCR among diverse groups were estimated using their multiple regression model. A p-value of 0.0012 ($p<0.05$) for HISPANIC categories indicates that there is goodness of fit in the model. The model has an R-square of 0.368 which implies that the predictors accounted for 36.8% of the variation in the model. 14 Variables were used in estimating the model, these are Non-Farm Income, Marital Status, Sex, Age square, Total Assets, Liquidity Ratio, Debt to Asset Ratio, ROA, ROE, Net Income Margin, ATR, ERR, Credit Score, and WCR, Net Income Margin, Asset Turnover Ratio, Earnings Retention, Credit Score, and Working Capital Ratio, out of which 6 are significant. These are Debt to Asset Ratio, ROA, Net Income Margin, ERR, Credit Score and WCR.

The debt-to-asset ratio results indicate that one unit increase in the debt-to-asset ratio leads to a 0.0256 decrease in the TDCR, significant at the 10% level. This suggests that as debt obligations increase relative to assets, Hispanic farmers' ability to repay long-term debt declines. A possible reason for this negative relationship is that higher leverage reduces financial flexibility, as more income must be allocated toward debt servicing rather than reinvestment or operational expenses. Additionally, Hispanic farmers may face structural barriers, such as limited access to credit and higher interest rates, which increase financial strain and reduce their ability to manage long-term debt effectively. This finding aligns with Cheng, Lin and Liu (2015), who found that minority

farmers, including Hispanic farmers, often have higher debt-to-asset ratios due to restricted access to traditional financing, leading to greater financial stress.

The ROA results indicate that a 1% increase in ROA leads to a 1.969 increase in the TDCR, significant at the 1% level. This suggests that as profitability improves, Hispanic farmers' ability to repay long-term debt strengthens. A possible reason for this positive relationship is that the higher ROA reflects better financial performance, increasing cash flow available for debt repayment. Additionally, Hispanic farmers with greater profitability may have better access to credit and financial resources, allowing them to allocate earnings efficiently toward debt servicing. This finding aligns with Escalante et al. (2018) who noted that higher ROA allows farmers to build financial resilience, reducing reliance on external borrowing and strengthening debt repayment capacity.

The Net Income Margin result indicate that a unit increase in Net Income Margin leads to a 3.490 increase in the TDCR, significant at the 5% level. This suggests that as Hispanic farmers achieve higher profitability, their ability to repay long-term debt improves significantly. A possible reason for this positive relationship is that a higher Net Income Margin indicates stronger financial health, allowing farmers to accumulate more cash flow and allocate more funds toward debt repayment. Additionally, profitability may improve access to credit, providing Hispanic farmers with better financial flexibility to manage and reduce long-term debt. This finding aligns with Escalante et al. (2018) who found out that farms with higher net income margins are better positioned to meet long-term financial obligations due to increased financial security.

The ERR result indicates that a unit increase in ERR leads to a 4.739 decrease in the TDCR, significant at the 5% level. This suggests that as Hispanic farmers retain more earnings, their ability to repay long-term debt decreases. A likely reason for this negative relationship is that instead of

using retained earnings for debt repayment, farmers may prioritize reinvestment in farm expansion, equipment purchases, or operational improvements, temporarily reducing the cash flow available for servicing debt. This finding aligns with Mishra, El-Osta and Johnson (2009), who found that retained earnings are often reinvested into farm operations rather than used for debt servicing, particularly among minority farmers with restricted access to credit.

The Credit Score results indicate that a unit increase in credit score leads to a 1.007 decrease in the TDCR, significant at the 1% level. This suggests that as Hispanic farmers achieve higher credit scores, their ability to repay long-term debt decreases. A possible reason for this negative relationship is that farmers with higher credit scores may secure more loans due to their favorable credit standing, increasing their overall debt burden and temporarily reducing their immediate repayment capacity. Also, Hispanic farmers with strong credit profiles may leverage their credit to expand their operations or invest in capital-intensive assets, which could lower short-term liquidity for debt repayment. This finding aligns with Mishra, El-Osta and Johnson (2009), who found that higher credit scores often lead to increased borrowing among farmers, which can reduce short-term debt coverage despite overall financial stability.

The WCR result indicates that a unit increase in the working capital ratio leads to a 0.448 decrease in the TDCR and is significant at the 10% level. This suggests that as Hispanic farmers maintain higher WCR, their ability to repay long-term debt declines. A possible reason for this negative relationship is that farms with higher WCR may prioritize reinvesting in operational expenses, short-term obligations, or business expansion rather than allocating funds toward long-term debt servicing.

In addition, Hispanic farmers facing financial constraints may use available working capital to cover immediate production costs instead of repaying long-term debt. This finding aligns with

Mishra, El-Osta and Johnson (2009), who found that while higher working capital improves short-term liquidity, it does not always translate into stronger long-term debt repayment capacity, particularly for farmers managing high operational expenses. Similarly, Briggeman, Towe & Morehart (2009) noted that higher working capital may indicate financial caution rather than a direct focus on reducing long-term debt obligations.

CHAPTER 5

DISCUSSIONS

The objective of this study was to analyze the factors influencing loan repayment capacity, as measured by the TDCR, among SDA farmers under the FSA lending program. The study utilized data from the FSA Borrowers Dataset, which included key financial and demographic variables. The data analysis involved running multiple regression models for different racial groups: ALL, WHITE, BLACK, and HISPANIC, to assess the impact of factors such as non-farm income, marital status, gender, age, total assets, liquidity ratio, debt-to-asset ratio, ROA, ROE, net income margin, ATR, ERR, credit score, and WCR on TDCR.

The descriptive results of this study reveal that TDCR levels vary across racial groups, with Black farmers having the highest mean TDCR at 2.06, followed by Hispanic farmers at 1.89, and White farmers at 1.73. This suggests that Black farmers are most likely to repay their debts on time, followed by Hispanic farmers, while White farmers are comparatively less likely to do so.

From Table 4.5, the regression results showed significant differences in financial determinants across racial groups. Age square was positive and significant for ALL and WHITE farmers but not significant for BLACK and HISPANIC farmers. Liquidity ratio was positive and significant for ALL and WHITE farmers but negative and significant for BLACK farmers. Debt-to-asset ratio was significant for ALL, WHITE, BLACK, and HISPANIC farmers but had a stronger negative effect on TDCR for BLACK and HISPANIC farmers compared to WHITE farmers. ROE was positive and significant for BLACK farmers but not significant for HISPANIC farmers.

Net income margin was significant and positive for ALL, WHITE, and HISPANIC farmers but not significant for BLACK farmers. ATR was significant and positive for ALL, WHITE, and BLACK farmers but not significant for HISPANIC farmers. ERR was positive and significant for ALL and WHITE farmers but negative and significant for HISPANIC farmers. Credit score was negative and significant for ALL, WHITE, and HISPANIC farmers but not significant for BLACK farmers. WCR was significant and negative for HISPANIC farmers but not significant for other groups. Sex (Male) was positive and significant for ALL and WHITE farmers at lower significance levels but significant for BLACK farmers. Non-farm income was significant for ALL and WHITE farmers but not significant for BLACK or HISPANIC farmers. Total assets were negative and significant for ALL and WHITE farmers but not significant for BLACK or HISPANIC farmers.

Furthermore, the study reveals that the variables that significantly influence TDCR across racial groups differ. In the ALL category, age square, liquidity ratio, ROA, net income margin, and ATR had a positive and significant impact on TDCR, while debt-to-asset ratio and credit score had a negative and significant effect. Among WHITE farmers, age square, liquidity ratio, ROE, net income margin, ATR, and ERR positively influenced TDCR, whereas debt-to-asset ratio and credit score had a negative effect. For BLACK farmers, ROE, ATR, and sex (male) were positive and significant, while liquidity ratio and debt-to-asset ratio negatively affected TDCR. Among HISPANIC farmers, return on assets and net income margin were positively significant, while ERR, debt-to-asset ratio, credit score, and WCR had a negative effect on TDCR.

Table 5.0 Summary Table Based on Regression Result

Variables	ALL	WHITE	BLACK	HISPANIC
Non-Farm Income	S	S	NS	NS
Marital Status (Married)	NS	NS	NS	NS
Sex (Male)	S	S	S	NS
Age square	S	S	NS	NS
Total Assets	S	S	NS	NS
Liquidity Ratio	S	S	S	NS
Debt to Assets Ratio	S	S	S	S
Return on Assets	S	S	NS	S
Return on Equity	S	S	S	NS
Net Income Margin	S	S	NS	S
Asset Turnover Ratio	S	S	S	NS
Earnings Retention	S	S	NS	S
Credit Score	S	S	NS	S
Working Capital Ratio	NS	NS	NS	S

S – Significant at the 1%, 5% or 10% level

NS – Not significant

Tables 4.2 to 4.4 present the descriptive statistics for WHITE, BLACK, and HISPANIC borrowers, highlighting notable differences in loan repayment capacity and financial performance.

BLACK farmers have the highest mean TDCR at 2.06, indicating stronger repayment capacity compared to WHITE (1.73) and HISPANIC (1.87) farmers. This suggests that BLACK farmers are more likely to meet their debt obligations despite having the lowest average total assets ($322,627.50) compared to WHITE ($732,137.30) and HISPANIC ($632,173.60) farmers. The lower debt-to-asset ratio for BLACK farmers (41.64%) compared to WHITE farmers (49.57%) and HISPANIC farmers (41.47%) reflects a more conservative debt structure among BLACK farmers.

Interestingly, BLACK farmers also report the highest credit score (2.92) compared to HISPANIC (2.67) and WHITE (2.52) farmers, which could explain their stronger repayment performance

despite lower asset levels. However, BLACK farmers have negative returns on assets (-1.03%) and equity (-2.21%), suggesting that profitability challenges may be offset by better debt management practices.

HISPANIC farmers report the highest liquidity ratio (3.05) and asset turnover ratio (0.49), indicating more efficient asset utilization and stronger cash flow management. In contrast, WHITE farmers have the highest average non-farm income ($29,228.49) and total assets but shows a lower TDCR, indicating that higher assets and income do not necessarily translate to better repayment capacity.

CHAPTER 6

SUMMARY AND CONCLUSION

This study investigated the loan repayment performance and financial outcomes of SDA under the USDA FSA program. It focused on analyzing whether lending terms loan amount, interest rate, and loan maturity differ among SDA groups and how these variations influence repayment performance and overall financial stability. The research aimed to address potential biases in loan term packaging and identify structural and economic barriers that may impact loan repayment capacity.

The study utilized the USDA FSA national dataset from 2004 to 2014, which includes borrower financial performance indicators and demographic attributes. The focus on SDA farmers reflects the need to address historical and structural disparities in agricultural credit markets.

The analysis of agricultural credit markets reveals significant historical and structural disparities in loan access and terms among racial groups. The findings indicate that Black and Hispanic farmers, despite facing less favorable loan terms compared to White farmers, exhibit healthier financial profiles. Specifically, Black and Hispanic farmers have higher credit scores and stronger repayment capacity, as evidenced by their higher TDCR. This suggests that these farmers are, in some cases, better positioned to manage and repay debt, even though they receive smaller loan amounts and face higher interest rates.

Despite these strengths, the study shows that higher debt-to-asset ratios, and lower ROA and ROE, remain significant predictors of repayment challenges, particularly among minority farmers. In addition, lower credit scores and limited financial literacy further exacerbate these repayment

issues. Interestingly, female farmers especially those from racial minority groups were found to receive smaller loan amounts, shorter loan maturities, and higher interest rates, highlighting the combined effects of racial and gender biases in the agricultural lending process.

This analysis emphasizes that while Black and Hispanic farmers may demonstrate stronger financial stability compared to White farmers, the systemic biases in the credit market continue to constrain their access to capital and fair lending terms. The implications of these findings highlighted the need for more equitable lending practices and policies that account for these disparities, enabling minority farmers to access the resources they need to grow and succeed.

An important caveat to this study's findings could be the dataset's relatively small sample sizes for Black and Hispanic farmers. As the econometric modeling framework required, the entire FSA borrower dataset was filtered and cleaned to remove observations with either outlier or missing values. This data cleaning procedure, while important for producing sound estimation results, could possibly result in some selection bias where farm borrowers that maintain complete financial records that remain in this study's dataset could be the better business and financial managers. Hence, future investigations should aim to address this issue to produce definitive conclusions on the repayment capacity of SDA farmers.

The study's findings carry substantial policy implications, particularly for improving financial inclusion among disadvantaged farmers. Despite receiving less favorable loan terms, Black and Hispanic farmers generally demonstrate stronger financial profiles compared to White farmers. Their higher credit scores, stronger repayment capacity, and more favorable TDCR suggest that with the right support, they can achieve better financial performance.

Taking all these into consideration, policymakers should consider strengthening financial literacy

programs and providing targeted support to these groups to build on their strengths and improve financial outcomes. Expanding access to flexible repayment structures that account for market volatility, particularly for beginning and minority farmers, is crucial to mitigating repayment risks. Interventions, such as adjusting loan terms to better reflect the realities of agricultural market fluctuations, would provide these farmers with the stability they need to thrive. Moreover, providing additional support tailored to SDA groups, including training and mentorship programs, could help Black and Hispanic farmers optimize their financial management and further enhance their repayment capacity.

Increasing transparency in loan approval processes and expanding government-backed loan programs that specifically cater to minority and beginning farmers would address structural barriers that continue to hinder access to capital. This approach would enhance financial inclusion and create a more level playing field for SDA farmers, ensuring they can access the financial resources necessary for growth and sustainability.

In conclusion, this study emphasizes the need for more fair, equitable and inclusive credit policies aimed at enhancing the financial sustainability of SDA farmers. Despite facing barriers such as higher interest rates and smaller loan amounts, Black and Hispanic farmers have the financial potential to perform as well as, or better than, White farmers, particularly when financial indicators like credit scores and debt-to-asset ratios are considered. By addressing these inequalities in loan terms and improving access to financial resources, policymakers can strengthen repayment capacity and foster long-term financial stability among disadvantaged farming communities. Ultimately, a more inclusive and fair credit system will empower Black, Hispanic, and other minority farmers, enhancing their ability to thrive in a competitive agricultural economy.

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