CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Behavioral Drivers for Adoption of Conservation Agriculture Practices Among Albanian Smallholder Farmers

MASTER'S THESIS

Prague 2022

Author: Peter Maes

Chief supervisor: doc. Ing. Miroslava Bavorová, Ph.D.

Declaration

I hereby declare that I have completed this thesis entitled “Behavioral Drivers for Adoption of Conservation Agriculture Practices Among Albanian Smallholder Farmers” independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague, 22nd April 2022

.....

Peter Maes

Acknowledgements

I would like to thank Drini & Edvin for their incredible hospitality as hosts in Tirana. My supervisor Miroslava Bavorová for her unending patience, kindness, and helpfulness. Irena, Indri, and the rest of the Albanian team for so much help on the ground in Albania and their incredible work completing over 200 surveys in a short period of time. Kate Vaiknoras of Virginia Tech for her help with understanding her research which some of mine was inspired by. Additionally, the International Relations office at CZU for the mobility grant to finance my research. Ilona Marková and study department for their kind help over the years for all the bureaucratic matters. Finally, to everyone else who I may have forgotten to mention – you know who you are, and I love and appreciate you.

Abstract

Smallholder farmers dominate the Albanian agricultural landscape and are a key component of nutrition and land conservation efforts worldwide. Intensive industrial agriculture is contributing to the problem of extensive loss of arable soil annually worldwide, as well as to climate change. Conservation Agriculture (CA) is an adaptable methodology that is supported by the FAO to help alleviate these issues while improving soil health and contributing to sustainable livelihoods. This thesis is focused on the current level of CA practices and the drivers or constraints for adoption in Albania.

Key words: Conservation Agriculture, Adoption, Behavior Economics, Smallholder farmer, Albania

1. Table of Contents

List of tables

List of figures

List of the abbreviations used in the thesis

CA - Conservation Agriculture

DCE - Discrete Choice Experiment

FAO – Food and Agriculture Organization of the United Nations

HH – Household

INSTAT – Institute of Statistics of Albania

OR - Odds Ratio

RUT – Random Utility Theory

SPSS - Statistical Package for the Social Sciences

TPB – Theory of Planned Behavior

UBT - Agricultural University of Tirana (Universiteti Bujqësor i Tiranës)

WHO – World Health Organization

1. Introduction

Agriculture is a key pillar of human civilization, as it provides sustenance for billions of people around the globe in addition to providing an economic livelihood for a significant proportion. While modern advances in agricultural methods and technology have kept up with the explosive growth in the human population over the past century, the sustainability of current methods to carry on with future demand without exhausting the available natural resources is increasingly being called into question. Official population estimates provided by the United Nations project global population numbers to reach nearly 10 billion by the year 2050 (United Nations Department of Economic and Social Affairs Population Division 2019). Estimates for the required increase in agricultural output to feed this growing population range from 25-75% (Hunter et al. 2017) to over 100% (Ray et al. 2013) of current levels. Meanwhile, the Intergovernmental Panel on Soils (FAO 2015) has recently reported that "the majority of the world's soil resources are in only fair, poor or very poor condition" and the United Nations note that 75 billion tons of fertile soil and 12 million hectares of land are lost every single year to erosion or other issues ("The United Nations Decade for Deserts (2010-2020) and the fight against Desertification | UNCCD" n.d.). The combination of a quickly increasing population and a dwindling supply of healthy natural resources gives us a dire warning and call to action for a change in how our agricultural systems are organized. However, there remains hope that a coordinated and proactive change in our behavior and underlying structures toward sustainable production can prevent the continued degradation of the world's arable land while feeding our increasing global population.

One system supported by the Food and Agriculture Organization of the United Nations (FAO) known as Conservation Agriculture is "a way to combine profitable agricultural production with environmental concerns and sustainability", and is compatible with a wide variety of growing regions and systems (Christensen 2012). Such a system that is well-suited for widespread usage and is effective in preserving the continuity of healthy land may be a key component of global sustainability efforts. However, no system – no matter how technically effective – can successfully mitigate these global problems without widespread adoption. The best agronomic systems and soil protection techniques are only effective if they are actually put into practice. The behavior of farmers is

ultimately what will make or break any system. Therefore, it is important to merge agronomic research with the fields of psychology and behavioral economics. In this way, we may better bridge the gap between what research finds regarding agricultural sustainability and the actual practice of these methods on the ground.

This thesis will begin with a review of the literature on Conservation Agriculture and Behavioral Economics generally, along with its more recent application in the realm of agricultural research, before discussing the specific case of smallholder farming in Albania.

2. Literature Review

2.1. Conservation Agriculture

Conservation Agriculture (CA) is defined as, namely:

i) Minimum mechanical soil disturbance (i.e. no-till),
ii) Permanent soil organic cover (at least 30% of arable land), and
iii) Crop diversification and rotation (FAO 2017a).

Conservation tillage has become generally defined as a system that leaves at least 30% of crop residue as cover on the surface (SSSA 2013). Seeding is done directly through mulch or residues from the previous year, and there are four primary approaches: no-tillage, reduced tillage, mulch tillage, and ridge tillage (Carter 2005).

Soil organic cover may be achieved through simply leaving crop residues on the surface or may include the growth of "cover crops" in between fallow periods. The point is to avoid bare ground exposed to the elements for any extended period of time (FAO 2017a).

Crop rotations should involve at least 3 different species and varied sequencing for diversification. Rotations should be designed both for optimizing desired crop yields as well as for residues which are used elsewhere in the system (FAO 2017a).

The FAO further explains CA as "an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment", while stressing that these principles are adaptable to all agricultural landscapes and can be adjusted easily to fit

local conditions, thus they can be promoted, and the benefits enjoyed, the world over. (FAO 2013).

Estimates of the global spread of CA adoption are sparse and admittedly uncertain; however, Kassam et al. (2018) has estimated the global extent at approximately 180 M ha, or 12.5% of global cropland, in 2016. While this is a small figure globally, they note a sharp increase of about 69% in adoption since 2008, with North and South America making up the vast majority (about 70% of worldwide adoption in ha) and Europe representing a very small fraction at only 2%.

Table 1: Cropland area under CA (M ha) by region in 2015/16

Region	CA cropland area	% of global CA cropland area	% of cropland area in the region
South America	69.90	38.7	63.2
North America	63.18	35.0	28.1
Australia & NZ	22.67	12.6	45.5
Asia	13.93	7.7	4.1
Russia & Ukraine	5.70	3.2	3.6
Europe	3.56	2.0	5.0
Africa	1.51	0.8	1.1
Global total	180.44	100	12.5

Source: Kassam et al. 2018

2.1.1. Benefits of CA

Much of the literature examines the effectiveness of each of the 3 principles individually, while a limited but growing amount of literature is focused on the synergistic effects of all 3 working in tandem. CA can improve soil health, minimize the usage of inputs such as fertilizers and herbicides, increase porosity and water retention, reduce erosion, and allows for sustainable agricultural intensification alongside other good practices (FAO 2013). Erosion is a major concern both in Europe and globally, being identified as the "gravest threat" to agriculture by The Intergovernmental Technical Panel on Soils (Montanarella et al. 2016). The Conservation Agriculture Group of Cornell University (2015) proclaimed that "CA has proven potential to improve crop yields while improving the long-term environmental and financial sustainability of farming," as well as being helpful in the fight against climate change due to reduced fossil fuel use and lower greenhouse gas emissions.

Reduced tillage protects soil quality and minimizes damage on the soil ecosystem that comes with heavy plowing. Traditional plowing has been shown to cause compaction of soil and damage soil structure, which is important for moisture retention, root development, nutrient cycling, and resistance to erosion (Stagnari et al. 2009).

Soil cover in the form of mulch is often found to improve the retention of moisture (Scopel et al. 2004; Huang et al. 2014), prevent erosion (Chen et al. 2021), and can help fight climate change by sequestering carbon (Nieto et al. 2012). Cover crops also act as a living mulch while providing ancillary benefits such as increased nitrogen and other nutrient cycling, "biological tillage" which allows for better root penetration for different crop types, and improving soil structure (FAO 2017a). They can also provide additional commercial value and income potential by being sold as fodder or the land rented to farmers to graze their livestock (Myers et al. 2019).

Increasing diversity and rotating crop types has widely proven to provide a host of ecosystem services which create more optimal growing conditions and wider environmental benefits. Crop rotation and diversity was found as "a significant and positive driver of corn and soybean yields" over a multi-year span by Hunt et al. (2019), along with "support[ing] the agricultural system, including pest suppression, improved water quality, and increased sediment and nutrient retention."

However, advocates of CA stress that it is the synergistic effects of all 3 practices combined that produce optimal long-term results and sustainability. The literature is rife with examples of some mixture of the practices, but a holistic look at all 3 is not well addressed. With that said, these smaller synergies are at least somewhat illustrative of the benefits of combining multiple CA practices. For example, combining conservation tillage with crop rotations, Fan et al. (2020) found significant effects on crop yield, nitrogen uptake, and soil organic carbon stocks over three decades for grain in a semi-arid climate in Canada. On a maize system in the United States, the synergy between no-till and cover crops enhanced soil carbon sequestration—an important finding in the fight against climate change (Huang et al. 2020). A similar finding of improved soil organic carbon and general soil health was found by Wulanningtyas et al. (2021) when combining no-till and cover crops in soybean production.

Finally, as economics are clearly important to the equation, numerous studies have looked at the financial aspect of CA adoption. The overall impact has been widely found to be

positive on individual farms (Knowler & Bradshaw 2007; Vlek & Tamene 2009), with reduced costs in labor and machinery, as well as when considering overall societal benefits (Stonehouse 1997).

2.1.2. Counterpoints and Constraints for Adoption

While much research touts the benefits of CA adoption, there remain studies that contradict these reports. The most common concern is a decrease in yields, particularly in the early years after adoption (Giller et al. 2009; Casagrande et al. 2016). Overall increases in yields are not always seen, with decreases being reported in the literature in varying locations, crop types, or climactic conditions (Vastola et al. 2017; Carter et al. 2019). Multi-year waiting periods for increased yields are found in longer-term trials, which may be unattractive to farmers, as well as certain aspects (such as no-till) being unsuitable for certain soil types (Liben et al. 2017).

There are also issues with competing uses for the residues – leaving as mulch for CA may be seen as unprofitable for farmers who use them for animal feed, fuel, or other uses (Wezel & Rath 2002; Giller et al. 2009; Hellin et al. 2013). Farmers may also have specialized equipment that is designed for conventional systems representing a large sunk cost, or not have access to the capital needed to invest in equipment designed for CA, such as no-till seed drills (Pereira De Herrera & Sain 1999). Pannell et al. (2014) stress that the promoted financial and economic benefits are by no means "one-size-fits-all" and that CA may increase or decrease farm profits in certain contexts, or that partial adoption may be better than full adoption.

Furthermore, there may be a tendency for farmers to feel comfortable with their current ways and averse to change, deeming the potential benefits too small or intangible to be worth the effort (Rodenburg et al. 2021). Knowledge passed down may conflict with what recent research shows, such as the idea that tilling the soil is beneficial, and these knowledge gaps may be a strong constraint against the adoption of no-till systems (Bhan & Behera 2014). A great example of this is the following quote from the FAO (2008): "*The plough has become the symbol of agriculture and many, including farmers, extension agents, researchers, university professors and politicians have difficulty in accepting that agriculture is possible without tillage.*"

2.2. Behavioral Economics

Behavioral Economics (BE) examines how people make economic choices and how those choices are influenced by external and internal factors that most people are completely unaware of. It incorporates social psychology to explain behavior displayed in experimental and real-life settings that often conflicts with classical economic theory and the concept of a perfectly rational "homo economicus" (Siegel et al. 2021). It is a relatively new field, although Adam Smith's work in the 1700s did touch on some of the psychological aspects of economic decisions, such as loss aversion or various personal biases (Khalil 2009). BE emerged as a discipline in the 1970s following the early work of Daniel Kahneman and Amos Tversky, as well as the work of Richard Thaler in the 1980s (Sunstein 2018; Siegel et al. 2021).

There are 3 assumptions made by "traditional", or neoclassical, economics:

1. "People are rational in making choices between identifiable and value-associated outcomes.
2. An individual's purpose is to maximize utility, as a company's purpose is to maximize profits.
3. People act independently on perfect (full and relevant) information (Corporate Finance Institute 2015)."

BE recognizes that real-world decisions often are subject to mistakes, are often irrational from a classical perspective, and rarely have perfect information before being made (Singh et al. 2021). For example, when purchasing a car most individuals lack the knowledge to effectively differentiate between build quality and engine reliability among the options, or the price for similar vehicles across the entire market, and make the decision based on limited information and/or personal or cultural biases such as the paint color or the status conferred upon them by friends and the public. Studies have also shown that people will make decisions on food in supermarkets or cafeterias simply based on how they are presented, at which level on a shelf, or in a particular order (Bucher et al. 2016; Cadario & Chandon 2018). When reading further into such literature it becomes clear that humans are not always perfectly rational, utility-maximizing beings.

Heuristics, or the study of decision making in the context of uncertainty or presence of limited information, was originally presented by Herbert Simon and later developed as part of the work by Tversky and Kahneman in the 1970s mentioned above (Hertwig & Pachur 2015). Also known as “mental shortcuts”, they represent biases that can result in irrational behavior—at least from the perspective of neoclassical economics. Herbert Simon coined the phrase ‘bounded rationality’, which is the concept that acknowledges that humans do not have unlimited cognitive abilities and must often make decisions which are “good enough” instead of perfectly optimized (Hertwig & Pachur 2015). Numerous heuristics have since been identified and thoroughly studied in the literature, particularly in the field of psychology. Some of the more common and relevant include: rules of thumb, availability (basing judgment on recent events or more easily-recalled information), authority (belief in opinions from authority figures), and recognition (prioritizing or valuing higher that which we more easily recognize)(Tversky & Kahneman 1974).

Subjective norms are the perceived social pressures that influence our behavior (Ajzen 1991). These norms were combined by Ajzen with attitude, perceived control, and intention in outlining the well-known Theory of Planned Behavior (TPB). Much behavioral and adoption research has since used this theoretical framework as its basis.

2.2.1. Behavioral Economics in Agriculture

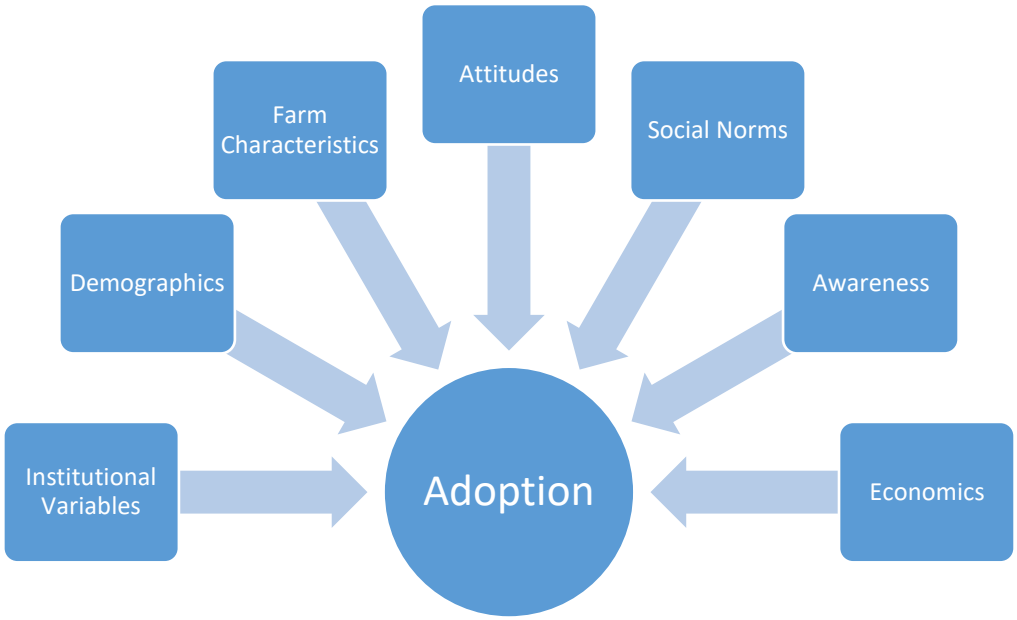
Research seeking to explain adoption of agricultural innovations has a long history stretching back to the mid-1900s (Feder et al. 1985).

There are subtle distinctions between BE literature in general versus BE in agriculture. As described by Streletskaya et al. (2020), BE looks to understand how behavior deviates from neoclassical, or ‘traditional’, economics based on general behavioral models while research on agricultural adoption explores the factors driving (or preventing) the implementation of certain practices or innovations.

Much agricultural adoption research also uses Ajzen’s TPB, however more recent studies have found this limiting and added others such as Random Utility Theory (RUT) or other stochastic models.

The combination of factors, ranging from basic demographics (age, gender, education, etc.) to economics (profits, costs, capital, etc.) to behavioral factors such as biases and general attitude toward environmental sustainability, or the above-mentioned social norms or pressures, are combined with TPB and RUT below in Figure 1 representing the Conceptual Framework.

Figure 1: Conceptual Framework



2.3. Albanian Agriculture

The country of Albania provides us with a unique and interesting perspective on agricultural development and the potential for the adoption of sustainable practices such as CA. A small country in the Balkans, it was the last to transition away from communism among the rest of Europe (Tarifa 1995). Due in part to its geography and size, and particularly to the lingering effects from the communist era, Albania remains one of the most isolated and least developed countries in the region. Many farmers work solely for subsistence, without entering markets at the national level, let alone for export abroad. This stems from a multitude of factors, including infrastructure constraints, a lack of modern machinery and technology, land fragmentation, and cultural obstacles impeding widespread cooperation (FAO 2017b). Albania experiences extensive soil loss from erosion, particularly in the northern mountainous regions, with a 2-3X higher rate of loss

than in other Mediterranean countries, and 10-100X higher than other European countries (Luli & Xinxo n.d.). Estimates range from 32 tons per hectare up to 185 tons per hectare of soil loss annually (Shallari 2019).

2.4. Research gaps

Much of the available literature takes an individualized approach to each component of Conservation Agriculture as opposed to the combination as a cohesive whole. It is common to find a study that looks solely at conservation tillage or crop rotation, but not all three as outlined by the FAO. More research is still needed on the synergistic effects of all three principles working together on soil health, environmental benefits, and farmer outcomes. Further, the literature shows at times conflicting results on the benefits or drawbacks of these principles for farmers and the environment, and meta-analyses are sparse.

Behavioral economics is an evolving field of research, with much of the newer literature in the fields of marketing and healthcare. BE in agriculture receives much less attention. When it comes to the country of Albania, the literature is even more sparse on these topics. This thesis hopes to contribute to the body of research by taking a holistic look at CA and behavioral economics in agriculture, with a specific focus on an oft-overlooked country in southern Europe.

3. Aims of the Thesis

Main Objective:

The primary aim of this thesis was to analyze the factors influencing smallholder farmer adoption of Conservation Agriculture practices.

Specific Objectives:

1. Examining the current land management practices and level of adoption of CA principles among smallholders in Albania.

2. Understanding the primary information sources for farmers and their impact on decisions.

3. Identification of which demographic, social, and behavioral factors are likely to influence the choice and extent of applying specific CA principles.

Research Questions:

i) What trends can we observe between farmer demographics, farm characteristics, and current management practices?

ii) How do social factors influence farmer decision-making regarding the adoption of conservation agriculture practices?

iii) How do various information sources affect the decisions of farmers regarding CA practices?

iv) What role do attitudes around risk and environmental concerns play in farmer behavior, and are they more or less significant than other variables?

v) Which factors are ultimately most predictive for farmer adoption of each CA practice and CA as a whole?

4. Methods

4.1. Data Collection

4.1.1. Primary Data

Field research was conducted from October to November 2020. Primary data were collected via in-person interviews conducted by local university students in collaboration with the author. Due to the fragmented nature of the agricultural region and lack of reliable land records, a multistage sampling method consisting of both snowball and judgement sampling techniques was employed. Key informants from the local Agricultural University of Tirana (UBT) provided a list of target localities to begin research, which were then canvassed by car and on foot by the student team. In this first stage, judgement was used to determine likely candidates within the targeted regions based on knowledge of the area and visual cues. The minimum farm size for conducting an interview was set at 1 dunum (0.1 hectares); there was no maximum. Respondents were then asked for referrals to other farmers in their personal network who fit the target profile and an exponential non-discriminative snowball sampling methodology was used to explore each referral. A total of 243 questionnaires were completed during this time.

A pilot test for the questionnaire was conducted during the first week of research to test and adjust for translation issues, length, and formatting of questions according to local conditions. Student assistants were trained in the administration of the survey by the author, as well as accompanied during interviews where possible. All interviews were conducted in the local language.

4.1.2. Design of the questionnaire

The questionnaire was developed in coordination with the thesis supervisor and professors from UBT in order to achieve the objectives of the study while being sensitive to local peculiarities. A total of 63 questions were formulated, with a variety of types (demographic, dichotomous, continuous, and Likert scale). In addition to collecting basic demographic and farm-level details, questions were targeted to identify the information sources for farmers and to understand their attitudes regarding environmental and social factors in accordance with the literature on agricultural

adoption and behavioral economics. For example, borrowing from behavioral economics research, questions measuring the importance respondents place on the opinions of friends and family were used similarly to how Higgs (2015) described the way social norms influence eating behaviors.

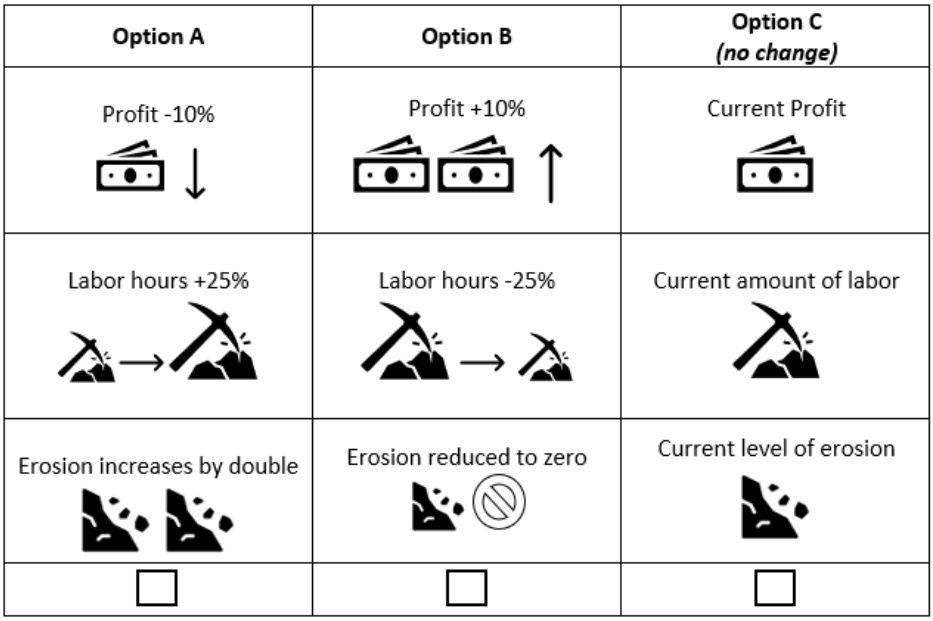
To capture information related to CA adoption, farmers were asked to report whether they currently use each of the 3 individual strategies (crop rotation, soil cover, and no-till), as well as to what extent of their arable land is dedicated to the respective strategy, which crop types are involved, and their main objectives for implementation. For those that did not currently use a particular strategy, they were asked whether they had practiced in the past 5 years and their main reasons for not implementing. These data were then analyzed for each of the 3 strategies, as well as for those who have fully adopted CA by using all 3 in combination on at least some portion of their fields.

4.1.3. Farmer Choice Experiment

In addition to the general questionnaire, an experimental "farm management game" was designed in order to obtain further insight into the motivations of the farmers. This section was designed as a discrete choice experiment (DCE), which is a methodology used by researchers to understand how individuals evaluate and prioritize individual attributes among multiple others when making decisions (Johnson et al. 2013). Participants are presented with a sequence of questions and must select between alternatives that offer various mixtures of the attributes of concern for the research. Based on the responses, the researcher can analyze how the likelihood of a specific decision is impacted by a specific attribute (Hauber et al. 2016). DCEs are frequently used in healthcare and consumer product research and have increasingly been applied to agricultural research in recent years. Vaiknoras et al. (2015) used a DCE to evaluate the preferences of farmers and willingness-to-pay for particular outcomes in Uganda. The experiment designed in this research was strongly inspired by this study.

Participants were presented with 8 "cards" representing a hypothetical choice between outcomes of making a change in farm management practices. An example of a choice card in English is shown in Figure 2 below, and the full DCE is provided in the Appendix. Respondents were presented with a version translated into Albanian and instructed in a hands-on fashion by the local survey team.

Figure 2: Choice Experiment Sample



The scenario was presented as follows:

You will now be presented with various scenarios representing a potential change in farm management practices and the effect on your overall profit, the amount of labor (personal or hired hours of work), and level of erosion (compared to current level). When making this decision we would like you consider the consequences your choice would have on your family and make this decision the same way you would make a planting decision. When picking an option please consider how your life would be if the harvest is good and if the harvest is bad. You can also select Option C, which represents no change in management and maintaining current practices.

When planning for next year, you are deciding between 2 new farm management practices or whether to make no changes.

- *After implementing Option A, next year your overall profit would change by [X]%, labor hours change by [Y]%, and the level of erosion is [Z].*
- *Option B results in profits changing by [X]%, labor hours being changed by [Y]%, and [Z] erosion.*
- *Option C is to make no change from current practices.*

X, Y, and Z represent the alternating attribute levels, where profit was either increased or reduced by 10%, labor hours increased or reduced by 25%, and erosion levels either

doubled or were eliminated to zero. Option C always represented an opt-out from the choices at hand, or no change from current practices. The sample shown in Figure 2 was used as a test to ensure participants understood the experiment before moving forward, as Option B clearly represents the optimal choice: increased profit, decreased labor, and the elimination of erosion, while Option A does the opposite. Images were added to help clarify the choices, improve engagement, and in case a respondent may have been illiterate.

The choices were allocated to be statistically efficient by using a full factorial foldover design, as outlined by the World Health Organization's (WHO) "User Guide for Choice Experiments in Healthcare Recruitment" (World Health Organization 2012). The design included 3 attributes (profit, labor, and erosion) with 2 levels each (increase or decrease), which meant that an efficient orthogonal design would require 2^3, or a total of 8, choice sets (Johnson et al. 2013). This means that each respondent would be presented with every possible combination of attributes, cycling equally through choices A and B, by the end of the experiment. Options A and B ultimately were mirror images of each other and together represented the choice to change, or willingness to adopt a new system (such as CA), vs. no change in farm management behavior (Option C). The question then becomes: *Which of the attributes are most important when a farmer is deciding to make a change in practices?*

The number of attributes and levels were kept to a minimum in order to maintain a reasonable number of questions for participants without burnout, since the amount of choice sets needed to maintain orthogonality increases exponentially as additional attributes are included. Each respondent was presented with all 8 choice sets, which remained the same for the entire sample.

Figure 3: Survey team with local farmer during DCE

Attribute levels were chosen in a best-effort attempt to simplify the decision-making process for the farmers as well as to balance the weight of each change as best as possible. For erosion levels, Vaiknoras et al. (2015) presented farmers with a choice of current levels, a reduction in half, or complete reduction. In our case, a negative outcome was needed, and doubling was chosen to be easily quantifiable in respondents' minds.

A meta-analysis by Knowler & Bradshaw (2007) found income and farm profitability to be a significant and positive variable for CA adoption in 6 studies, significant and negative in 1, and insignificant in 3 studies. An increase or decrease by 10% was decided upon as both an easy-to-grasp figure and not too large so it would overshadow the other choices, since farmers in the region generally operate on very low incomes.

Westra & Olson (1997) found that farmers who perceived CA as labor-saving were significantly more likely to adopt conservation tillage, while Casagrande et al. (2016) found that increased labor was a significant obstacle for adopting conservation tillage and

soil cover practices. Similar to the other attributes, the selection of increasing or decreasing labor hours by 25% was a balance of an easily understandable figure while not being substantially large or small.

4.2. Research Location

Albania is a small country in the Balkans of Southeastern Europe, just north of Greece with a western coastline along the Adriatic Sea across from Italy. It has a population of approximately 2.9 million inhabitants and a total land area of 27,400 km^2, 24% of which is agricultural land – mostly in the coastal lowlands (The World Bank n.d.; Shallari 2019; INSTAT 2021).

Albania has a range of climate types due to its geography, though it is mainly classified as Mediterranean in the western half and Oceanic or Continental in the mountainous east.

Figure 4: Map of Albania & surrounding region; source: geology.com

The country has a Human Development Index (HDI) of 0.795, which is categorized as ‘high’, and ranked 69th out of 189 countries worldwide in 2020 (United Nations Development Programme (UNDP) 2020). The official language is Albanian and over

98% of inhabitants declare it as their native tongue; however, it is very common for people to speak 2 or more languages – primarily a mixture of Italian, Greek, and English (WorldAtlas 2021). As of 2018, the overall adult literacy rate in Albania was 98% (The World Bank n.d.).

Thanks to a history of wars, communist rule, and difficult economic conditions, Albania has a very large diaspora and has consistently seen net migration from the country (Barjaba 2017). Over the last decade, net outflows have averaged 20,000 people each year, although the trend is slowing as of late (INSTAT 2021). Land ownership in Albania is highly fragmented, with complicated property rights issues and an underdeveloped and largely informal land market. During the communist years it was the only country to collectivize 100% of private land, and after reforms in the 1990s, land was distributed in a highly fragmented manner that created 1.8 million small parcels for approximately 480,000 families and an average parcel size of 0.2-0.55 ha (Koprencka & Muharremi 2010). As of 2012, 98.2% of agricultural holdings are family farms and 86% of them are 2 ha or less; therefore the majority are subsistence or have very little economic potential (Rama et al. 2018).

4.2.1. Research Location Detail

Interviews were conducted across 2 counties in central and western Albania—the county and capital city of Tirana, as well as Durrës. A total of 8 municipalities within these counties were represented, with Kamëz and Shijak comprising 29% and 28% of the sample locations, respectively.

Figure 5: Map of study area (highlighted red); source: vectorstock.com

Tirana and Durrës are classified as Hot-summer Mediterranean with dry summers and generally mild winters with heavier rains. Average temperatures in this region are approximately 15 degrees Celsius with yearly precipitation of about 1200mm (Climate-Data.org 2021).

Soil types in the country are quite varied due to climate and geography. The study area is located in the coastal zone with mostly fertile alluvial soils, 70% of which are cropped (Shallari 2019). According to INSTAT (2020), the most common crops in the country are forage, vegetables, and cereals. Tirana county is the 3rd largest vegetable producer in the country with 130,001 tonnes in 2020. Permanent crops such as fruit trees, olive groves, and grapes are also important and widely grown (INSTAT 2020).

4.3. Data Analysis

Primary data were coded into Microsoft Excel spreadsheets, which also provided basic descriptive statistics and data visualization. The remainder of the analysis was performed via IBM SPSS Statistics software version 27. The two primary methods of analysis were:

1. Descriptive statistics: General sample characteristics at the farmer and farm level were analyzed, as well as insights into the various information sources and other social factors measured by the questionnaire. This was also performed on the DCE data.

2. Application of a Binary Logit Model (BLM): The key component of the data analysis was the estimation of a BLM. Each of the 3 CA components were modeled as dependent variables individually, along with "full adoption", or the usage of all 3 in combination. A total of 16 independent variables derived from the literature were modeled for each dependent variable to discern their level of impact on adoption.

4.3.1. Binary Logit Model

A binary logit model is a regression on a set of independent variables (X), which

can be categorical or continuous, on a binary dependent variable (Y). The four different dependent variables are dummy coded as farmers either have or have not adopted a practice:

1. Crop Cover use (1=yes, 0=no)
2. Crop Rotation use (1=yes, 0=no)
3. No-Till use (1=yes, 0=no)
4. CA User [uses all 3] (1=yes, 0=no)

The logit model estimates the linear logged odds and has the following form:

$$\textbf{logit } (Y) = \ln (P_i / 1 - P_i) = \beta_0 + \beta_k X$$

Where Y is the dependent variable representing farmer adoption of a practice,

$(P_i / 1- P_i)$ is the probability of the likelihood of an event given X; β_0 is the constant term or intercept, β_k is a vector of regression coefficients to be estimated, and X is a set of independent variables determining the probability of the event (Horowitz & Savin 2001).

4.3.1.1. Odds Ratio

It is difficult to directly interpret coefficients due to the fact that each variable can have an effect on another variable in the model along with the variable of concern. An alternative way is to use the Odds Ratio (OR), which is the ratio of odds of a variable at two different values, in this case the ratio of the probability of CA adoption divided by the probability of non-adoption (the reference group in the estimation is Adoption = 1).

An odds ratio is a measure of association between an exposure and an outcome. The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. (Szumilas 2010)

OR >1 – Higher odds of result

OR = 1 – Odds of result unchanged

OR < 1 – Lower odds of result

As an example, an OR of 0.5 can be interpreted as a 50% reduction in the probability of the targeted result occurring, or an OR of 2 means it is twice as likely.

4.3.2. Selection of variables

Table 2 presents a categorized view of the literature-derived variables which were used in the final models. These were filtered from a larger initial selection based on the literature review and after iterative testing of the models for goodness-of-fit.

Table 2: Model variables

Dependent Variables	Type	Literature
Adopted Crop Rotation	Dichotomous, yes/no	FAO
Adopted Soil Cover	Dichotomous, yes/no	FAO
Adopted Zero/Minimal Tillage	Dichotomous, yes/no	FAO
Full CA Adoption	Dichotomous, yes/no	FAO
Independent Variables	**Type**	**Literature**
	Farmer Characteristics	
Age	Continuous, years	Rogers 1983; Gould, Saupe, & Klemme 1989
Gender	Dichotomous, m=1/f=0	Ndiritu, Kassie, & Shiferaw 2014; Lee & Gambiza 2022
Education	Ordinal, 6 categories	Gould, Saupe, & Klemme 1989; Carlson et al 1981, Ervin & Ervin 1982; Agbamu 1995
Experience	Continuous, years	Gould, Saupe, & Klemme 1989; Westra & Olson 1997; Miranowski 1981
	Farm Characteristics	
Land tenure (owned/leased)	Continuous, ratio	Abd-Ella, 1981; Carlson et al., 1981; Sklenicka et al., 2015; Bavorová et al. 2020
	Information sources	
Internet	Ordinal, never-daily	Hassan et al. 2010; Liu et al. 2021
Extension	Ordinal, never-daily	Agbamu 1995; Gould et al 1989; Antwi-Agyei & Stringer 2021
Other farmers	Ordinal, never-daily	Westra & Olson 1997; Harriss 1972
	Attitudes/Behavioral Factors	
Risk tolerance	Ordinal, Likert	Ervin & Ervin 1982; Clearfield & Osgood 1986; Okoye 1998; Ullah et al 2015
Seeking new technology information	Ordinal, Likert	Starasts 2015
Cost sensitivity	Ordinal, Likert	Westra & Olson 1997
Community impact	Ordinal, Likert	Frey and Meier 2004; Chouinard et al. 2008; Klucharev et al. 2009
Trusts intuition (independent-minded)	Ordinal, Likert	G von Diest et al. 2020
Family involvement	Ordinal, Likert	Abd-Ella et al., 1981; Carlsmt & Dillman, 1983)
Friends' opinions (social norms)	Ordinal, Likert	Higgs 2015; Harriss 1972; Krishnan & Patnam 2014
	Institutional Factors	
Government incentives/schemes	Ordinal, Likert	Knowler & Bradshaw 2007; Warner 1999

4.3.2.1. Dependent Variables

Using the commonly accepted definitions of the components of CA as described by the FAO, respondents were grouped according to their reported adoption of crop rotation, soil cover, minimal or zero tillage. Lastly, if a respondent reported at least some usage of all three components they were grouped into “CA users”. Each of these 4 variables were modeled independently, and as such respondents could have been in just one or multiple overlapping groups.

4.3.2.2. Farmer Characteristics

These are sociodemographic variables used commonly in research, such as age, gender, and education. Education and experience were expected to positively influence the adoption of CA and its underlying principles since more educated and experienced farmers should have more knowledge and resources to understand and implement them (Ervin & Ervin 1982; Gould et al. 1989).

Ndiritu et al. (2014) investigated gender differences in Kenya regarding the adoption of sustainable practices and found that females are less likely to implement minimal tillage, while there were no significant differences between genders regarding other soil and water conservation practices. Other studies found mixed results based on gender, noting factors such as gaps in resources and labor responsibilities between men and women (Lee & Gambiza 2022).

4.3.2.3. Farm Characteristics

These are external factors that play a role in decision-making due to physical constraints or opportunities. Land tenure (ownership vs. renting) is cited multiple times in the literature, as landowners are expected to have a more vested interest in the long-term health of the land instead of short-term maximization of yield (Abd-Ella et al. 1981; Clearfield & Osgood 1986). A sustainable cover cropping system in Honduras was found by Neill & Lee (1999) to be significantly influenced by ownership vs. renting, and reduced tillage in Siberia was found by Bavorová et al. (2020) to be adopted more by those with less share of rented land. Further, Sklenicka et al. (2015) found that landowners were significantly more likely to responsibly adopt each of 4 different erosion control measures than land renters in the Czech Republic.

4.3.2.4. Information source variables

The availability, type, and level of information available to farmers should play a major role in their behavior (Xie & Huang 2021). Further, it is unlikely for a farmer to adopt CA practices without having been introduced to them in some way, other than purely coincidentally. The questionnaire asked farmers to describe the frequency of accessing various information sources with regard to farming practices, using a scale of never, once or twice per year, monthly, weekly, or daily.

The internet is a widely used tool for seeking information, and farmers are no exception (Hassan et al. 2010). It provides access to an abundance of information regarding farming techniques, technologies, and the latest innovations. It is possible that farmers discover CA via the web; however, what they find may shine either a positive or negative light on the practice. Liu et al. (2021) found a direct positive effect for internet usage on environmental knowledge and pro-environmental behaviors. In general, mass media such as the internet is quite influential in driving behavior (Loh & Kanai 2015; Varga 2020).

Extension workers interact with and influence farmers regularly across the globe. If they are trusted and effective, they would certainly impact farmer behavior (Antwi-Agyei & Stringer 2021). If not, then as Harriss (1972) pointed out, extension service can fail and lose farmers' confidence, which will lead them to rely instead on the experience and advice of their friends, neighbors, and family.

Finally, other farmers were expected to have a notable influence on adoption of CA and its principles. It is natural for farmers to communicate with their peers, discuss land management strategies, and learn from observation via imitation or competition (Niu et al. 2022). Literature is extensive on the effects of farmer-to-farmer information diffusion and membership in cooperatives. These factors may have a major role in the high level of CA adoption seen in Australia and South America (Bellotti & Rochecouste 2014; Kassam et al. 2018); however, cooperatives and other formal farmer groups are practically non-existent in Albania.

4.3.2.5. Attitudes & Behavioral Factors

These variables have often been overlooked until recently in the literature, in favor of the more traditional factors presented above. However, as behavioral research finds its way more and more into the field of agriculture, researchers are gaining more insight into the

often conflicting and counterintuitive results seen in empirical studies. For example, Chouinard et al. (2008) found that farmers can be willing to sacrifice profit and personal goals for social interests. A variety of other variables along the same vein are utilized in this section.

Risk tolerance is an attitudinal factor with a long history in the literature, and was added based on the literature suggesting that more risk tolerant individuals are more likely to adopt new technologies or experiment with different methods (Ervin & Ervin 1982; Okoye 1998; Ullah et al. 2015). Responses on risk tolerance for this thesis were collected via a 7-point Likert scale.

As seen in the BE literature, social norms, expectations, and pressures can be quite important for understanding behavior. Krishnan & Patnam (2014) found strong evidence that the social networks of farmers, such as neighbors and friends, had a longer-lasting and larger impact on adoption behaviors than advice from extension workers. Family members could be expected to have an even more outsized impact, since they not only tend to have a more direct hand in the operation, but can exert a unique type of social pressure (Abd-Ella et al. 1981; Ervin & Ervin 1982; Carlsmt & Dillman 1983).

4.3.2.6. Institutional Factors

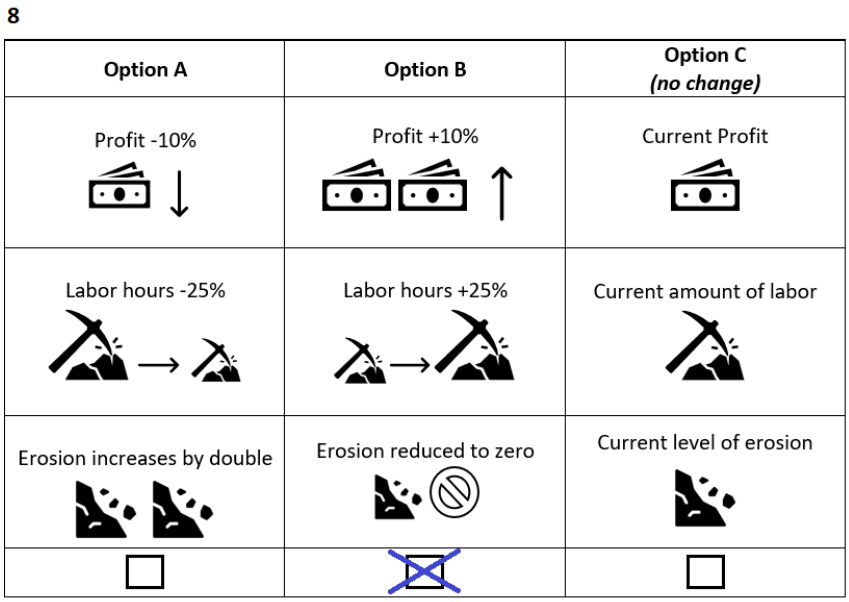
Government can obviously play a major role with direct policy intervention, whether via rules & regulations or by monetary incentives. It can also provide mass education programs and help disseminate information in favor of conservation principles. However, as argued by Warner (1999), involvement of the state can also be counterproductive when there is skepticism towards top-down intervention.

4.3.3. Farmer Choice Experiment

Responses were coded with either a 1 for yes (selected) or a 0 for no (not selected) for each of the 3 choices in a card: A, B, or C. Choices A and B represented a mixture of attribute levels (profit/labor/erosion either up or down), and they were coded with a similar 1/0 system. For example, if option B was selected and represented increased profit, increased labor, and decreased erosion, then *profit up* would be coded with a 1

(*profit down* 0), *labor up* with a 1 (*labor down* 0), and *erosion down* with a 1 (*erosion up* 0). A visual for clarity is in Figure 6 below:

Figure 6: Choice card sample (option B selected), with coding method below



ID (respondent)	card	choice a	choice b	choice c	Chosen? (1-yes, 0-no)	profit up	profit down	labor up	labor down	erosion up	erosion down
143	8	1	0	0	0	0	1	0	1	1	0
143	8	0	**1**	0	**1**	**1**	0	**1**	0	0	**1**
143	8	0	0	1	0	0	0	0	0	0	0

Each card could then be filtered for the selected choice and a tally made for the selected attribute levels. Trends in the underlying attributes (i.e., how often is *profit up* part of the selected choice?) for each card were then calculated to estimate the relative importance of each attribute. A score between 0 and 1 could then be given, by taking the average of the attribute columns after filtering for the desired selection (A, B, or C chosen). 0 would mean that the attribute was never part of the selected choice, and 1 would mean that it was included in every single chosen option.

5. Results

5.1. Sample description

5.1.1. Farmer characteristics

A summary of demographic characteristics is presented in Table 3 below. The majority of respondents were male, making up 84.4% of the sample. The mean age was 52.7 years, which is in line with European averages as reported by Eurostat (2021), although a wide age spectrum was represented with the minimum respondent age being 18 and the maximum 80. The average household (HH) size was 4.6 members, with approximately 44% being female. Most family members work on the farm—71% of total HH members, of which 46% are female. It is interesting to note that although nearly half of all family members were female and provide labor for the farm, only 9.8% of respondents reported a female as the primary decision-maker. However, INSTAT (2014) notes that approximately 14% of Albanian households are female-headed as of the last national census in 2011.

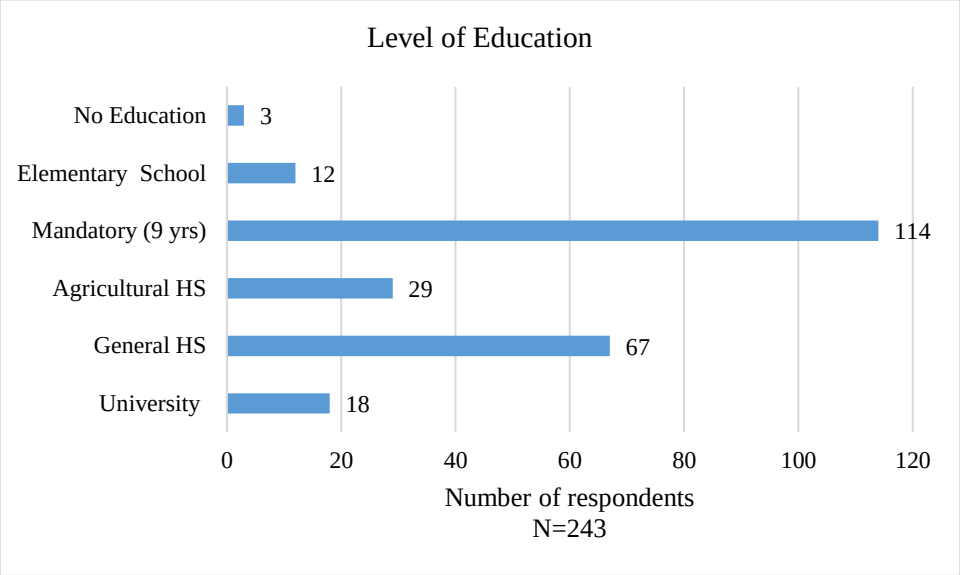
Table 3: Demographic characteristics

Variable	Total (%)	Minimum	Maximum	Mean	Std.
Male	205 (84.4%)	-	-	-	-
Female	38 (15.6%)	-	-	-	-
Age	-	18	80	52.71	12.122
Experience (years)	-	2	52	21.80	10.939
Total Household Members	-	2	12	4.60	1.662
Female HH Members	-	0	6	2.05	0.989
HH Adults	-	1	12	4.01	1.421
HH Adults Female	-	0	5	1.84	0.866
HH Labor	-	1	12	2.86	1.344
HH Labor Female	-	0	5	1.32	0.683

The most common level of education among respondents was that of “mandatory education”, which in the Albanian school system is 9 years of basic schooling, with a total of 114 respondents. A significant proportion (approx. 39.5%) also completed High School (grades 10-12), with 29 of these 96 respondents (30%) attending an agriculture-specific

school. Approximately 7.4% of respondents achieved a university-level education, with only 3 of these 18 (16.6%) respondents attaining a degree in agricultural sciences.

Figure 7: Education level of respondents



5.1.2. Farm characteristics

A summary of measured farm-level characteristics is provided in Table 4 below. The mean size of land ownership was 7.9 dunam (0.79 ha), with a maximum size of 70 dunam (7 ha). The most frequently cited amount of land ownership was 3 dunam (0.3 ha). While rented land was quite uncommon, with 45 out of the 243 respondents (18.5%) reporting affirmatively, the mean leased plot size was 1.4 dunam (0.14 ha). The most common crop type was fruits, with a mean of 2.8 dunam (0.28 ha) growing area, followed by fodder crops with 2.13 dunam (0.213 ha). Regarding the "other" cultivation category with a mean of 1.01 dunam (0.101 ha), custom responses were recorded manually, and the most common responses were olive orchards and vineyards. The total livestock count was calculated by summing individual headcounts for cattle, small ruminants (goats, sheep), and poultry (chickens, turkeys). Poultry were the most common, with a mean of 20 per respondent. Mean headcounts were 10.4 for small ruminants and 1.9 for cattle.

Respondents were also asked to delineate the percentage of farm production that is used for personal and family consumption vs. dedicated to selling at the market. The mean percentage of personal production was 53.5% and for market production was 46.4%,

although standard deviations were quite high—approximately 33% for both. Only 2 respondents reported zero farm production for personal use, meaning that the sample was comprised almost wholly of mixed production family farms instead of exclusively commercial operations.

On average, 58% of arable land had access to irrigation water. Only 21 of the 243 respondents (8.6%) had no irrigation whatsoever. When it comes to erosion, 169 out of 243 respondents (69.5%) reported at least some erosion on their land. The questionnaire asked for the farmer's judgment between "somewhat" and "seriously" eroded land, as well as differentiating between wind and water erosion. The mean amount of somewhat eroded land was 11.5%, and the mean amount of seriously eroded land was 4.47%. Notably, 4 farmers reported 50% or higher levels of serious erosion with a maximum of 80%. Wind erosion was responsible for 32.5% of erosion, and water for 67.5%.

Table 4: Farm characteristics

	Minimum	Maximum	Mean	Std. Deviation
Land ownership (dunam)	0.0	70.0	7.991	8.5683
Land rented (dunam)	0.0	27.0	1.426	3.8949
Vegetable crops (dunam)	0.0	10.0	1.414	1.7541
Fruits (dunam)	0.0	25.0	2.806	3.3969
Cereals (dunam)	0.0	12.0	1.574	2.8799
Fodder (dunam)	0.0	40.0	2.132	4.6547
Other cultivation (dunam)	0.0	72.0	1.014	4.9690
Uncultivated (dunam)	0.0	18.0	0.444	1.9902
Livestock (heads)	0	420	32.35	66.730
Beehives	0	100	1.22	7.224
Personal production (%)	0	100	53.54	33.295
Market production (%)	0	100	46.38	33.336
Percentage irrigated	0	100	58.22	38.823
% land somewhat eroded	0	50	11.54	12.435
% seriously eroded	0	80	4.47	10.500

5.2. Factors for Conservation Agriculture Adoption

A primary objective of this thesis was to understand the current extent of adoption of each of the three primary CA strategies-crop rotation, soil cover, and zero/minimal tillage (a.k.a. Conservation Tillage)-as described in the introduction of this paper. From the 243 respondents in total, 162 (66.7%) answered yes to using crop rotation, 217 (89.3%), answered yes to using soil cover, and 132 (54.3%) answered yes to using no-till methods. The combination of all 3 methods ("CA User") resulted in a total of 86 out of the 243 respondents (35.4%).

5.2.1. Information Sources

A detailed view of the frequency of exposure to each type of information source across the sample is provided in Figure 8. The most frequent source of information for farmers is other farmers, with a significant proportion (a combined 61.3%) citing either daily or weekly contact—more so than any other source.

Communication with agricultural extension workers was also reported as quite common, with 45.3% of farmers citing either a monthly or semi-annual frequency. However, the term "extension worker" is used a bit loosely in the country as formal agricultural extension organizations are not active. The term was commonly a proxy for proprietors and subject matter experts at agricultural input supply outlets.

Usage of the internet for farm-related information was mixed—48.5% of farmers stated that they never use it, while 19.7% use it daily and another 9.8% use it weekly. Print media and events are rarely a source of information, with the majority responding 'never' and approximately 1/4th of farmers using these sources once or twice per year.

Figure 8: Information source frequency

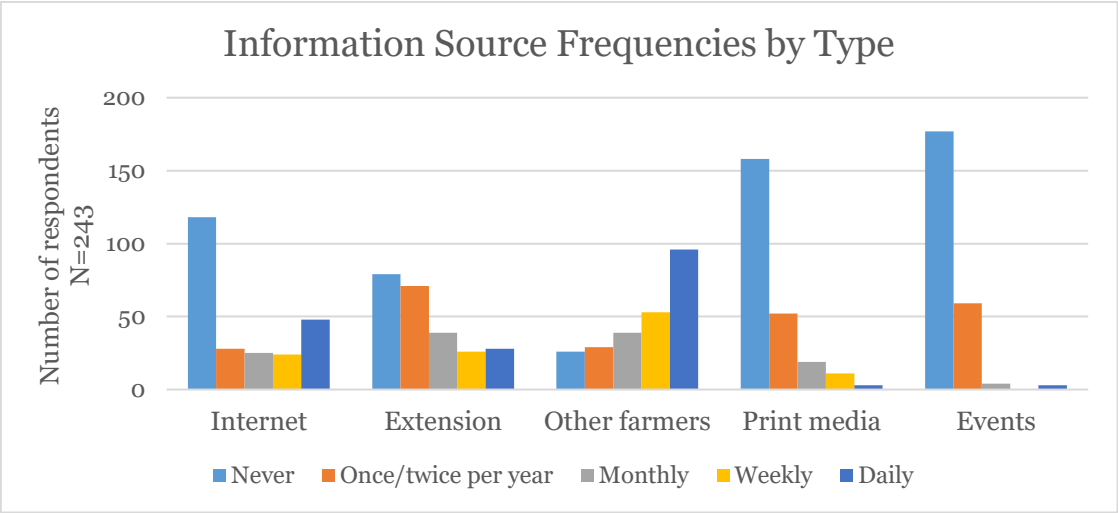
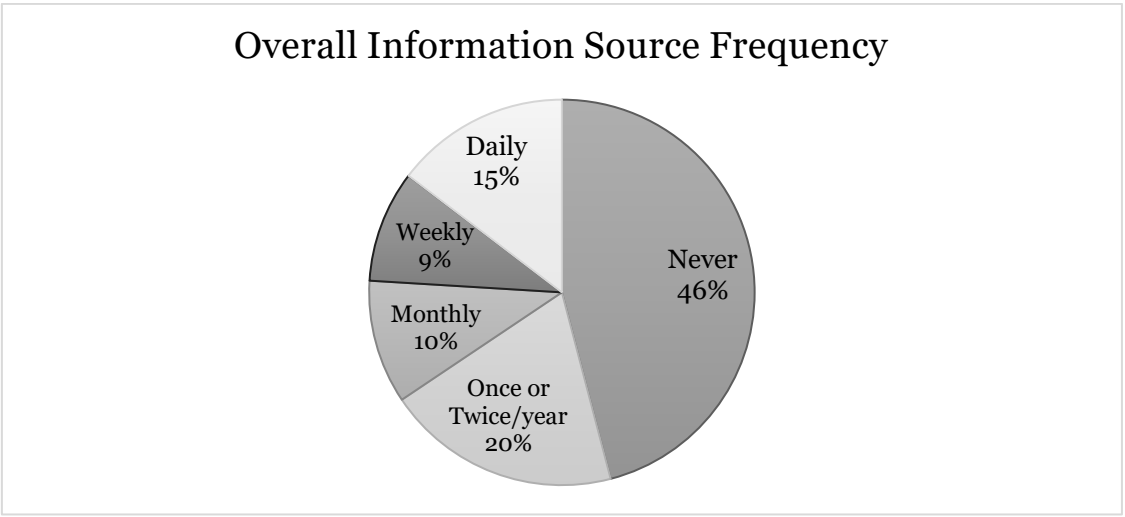


Figure 9 provides a more high-level view of how often farmers in the sample are accessing any type of information source regarding farming practices. Interestingly, nearly half of all respondents never use any information source regarding farming activities, showing a high degree of independence. Further, more regular information consumption (daily or weekly) was reported by only 24% of farmers.

Figure 9: Overall information frequency

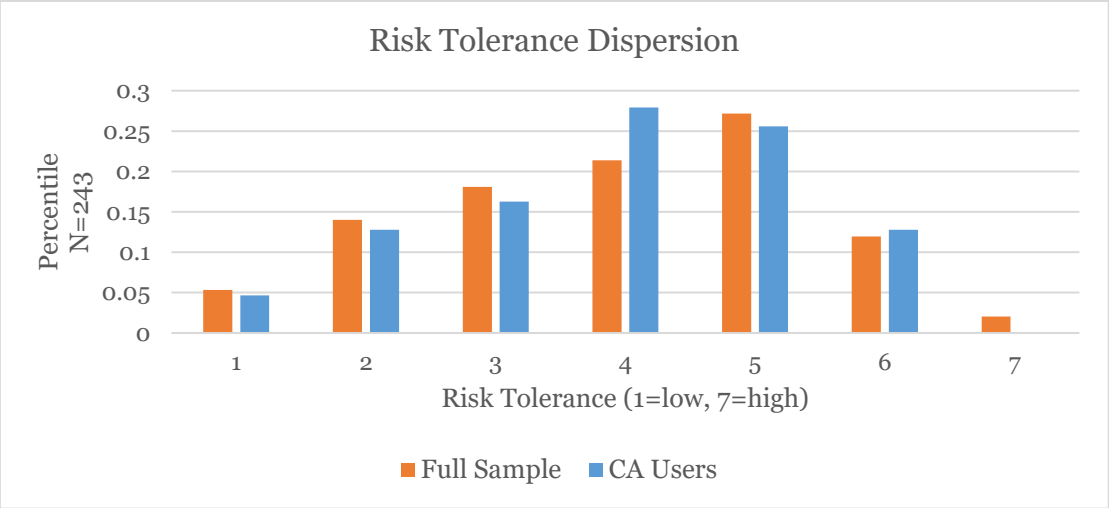


5.2.2. Personal and Social Influences

Farmers' risk tolerance can be interpreted as the willingness to implement innovations to increase agricultural productivity with uncertain future benefits. Risk tolerance was

measured on a Likert scale of 1 to 7, with 1 being low and 7 being high, and the percentiles for each level are presented in Figure 10 below. The average risk tolerance score reported for the full sample was 3.95, while the most common response was 5.

Figure 10: Risk Tolerance responses

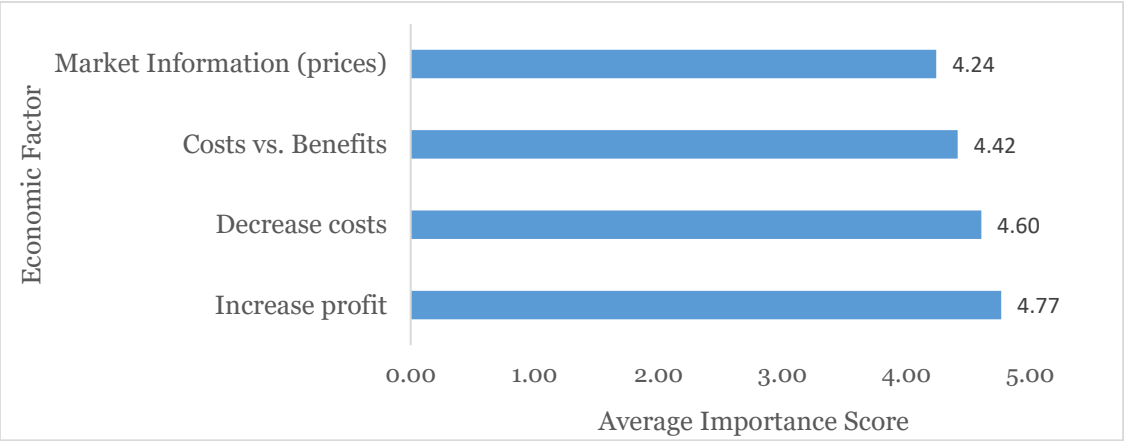


Responses for CA Users are included in Figure 10 alongside the full sample, as the expectation is that an increased risk tolerance would lead to increased adoption of agricultural innovations. While there appears to be a slight trend in this direction visually in the graph, there is no statistical difference. The mean score for CA Users was 3.953, vs. 3.950 for the full sample.

5.2.3. Economic Concerns

The majority of farmers in the sample produced at least some portion of their crop for sale on the market. Only 45 out of 243 (18.5%) reported 100% personal farm production, so it was expected that economics (such as profit) would factor greatly into farmers' decisions. For the small fraction that do not sell on the market, other economics such as input costs should also be important for decision-making. Casagrande et al. (2016) found cost reduction to be one of the most important motivations for no-tillage. Figure 11 shows the average rating (1 to 5 scale, with 1 as low and 5 as high) for various economic measures.

Figure 11: Economic Concerns



As expected, increased profit was very important. Costs came a close second, with information on market prices last, though still highly important.

5.2.4. Erosion and Land Issues

Farmers reported an average of 11.53% of their arable land as 'somewhat eroded', and an average of 4.46% as 'seriously eroded'. Interestingly, 58% of all respondents experienced at least some amount of somewhat eroded land, and a further 28% reported having some seriously eroded land. This is in line with reports in the literature of dire levels of erosion issues in the country.

Water was the most cited cause of erosion, with 59% of somewhat eroded land suffering from it, and 69% of the seriously eroded land. Wind erosion is also problematic, being the source for 41% and 31% of the erosion levels, respectively.

Half of the entire sample has implemented some erosion intervention, 120 out of the 243 (49%) responding in the affirmative. Additionally, 53 farmers (22%) plan to implement a future erosion intervention (whether for the first time or an additional investment).

5.3. BLM Results

The full results of the BLM for each of the CA strategies and the full adoption profile are presented in Table 5. Variables at the 90% confidence level or greater are highlighted. A likelihood-ratio chi-square test for each of the models versus the null (intercept) model was also performed. Generally, a higher chi-square value suggests a better overall fit, and a significance value of less than 0.05 indicates that the current model outperforms the null

model (Lewis et al. 2011). The chi-square value for Crop Rotation was 62.926, for Soil Cover 65.251, for No Till 50.145, and for CA User was 57.129. Significance values of 0.000 were found for all 4 tests. These are all acceptable values for the models.

The Crop Rotation model resulted in 8 independent variables with significance: Education, Rented Land %, Info other farmers, Government Incentives, New Technology info, Decrease Costs, Community Impact, and Consulting with family. Decreasing costs had the strongest positive impact on adoption with an OR of 1.649. Rented land was the strongest predictor against adoption with an OR of .263, meaning that as the ratio of rented area increased there was about a 74% decrease in the odds of the farmer using crop rotation.

The Soil Cover model produced 5 significant variables: Risk Tolerance, Info other farmers, Decrease Costs, Community Impact, and Intuition. Concern with decreasing costs (OR 3.378) and trust in intuition (OR 2.081) were the strongest variables here, representing an approximately 3.4x and 2x increase in odds of usage (per unit increase on the Likert scale), respectively. Increased frequency of information from other farmers and concern about community impact were both negative influences on soil cover adoption, though the ORs did not show a very strong effect and they were only significant at the 90% confidence level.

The No Till model resulted in 4 significant variables: Gender, Info from Extension, New Technology info, and Friends' Opinions. With an OR of 2.40 for gender, we see that males have 2.4 times greater odds than females of using No Till. More frequent contact with extension and increasing perceived importance of friends' opinions showed a small reduction in likelihood for this practice.

Finally, the model representing CA users produced 6 statistically significant variables: Rented Land %, Info from Extension, New Technology Info, Community Impact, Intuition, and Friends' Opinions. Decrease Costs was just slightly below the 90% confidence threshold with a p-value of .108. Those placing more importance on keeping up with new technology information and trusting their intuition had about 65% increased odds of using all 3 CA practices, with high significance levels of .000 and .007 respectively. Each increase in the ratio of rented land had about 74% lower odds of full CA adoption, significant at the 10% level (p-value of .065). Increased frequency of

information sourced from extension also decreased odds of adoption (OR .560), significant at the 1% level (p-value of .001).

There was some overlap with the different models sharing significant independent variables. New Technology Info was significant in 3 out of the 4 models, just falling slightly short for Soil Cover. Community Impact was also significant in 3 of the 4, with insignificance for No Till. Rented Land, Info Extension, Decrease Costs, Intuition, and Friends' Opinions were significant for 2 out of 4. Age, Experience, and Info from Internet showed no significance for any of the models.

	Crop Rotation			*Soil Cover*			*No Till*			*CA User*		
Parameter	Sig.	OR	Std. Error	Sig.	OR	Std. Error	Sig.	OR	Std. Error	Sig.	OR	Std. Error
Age	.248	.976	.0211	.874	.994	.0381	.234	1.023	.0190	.493	1.014	.0199
Gender	.939	1.035	.4499	.915	.914	.8379	.040	2.400	.4259	.484	1.381	.4615
Education	.047	.734	.1557	.264	1.389	.2943	.547	.916	.1452	.258	.836	.1585
Experience	.955	.999	.0211	.328	.964	.0377	.144	.971	.0200	.195	.973	.0210
Rented Land (%)	.070	.263	.7369	.945	1.112	1.5421	.999	.999	.7053	.065	.257	.7359
Risk tolerance	.658	.951	.1130	.005	1.839	.2168	.957	1.006	.1160	.279	1.139	.1199
Info internet	.889	1.018	.1280	.157	.750	.2033	.983	.997	.1211	.234	1.170	.1320
Info extension	.513	1.116	.1684	.816	.940	.2661	.009	.669	.1545	.001	.560	.1760
Info other farmers	.004	1.521	.1466	.065	.613	.2649	.487	1.099	.1364	.252	1.183	.1470
Gov't incentives	.015	1.368	.1288	.978	1.006	.2083	.125	.830	.1215	.681	1.051	.1205
New technology info	.043	1.359	.1512	.160	1.435	.2572	.000	1.729	.1344	.000	1.642	.1389
Decrease costs	.024	1.649	.2219	.000	3.378	.3343	.481	1.162	.2132	.108	1.537	.2673
Community impact	.008	.662	.1545	.057	.594	.2730	.899	.983	.1332	.045	.755	.1404
Intuition	.131	1.257	.1514	.002	2.081	.2319	.168	1.215	.1414	.007	1.662	.1872
Consult with family	.036	1.535	.2038	.382	1.334	.3300	.334	.826	.1978	.181	1.370	.2353
Friends' opinions	.261	.871	.1230	.388	.818	.2323	.001	.684	.1192	.012	.735	.1226

Table 5: Binomial Logistic Model – note: sig. = p-value, OR = Odds Ratio, statistically significant variables highlighted (90% confidence or greater)

5.3.1. Farmer Choice Experiment

The results of the DCE, or experimental "game", yielded interesting results. A total of 245 participants received 8 different choice sets (or "cards") with 3 options in each (A, B, or C), representing 1,958 total choices (with 36 choices not completed). The first noticeable outcome is the high rate of Choice C (no change) being selected. About half (43.89%) of all responses indicated a desire for no change versus the presented alternatives. However, this is not surprising, as farmers are often found in the literature to be more conservative and reluctant to change, and there was often a difficult tradeoff of benefits vs. sacrifices in the attributes. Choices A and B were selected about equally to each other across the remainder of responses. This is to be expected, and helps validate the design of the experiment, as the mirrored foldover design presents these two options representing change in a balanced manner over the course of the series.

Table 6 below shows a simple breakdown of the selected option for each of the cards across all participants in total, along with a percentile for each choice type.

Table 6: DCE responses

Option	Choice A	Choice B	Choice C (no change)
# of times chosen	515	578	855
Percentile	26.44	29.67	43.89

Half of the chosen options were for no change, but what about the half that did represent change? How often were the various attributes (i.e., increased/decreased profit) part of the selected choice? Table 7 below shows the average score for each attribute when it was selected in a card. A score of 1 would indicate that the attribute level was part of the selected choice in every chosen card, while a score of 0 would indicate that the attribute level was not part of the selected choice in any of the chosen cards.

Table 7: Average attribute scores

Average	Profit Up	Profit Down	Labor Up	Labor Down	Erosion Up	Erosion Down
When A is chosen	0.738	0.262	0.386	0.614	0.025	0.975
When B is chosen	0.725	0.275	0.446	0.554	0.055	0.945
Combined avg.	**0.731**	**0.269**	**0.416**	**0.584**	**0.040**	**0.960**

Note: minimum score =0, maximum =1

The average attribute scores for choices A and B are roughly the same, again as expected due to the design, as they represent a mirror image of each other after all 8 cards are complete. Importantly, this tells us that respondents' answers were consistent and not arbitrary. Hence a combined average of A and B is provided and the focus here, as together they represent change versus the status quo, or willingness to adopt a new farming system.

The most conspicuous result is the high scores for 'Erosion Down' as well as the low scores for 'Erosion Up'. Lowering erosion is clearly the highest priority for the sample, as it had a nearly perfect score – meaning it was part of the selected choice in nearly all chosen cards. Similarly, increased erosion was nearly never part of the selected choice. Respondents consistently sought out the option to lower erosion and actively avoided choices that increased erosion.

Increased profit, with a combined average of 0.731, was also very strongly preferred. Changes in labor time had minimal effect on the decision, as can be seen by the nearly equal scores for an increase or decrease in labor hours.

6. Discussion

General Observations

Overall adoption of CA was seen by 35% of the sample, which in the context of European CA adoption levels is actually quite high. As reported by Kassam et al. (2018), the share of cropland in Europe under CA is only about 5%. Erosion is a serious problem in Albania

which farmers are well-aware of and highly motivated to ameliorate—it makes sense that they are using methods known to protect soil quality and structure, whether they know them as "Conservation Agriculture" or not. We saw consistent results in the data with respect to concern for erosion (particularly in the DCE), soil health, and seeking of new technology information. 120 out of the 243 respondents (49.4%) had already invested into some sort of erosion intervention on their farm (i.e., retaining wall, ditches, tree planting), with another 45 individuals planning to do so in the future. Increasing importance placed on new farming technology information and innovations was a strongly significant indicator across the models, which tells us that the combination of the awareness of the soil degradation problem and the motivation to find solutions is helping drive CA behavior.

Furthermore, these were primarily small farmers of limited means without resources to invest in modern machinery or to hire outside labor, in a country with minimal infrastructure support, and such are forced to find more creative ways to maintain viability. However, ingrained belief systems about tillage being beneficial, or simply a default part of the farming process, remain barriers to further adoption. A response commonly heard from the respondents who do till the soil was that it helps the soil and increases yield.

Farmer Characteristics

Farmer demographics were only significant in 2 instances – education for crop rotation and gender for no-till. This result is in agreement with the inconsistent findings for this category of variables by Knowler & Bradshaw (2007) in their synthesis of research on adoption studies. Females were less likely to adopt no-till in our sample, which is explained by Ndiritu et al. (2014) as the result of this practice being more labor-intensive and requiring more resources, which females tend to lack in comparison to men. Interestingly, each level of higher education obtained decreased the odds of adopting crop rotation by 27%. This is a bit counterintuitive as we would expect those with more education to have learned about the benefits of crop rotation; however, Knowler & Bradshaw (2007) did also find mixed results for education in their literature review. Perhaps the association found in this research could be attributed to those with higher education being more economically minded and following the modern path of intensive monoculture to maximize yields on cash crops, or that they were educated in this manner.

Farm Characteristics

The ratio of total land that is rented had an expectedly strong and significant effect on the level of CA adoption. In agreement with Sklenicka et al. (2015) and Bavorová et al. (2020)

those with less ownership of the land are unlikely to make increased investments of time, effort, and money for soil conservation strategies. They may also consider this the duty of the landowner instead of their own.

Information Sources

An interesting result meriting further discussion is the strong negative effect of extension workers on the adoption of CA. A significant variable with an OR of 0.669 for No Till and 0.560 for CA User, those who reported more regular information from extension workers had 33% lower odds of using conservation tillage and 44% lower odds of full CA adoption. This may be due to the unique nature of 'agricultural extension' work in the country. It was found after the survey that classic non-profit or NGO-based extension is practically nonexistent in Albania and when survey respondents were asked to clarify, the agricultural experts referred to were commonly the owners or employees of agricultural input and supply stores. These actors have a vested interest in selling fertilizers, pesticides, and other inputs rather than providing education on sustainable cropping systems; or may simply not be knowledgeable about CA.

Contrary to the hypothesis that increased exposure to internet-based information regarding farming would increase the chances of adopting CA innovations, the results showed no significance across any of the models. There are a variety of potential explanations for this, starting with the fact that the information accessible on the internet is so vast that it is impossible to determine what exactly farmers are finding and whether it drives them toward environmentally-friendly behaviors—or whether it is relevant to the topic whatsoever. Liu et al. (2021) found both positive and negative effects of the internet on pro-environmental behavior in their study, but it was not specific to agricultural adoption. Also notable is that approximately half of the sample reported "never" using the internet to access farming-related information. With a median age of 52 years and the region having a reasonably good broadband and cellular network this was somewhat surprising. The most common information source reported was other farmers, which was not surprising.

Attitudes & Behavioral Aspects

Risk tolerance had little effect on the models, as it was significant only for soil cover. The OR of 1.839 shows about an 80% increase in odds of soil cover adoption for each increase in reported risk tolerance. However, it is difficult to read too much into this figure as it was not significant elsewhere. The assumption that increased risk tolerance contributes to increased willingness to adopt new innovations may be more applicable to new

technologies, versus things like mulching and crop rotations which are well-established farming techniques with a long history and may not be perceived as 'risky'. Community impact results were counter to expectations. The results showed a strong negative impact for crop rotation, soil cover, and CA adoption in the models. The expectation from literature was that those concerned with making a broader impact on their community through their work would be more likely to adopt these practices which contribute to long-term health of the land—perhaps there is an information or education gap when it comes to the benefits of these practices. Considering the situation mentioned above regarding extension (or input suppliers in this case), as well as the economic situation in the country, it is likely that farmers perceive more modern monocropping methods to be more profitable and hence more of a positive impact on their community via increased incomes.

7. Conclusions

This thesis has examined the current level and factors influencing the adoption of Conservation Agriculture among smallholder farmers in the Tirana and Durrës regions of Albania. There is a relatively high level of current adoption which is encouraging to find, as the country struggles with erosion and land degradation issues. Farmers are aware of the land issues and highly motivated to remedy them with a focus on the longer term. CA can be a helpful tool in the effort to reach agricultural sustainability while also maintaining economic viability for a country that is still growing and developing, with hopes of eventual accession into the European Union. However, there remains opportunities to empower farmers further, fill in the gaps in knowledge, and increase adoption.

Another key problem is the lack of effective institutions and incentives to support sustainable agriculture at scale. With the right incentives and institutional support, we should see greater strides in agricultural development across the country.

8. Recommendations

The successful spread of CA requires that a variety of constraints are overcome. Trust in institutions is incredibly low, so more informal education efforts on the benefits and methodologies for CA should be undertaken at the local level. Top-down governmental programs are not recommended at this point; however, institutional support in the form of access to capital (with few strings attached) would be helpful for those living at or near subsistence level and in need of specialized equipment. Trust in agricultural professionals is high, but there is a lack of true extension support in the country. Bottom-up education, with a heavy focus on the benefits for erosion control & prevention of CA, starting with agricultural input providers could help kick-start further dissemination in the farming community.

Farmer-to-farmer programs that have seen great success in other places around the world can be modeled and brought to Albania by tapping into key influencer networks. The design of any such effort should of course take into accountf the needs and unique circumstances of the community.

9. Limitations of the study

9.1. Methodological limitations

- Centralized records and lists were not available, so random sampling was not possible.
- It is difficult to tell whether the selection of the attribute levels in the DCE may have influenced results, i.e. if the choice of erosion doubling vs. being eliminated was perceived as overwhelmingly large compared to a 10% or 25% change for profit and labor, respectively.
- Advanced statistical analysis of the DCE was foregone due to a lack of experience and understanding of the experimental methodology and its statistical processing. Future work with this data is currently underway between the author and academic team, with hopes of journal publication.

9.2. Logistical limitations

- Language barriers made direct interaction with most all the respondents impossible for the author. Communication was completely dependent on the local survey team and misunderstandings could easily arise. The survey team needed to be trained on the concepts on the spot and relied upon for proper translation of both language and context. An example effect of this can be seen in the issues with the definition of an extension worker described in the discussion above.
- Cultural complexities – in particular a mistrust of government officials – at times led to a hesitancy to divulge information beyond the surface level, or outright denial of interviews.
- Transportation was wholly dependent on the schedule and availability of a borrowed vehicle and one of the local students' schedules. Many interviews were conducted by the survey team on their own time, where it was not possible to supervise the interactions or help with potential misunderstandings.
- The ongoing COVID-19 pandemic further complicated logistical challenges across the board, as well as restricted travel to other neighboring agricultural regions.

10. References

Abd-Ella MM, Hoiberg EO, Warren RD. 1981. Adoption Behavior in Family Farm Systems: An Iowa Study. Rural Sociology **46**:42–61.

Ajzen I. 1991. The theory of planned behavior. Organizational Behavior and Human Decision Processes **50**:179–211. Academic Press.

Antwi-Agyei P, Stringer LC. 2021. Improving the effectiveness of agricultural extension services in supporting farmers to adapt to climate change: Insights from northeastern Ghana. Climate Risk Management **32**. Elsevier B.V. Available from https://doi.org/10.1016/j.crm.2021.100304.

Barjaba J. 2017. Albanian Diaspora across the World. Athens Journal of Mediterranean Studies **5**:3–173. Available from https://doi.org/10.30958/ajms.5-3-3 (accessed January 6, 2021).

Bavorová M, Unay-Gailhard İ, Ponkina E V., Pilařová T. 2020. How sources of agriculture information shape the adoption of reduced tillage practices? Journal of Rural Studies **79**:88–101.

Bellotti B, Rochecouste JF. 2014. The development of Conservation Agriculture in Australia—Farmers as innovators. International Soil and Water Conservation Research **2**:21–34. Elsevier.

Bhan S, Behera UK. 2014. Conservation agriculture in India – Problems, prospects and policy issues. International Soil and Water Conservation Research **2**:1–12. Elsevier.

Bucher T, Collins C, Rollo ME, McCaffrey TA, De Vlieger N, Van Der Bend D, Truby H, Perez-Cueto FJA. 2016. Nudging consumers towards healthier choices: A systematic review of positional influences on food choice. British Journal of Nutrition **115**:2252–2263.

Cadario R, Chandon P. 2018. Which Healthy Eating Nudges Work Best? a Meta-Analysis of Field Experiments. Advances in Consumer Research **46**:497–497.

Carlsmt J, Dillman D. 1983. Influences of Kinship Arrangements on Farmer Innovations. Rural Sociology **48**:183–200.

Carter EK, Riha SJ, Melkonian J, Deines JM, Wang S, Lobell DB. 2019. Satellites reveal a small positive yield effect from conservation tillage across the US Corn Belt.

Environmental Research Letters **14**:124038. IOP Publishing. Available from https://iopscience.iop.org/article/10.1088/1748-9326/ab503b (accessed April 20, 2022).

Carter MR. 2005. CONSERVATION TILLAGE. Encyclopedia of Soils in the Environment **4**:306–311. Elsevier.

Casagrande M et al. 2016. Organic farmers' motivations and challenges for adopting conservation agriculture in Europe. Organic Agriculture **6**:281–295. Organic Agriculture. Available from http://dx.doi.org/10.1007/s13165-015-0136-0.

Chen J, Li Z, Xiao H, Ning K, Tang C. 2021. Effects of land use and land cover on soil erosion control in southern China: Implications from a systematic quantitative review. Journal of Environmental Management **282**. Elsevier Ltd. Available from https://doi.org/10.1016/j.jenvman.2020.111924.

Chouinard HH, Paterson T, Wandschneider PR, Ohler AM. 2008. Will Farmers Trade Profits for Stewardship? Heterogeneous Motivations for Farm Practice Selection. Land Economics **84**:66–82. University of Wisconsin Press. Available from http://le.uwpress.org/content/84/1/66 (accessed November 16, 2020).

Christensen C. 2012. Sustainable and Profitable GROWTH. MWorld **11**:6–8. Available from www.fao.org/reliefoperations (accessed March 27, 2021).

Clearfield F, Osgood B. 1986. Sociological Aspects of the Adoption of Conservation Practices. Page Soil Conservation Service. Washington D.C.

Climate-Data.org. 2021. Average Temperature, weather by month, weather averages. Available from https://en.climate-data.org/europe/albania-68/ (accessed January 6, 2021).

Corporate Finance Institute. 2015. Neoclassical Economics - Overview, Assumptions, Key Concepts. Available from https://corporatefinanceinstitute.com/resources/knowledge/economics/neoclassical-economics/ (accessed August 1, 2020).

Ervin CA, Ervin DE. 1982. "Factors affecting the use of soil conservation practices: Hypotheses, evidence, and policy implications." Land Economics **58**:277–292.

Eurostat. 2021. Agriculture statistics at regional level. Available from https://ec.europa.eu/eurostat/statisticsexplained/ (accessed February 16, 2021).

Fan J, McConkey BG, St. Luce M, Brandt K. 2020. Rotational benefit of pulse crop with no-till increase over time in a semiarid climate. European Journal of Agronomy **121**:126155. Elsevier.

FAO. 2008. An international technical workshop Investing in sustainable crop intensification: The case for improving soil health **6**:149.

FAO. 2013. Conservation agriculture in Central Asia: Status, Policy, Institutional Support, and Strategic Framework for its Promotion:57 pp. Available from www.fao.org/ (accessed July 25, 2021).

FAO. 2015. Status of the World's Soil Resources: Main Report. Rome.

FAO. 2017a. Conservation Agriculture | Food and Agriculture Organization of the United Nations. Available from http://www.fao.org/conservation-agriculture/en/ (accessed August 16, 2020).

FAO. 2017b. Country Programming Framework in the Republic of Albania 2015 – 2017. Available from http://www.fao.org/3/a-au045e.pdf.

Feder G, Just RE, Zilberman D. 1985. Adoption of Agricultural Innovations in Developing Countries: A Survey **33**:255–298. Available from https://about.jstor.org/terms (accessed August 5, 2021).

Giller KE, Witter E, Corbeels M, Tittonell P. 2009. Conservation agriculture and smallholder farming in Africa: The heretics' view. Field Crops Research **114**:23–34. Elsevier.

Gould BW, Saupe WE, Klemme RM. 1989. Conservation tillage: the role of farm and operator characteristics and the perception of soil erosion. Land Economics **65**:167–182.

Harriss B. 1972. Innovation Adoption in Indian Agriculture—the High Yielding Varieties Programme. Modern Asian Studies **6**:71–98. Cambridge University Press. Available from https://www.cambridge.org/core/journals/modern-asian-studies/article/abs/innovation-adoption-in-indian-agriculturethe-high-yielding-varieties-programme/A2BE22A72845994614FAE24F185244CC (accessed January 6, 2021).

Hassan MS, Shaffril HAM, Samah MSS, Ramli NS. 2010. Agriculture Communication in Malaysia : The Current Situation. American Journal of Agricultural and Biological

Sciences **5**:389–396.

Hauber AB, González JM, Groothuis-Oudshoorn CGM, Prior T, Marshall DA, Cunningham C, IJzerman MJ, Bridges JFP. 2016. Statistical Methods for the Analysis of Discrete Choice Experiments: A Report of the ISPOR Conjoint Analysis Good Research Practices Task Force. Value in Health **19**:300–315. Elsevier. Available from http://dx.doi.org/10.1016/j.jval.2016.04.004.

Hellin J, Erenstein O, Beuchelt T, Camacho C, Flores D. 2013. Maize stover use and sustainable crop production in mixed crop–livestock systems in Mexico. Field Crops Research **153**:12–21. Elsevier.

Hertwig R, Pachur T. 2015. Heuristics, History of. International Encyclopedia of Social & Behavioral Sciences:829–835. Available from http://dx.doi.org/10.1016/B978-0-08-097086-8.03221-9.

Horowitz JL, Savin NE. 2001. Binary Response Models: Logits, Probits and Semiparametrics. Journal of Economic Perspectives **15**:43–56. American Economic Association.

Huang J, Wang J, Zhao X, Wu P. 2014. Effects of permanent ground cover on soil moisture in jujube orchards under sloping ground : A simulation study. Agricultural Water Management **138**:68–77. Elsevier B.V. Available from http://dx.doi.org/10.1016/j.agwat.2014.03.002.

Huang Y, Ren W, Grove J, Poffenbarger H, Jacobsen K, Tao B, Zhu X, McNear D. 2020. Assessing synergistic effects of no-tillage and cover crops on soil carbon dynamics in a long-term maize cropping system under climate change. Agricultural and Forest Meteorology **291**:108090. Elsevier.

Hunt ND, Hill JD, Liebman M. 2019. Cropping System Diversity Effects on Nutrient Discharge, Soil Erosion, and Agronomic Performance. Environmental Science and Technology **53**:1344–1352. American Chemical Society.

Hunter MC, Smith RG, Schipanski ME, Atwood LW, Mortensen DA. 2017. Agriculture in 2050: Recalibrating Targets for Sustainable Intensification. BioScience **386**. Available from http://bioscience.oxfordjournals.org (accessed March 26, 2021).

INSTAT. 2014. Population and population dynamics in Albania. Tirana.

INSTAT. 2020. Agriculture Statistics 2020. Tirana. Available from

http://www.instat.gov.al/ (accessed February 20, 2021).

INSTAT. 2021. Population of Albania. Available from http://www.instat.gov.al/en/themes/demography-and-social-indicators/population/publication/2021/population-of-albania-1-january-2021/ (accessed February 6, 2021).

Johnson FR, Lancsar E, Marshall D, Kilambi V, Mühlbacher A, Regier DA, Bresnahan BW, Kanninen B, Bridges JFP. 2013. Constructing experimental designs for discrete-choice experiments: Report of the ISPOR conjoint analysis experimental design good research practices task force. Value in Health **16**:3–13.

Kassam A, Friedrich T, Derpsch R. 2018. Global spread of Conservation Agriculture. International Journal of Environmental Studies **76**:29–51. Routledge. Available from https://doi.org/10.1080/00207233.2018.1494927.

Khalil E. 2009. Self-deceit and self-serving bias: Adam Smith on 'General Rules.' Journal of Institutional Economics **5**:251–258. Cambridge University Press. Available from https://www.cambridge.org/core/journals/journal-of-institutional-economics/article/abs/selfdeceit-and-selfserving-bias-adam-smith-on-general-rules/325205F27C32E8E39C1F76D797CD1743 (accessed September 1, 2020).

Knowler D, Bradshaw B. 2007. Farmers' adoption of conservation agriculture: A review and synthesis of recent research. Food Policy **32**:25–48.

Koprencka L, Muharremi O. 2010. LAND MARKET IN ALBANIA: UNRESOLVED PROPERTY OWNERSHIP RIGHTS. Perspectives of Innovations, Economics & Business **6**:41–44. Available from https://scindeks-clanci.ceon.rs/data/pdf/0352-3462/2019/0352-34621901189S.pdf.

Krishnan P, Patnam M. 2014. Neighbors and extension agents in ethiopia: Who matters more for technology adoption? American Journal of Agricultural Economics **96**:308–327.

Lee M, Gambiza J. 2022. The adoption of conservation agriculture by smallholder farmers in southern Africa : A scoping review of barriers and enablers. Journal of Rural Studies **92**:214–225. Elsevier Ltd. Available from https://doi.org/10.1016/j.jrurstud.2022.03.031.

Lewis F, Butler A, Gilbert L. 2011. A unified approach to model selection using the

likelihood ratio test. Methods in Ecology and Evolution **2**:155–162. John Wiley & Sons, Ltd. Available from https://onlinelibrary.wiley.com/doi/full/10.1111/j.2041-210X.2010.00063.x.

Liben F, Hassen SJ, Kim HK, Kidane MS, Yeda GG, Beshir B. 2017. Conservation Agriculture for Maize and Bean Production in the Central Rift Valley of Ethiopia. Soil Tillage, Conservation & Management.

Liu P, Han C, Teng M. 2021. Resources , Conservation & Recycling The influence of Internet use on pro-environmental behaviors : An integrated theoretical framework. Resources, Conservation & Recycling **164**:105–162. Elsevier. Available from https://doi.org/10.1016/j.resconrec.2020.105162.

Loh KK, Kanai R. 2015. How Has the Internet Reshaped Human Cognition? The Neuroscientist.

Luli F, Xinxo M. (n.d.). Soils In Albania And Their Characteristics. Available from http://natres.psu.ac.th/link/soilcongress/bdd/symp15/688-t.pdf.

Montanarella L et al. 2016. World's soils are under threat. SOIL **2**:79–82. Copernicus GmbH.

Myers R, Weber A, Tellatin S. 2019. Cover Crop Economics: Opportunities to Improve Your Bottom Line in Row Crops. Available from www.SARE.org (accessed September 19, 2020).

Ndiritu SW, Kassie M, Shiferaw B. 2014. Are there systematic gender differences in the adoption of sustainable agricultural intensification practices? Evidence from Kenya. Food Policy **49**:117–127. Elsevier Ltd.

Neill SP, Lee DR. 1999. Working Paper Explaining the Adoption and Disadoption of Sustainable Agriculture: The Case of Cover Crops in Northern Honduras.

Nieto OM, Castro J, Fernández-Ondoño E. 2012. Conventional tillage versus cover crops in relation to carbon fixation in Mediterranean olive cultivation. Plant Soil.

Niu Z, Chen C, Gao Y, Wang Y, Chen Y, Zhao K. 2022. Peer effects, attention allocation and farmers' adoption of cleaner production technology: Taking green control techniques as an example. Journal of Cleaner Production **339**. Elsevier Ltd. Available from https://doi.org/10.1016/j.jclepro.2022.130700.

Okoye CU. 1998. Comparative analysis of factors in the adoption of traditional and

recommended soil erosion control practices in Nigeria. Soil and Tillage Research **45**:251–263. Elsevier.

Pannell DJ, Llewellyn RS, Corbeels M. 2014. The farm-level economics of conservation agriculture for resource-poor farmers. Agriculture, Ecosystems & Environment **187**:52–64. Elsevier.

Pereira De Herrera A, Sain G. 1999. Adoption of Maize Conservation Tillage in Azuero, Panama:34.

Rama K, Zhllima E, Imami D. 2018. Albania's challenges of implementation of Agri-Environmental Policies in the framework of EU Accession. Tirana. Available from http://library.fes.de/pdf-files/bueros/albanien/14991.pdf.

Ray DK, Mueller ND, West PC, Foley JA. 2013. Yield Trends Are Insufficient to Double Global Crop Production by 2050. PLoS ONE **8**.

Rodenburg J, Büchi L, Haggar J. 2021. Adoption by adaptation: moving from Conservation Agriculture to conservation practices. International Journal of Agricultural Sustainability **19**:437–455. Taylor & Francis. Available from https://www.tandfonline.com/doi/abs/10.1080/14735903.2020.1785734.

Scopel E, Silva FAM da, Corbeels M, Affholder F, Maraux F. 2004. Modelling crop residue mulching effects on water use and production of maize under semi-arid and humid tropical conditions. Agronomie **24**:383–395. Available from https://hal.archives-ouvertes.fr/hal-00886027 (accessed July 26, 2021).

Shallari S. 2019. Land Degradation Neutrality Target for Albania and Soil Erosion Measurement Norms and Standards. Tirana. Available from https://www.undp.org/content/dam/albania/Environment/WEB_final_report.pdf.

Siegel R, Gordon K, Dynan L. 2021. Behavioral Economics: A Primer and Applications to the UN Sustainable Development Goal of Good Health and Well-Being. Reports **4**:16. MDPI AG.

Singh JE, Babshetti V, Shivaprasad HN. 2021. Efficient Market Hypothesis to Behavioral Finance: A Review of Rationality to Irrationality. Materials Today: Proceedings. Elsevier.

Sklenicka P, Molnarova KJ, Salek M, Simova P, Vlasak J, Sekac P, Janovska V. 2015. Owner or tenant: Who adopts better soil conservation practices? Land Use Policy

47:253–261. Elsevier Ltd. Available from http://dx.doi.org/10.1016/j.landusepol.2015.04.017.

SSSA. 2013. Glossary of Soil Science Terms. Soil Science Society of America.:2010. Available from https://www.soils.org/publications/soils-glossary#.

Stagnari F, Ramazzotti S, Pisante M. 2009. Conservation Agriculture: A Different Approach for Crop Production Through Sustainable Soil and Water Management: A Review:55–83.

Stonehouse DP. 1997. Socio-economics of alternative tillage systems. Soil and Tillage Research **43**:109–130. Elsevier.

Streletskaya NA, Bell SD, Kecinski M, Li T, Banerjee S, Palm-Forster LH, Pannell D. 2020. Agricultural Adoption and Behavioral Economics: Bridging the Gap. Applied Economic Perspectives and Policy **42**:54–66.

Sunstein CR. 2018. The rise of behavioral economics: Richard Thaler's misbehaving. Journal of Behavioral Economics for Policy **2**:53–57. Society for the Advancement of Behavioral Economics (SABE). Available from https://ideas.repec.org/a/beh/jbepv1/v2y2018i1p53-57.html (accessed August 1, 2021).

Szumilas M. 2010. Explaining Odds Ratios. Journal of the Canadian Academy of Child and Adolescent Psychiatry **19**:227. Canadian Academy of Child and Adolescent Psychiatry. Available from /pmc/articles/PMC2938757/ (accessed April 22, 2022).

Tarifa F. 1995. Albania's Road from Communism: Political and Social Change, 1990–1993. Development and Change **26**:133–162.

The United Nations Decade for Deserts (2010-2020) and the fight against Desertification | UNCCD. (n.d.). Available from https://www.unccd.int/actions/united-nations-decade-deserts-2010-2020-and-fight-against-desertification (accessed October 27, 2020).

The World Bank. (n.d.). Albania | Data. Available from https://data.worldbank.org/country/albania (accessed November 12, 2020).

Tversky A, Kahneman D. 1974. Judgment under Uncertainty: Heuristics and Biases. Science **185**:1124–1131. American Association for the Advancement of Science . Available from https://www.science.org/doi/abs/10.1126/science.185.4157.1124 (accessed April 21, 2022).

Ullah R, Shivakoti GP, Ali G. 2015. Factors effecting farmers' risk attitude and risk perceptions: THE case of Khyber Pakhtunkhwa, Pakistan. International Journal of Disaster Risk Reduction **13**:151–157. Elsevier. Available from http://dx.doi.org/10.1016/j.ijdrr.2015.05.005.

United Nations Department of Economic and Social Affairs Population Division. 2019. World Population Prospects 2019 Highlights. New York.

United Nations Development Programme (UNDP). 2020. Human Development Report 2020: The Next Frontier Human Development and the Anthropocene Briefing note for countries on the 2020 Human Development Report Albania. Page UNDP: New York, NY, USA. Available from http://hdr.undp.org/en/data (accessed January 26, 2021).

Varga E. 2020. How does the Internet Influences the Readers' Behavior. Procedia Manufacturing **46**:949–956. Elsevier B.V. Available from https://doi.org/10.1016/j.promfg.2020.05.013.

Vastola A, Zdruli P, D'Amico M, Pappalardo G, Viccaro M, Di Napoli F, Cozzi M, Romano S. 2017. A comparative multidimensional evaluation of conservation agriculture systems: A case study from a Mediterranean area of Southern Italy. Land Use Policy **68**:326–333. Pergamon.

Vlek PLG, Tamene L. 2009. Conservation agriculture: why? Page 4th World Congress on Conservation Agriculture. New Delhi. Available from https://www.researchgate.net/publication/288968776.

Warner M. 1999. Social Capital Construction and the Role of the Local State. Rural Sociology **64**:373–393. John Wiley & Sons, Ltd. Available from https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1549-0831.1999.tb00358.x?saml_referrer.

Westra J V., Olson KD. 1997. Farmers' Decision Processes And Adoption Of Conservation Tillage. Department of Applied Economics, University of Minnesota:37.

Wezel A, Rath T. 2002. Resource conservation strategies in agro-ecosystems of semi-arid West Africa. Journal of Arid Environments **51**:383–400. Academic Press.

World Health Organization. 2012. User Guide With Case Studies: How to Conduct a Discrete Choice Experiment for Health Workforce Recruitment and Retention in Remote and Rural Areas. Available from

https://www.who.int/hrh/resources/DCE_UserGuide_WEB.pdf?ua=1 (accessed August 27, 2020).

WorldAtlas. 2021. What Languages Are Spoken In Albania? Available from https://www.worldatlas.com/articles/what-languages-are-spoken-in-albania.html (accessed January 6, 2021).

Wulanningtyas HS, Gong Y, Li P, Sakagami N, Nishiwaki J, Komatsuzaki M. 2021. A cover crop and no-tillage system for enhancing soil health by increasing soil organic matter in soybean cultivation. Soil and Tillage Research **205**:104749. Elsevier.

Xie H, Huang Y. 2021. Land Use Policy Influencing factors of farmers ' adoption of pro-environmental agricultural technologies in China : Meta-analysis. Land Use Policy **109**. Elsevier Ltd. Available from https://doi.org/10.1016/j.landusepol.2021.105622.

Appendices

Appendix 1: General Questionnaire (English)

Appendix 2: Discrete Choice Experiment (English)

Appendix 3: General Questionnaire (Albanian)

Appendix 4: Discrete Choice Experiment (Albanian)

Appendix 1: General Questionnaire (English)

Questionnaire – Farmer Motivation to Adopt Conservation Agriculture Practices

This is a research project being conducted by the Agricultural University of Tirana in partnership with the Czech University of Life Sciences Prague. Results will be used to publish scientific work and policy recommendations. All responses are kept strictly confidential.

0.1 No of questionnaire_____ **Start time** _____ **End time** _____

0.2 Interviewee name _____

0.3 Interviewer name _____

0.4 Date _____

0.5 Municipality _____

0.6 Administrative unit _____

0.7 Village name _____

A1. Who makes the farm decisions? _____

A2. Who is answering this questionnaire? _____

1. Father senior
2. Mother
3. Son
4. Daughter
5. Son-in-law
6. Daughter-in-law

A2.1. Are you involved in farm processes? 1. Yes 2. No
[In case of no, stop the interview]

A3. Age of the respondent	_____ years old
A4. Gender of the respondent	1. M 2. F
A5.1 No. of household members	A. _____ people B. of which female _____
A5.2. No. of household members above 16 years	A. _____ people B. of which female _____
A5.3. Number of household members working on farm	A._____ people B. of which female _____

Note: Choose only one

A6. Main employment of respondent	A7. Highest education level of respondent
1. Wage employment in public sector 2. Wage employment in private sector 3. Self-employed in non-agricultural sector 4. Self-employed in farming sector	1. No education 2. Elementary school (4 years) 3. Mandatory education (up to 9 years) 4. Agricultural high school 5. General and other technical high school 6. University education 6.1 Agriculture degree 1. YES 2. NO

A8. Number of years of experience with the farming sector: _____ Years

A9. Have you ever emigrated to a country outside of Albania for longer than 3 months in the last 10 years?	
1. Yes	2. No

A10. Please complete table with farm details:		
	Unit	Year 2019
A10.1 Agriculture land in ownership	Dyn	
A10.2 Agriculture land rented	Dyn	
A10.3 Agriculture land in use of which		
a. Field Vegetable	Dyn	
b. Fruits	Dyn	
c. Cereals	Dyn	
d. Fodder	Dyn	
e. Other cultivated	Dyn	
f. Uncultivated land	Dyn	
A10.4 Animals		
a. Cattle (lactating)	Heads	
b. Small ruminants	Heads	
c. Poultry	Heads	
d. Bees	Hives	

A11. Please indicate % of farm production for family consumption vs. market sale:	
A11.1 Personal/Family consumption: _____%	A11.2 Sale on market: _____%

A12. Is your farm currently certified according to organic standards?	
1. Yes	2. No
A12.1 If no, are you planning to obtain certification in the future? 1. Yes 2. No	

A13. Does the farm have access to irrigation water?	
1. Yes	2. No
A13.1 If yes, what percentage of land is covered by irrigation access? _____%	

A14. Have you ever used credit (e.g. loans) for farm expenses?	
1. Yes	2. No

A15. How do you see yourself as far as being able to take risks? Circle one:						
1 (not risky at all)	2	3	4	5	6	7 (very risky)

B1. Which of these strategies did you use in the year 2019?

	a) Usage 1. Yes 2. No	b) If YES, When first implemented? (Year)	c) If YES, Share of arable land: 1. <30% 2. 30-60% 3. 60-90% 4. >90% **select only 1*	d) If YES, Type of crop: 1. Vegetable 2. Fodder 3. Cereals 4. Fruits 5. Other **may select more than 1*	e) If YES, Main objectives: 1. Pest control 2. Weed control 3. Soil protection 4. Increase profit 5. Increase yield 6. Climate change adaptation 7. Environmental concern 8. Other (specify) **may select more than 1*	f) If NO, Did you practice in the past 5 years? 1. Yes 2. No	g) If NO, Main reasons: 1. Too costly 2. Too time consuming 3. Not beneficial 4. Need information 5. Other (specify) **may select more than 1*
B1.1 Crop rotation							
B1.2 Permanent soil organic cover							
B1.3 Minimal or Zero Tillage							

Notes

B1.1: Crop rotation means that different crops are alternated in the same plot in sequence over different planting seasons

B1.2: Using mulch, compost, and/or cover crops to cover exposed land

B1.3: Minimal mechanical disturbance to the soil other than to directly sow seeds

B2. Please estimate how much of your arable land (in %) is deteriorated from soil erosion:

[Erosion is a process of natural damage to land and loss of topsoil by wind and/or water over time. See photos provided]

B2.1 Somewhat deteriorated _____% a) 1. Wind erosion ☐ 2. Water erosion ☐

B2.2 Seriously deteriorated _____% a) 1. Wind erosion ☐ 2. Water erosion ☐

B3. Concerning the land that is deteriorated:

B3.1 It mostly has access to irrigation 1. Y ☐ 2. N ☐

B3.2 1. The slope of land is mostly steep 2. It is mostly flat

B3.3 What is the primary crop type grown in this plot? 1. Vegetables 2. Fodder 3. Cereals 4. Fruit

5. Other:

B4. In the last 5 years, have you made any interventions to control erosion?

1. Yes	2. No

B4.1. If yes, what specific interventions have been made?

1. Trees as wind breaks
2. Stone wall
3. Cement wall
4. Wood or debris barrier
5. Contouring or terracing
6. Other:

B5. Do you plan to make interventions to control land erosion in the future?

1. Yes	2. No

B5.1 If yes, which type of intervention do you plan to use?

1. Trees as wind breaks
2. Stone wall
3. Cement wall
4. Wood or debris barrier
5. Contouring or terracing
6. Other:

B6. Please estimate the cost of the interventions:

B6.1 Already undertaken: _____ Lek

B6.2 Planned in future: _____ Lek

C1. Please indicate to which extent you agree:					
	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
C1.1 Protecting the environment is important					
C1.2 Climate change is a threat to my farm					
C1.3 Water shortages are a significant concern					
C1.4 Harvests regularly experience losses to due to disease					
C1.5 I regularly have problems controlling weeds					

C2. How often do you make use of the following information channels regarding farming practices?					
1-Never	**2-Once or twice per year**	**3-Monthly**	**4-Weekly**	**5-Daily**	
C2.1 Internet	1	2	3	4	5
C2.2 Local Extension	1	2	3	4	5
C2.3 Other farmers I am in contact with	1	2	3	4	5
C2.4 Print media (e.g. farming magazine)	1	2	3	4	5
C2.5 Events/Conferences	1	2	3	4	5
C2.6 Other (please indicate):	1	2	3	4	5

C3. Are you currently a member of a farming association?	
1. Yes	2. No

C4. In general, how well-informed do you feel about topics important to you as a farmer?
Not at all informed - 1 2 3 4 5 - Very informed

C5. Please evaluate the importance of the following types of information for your decisions as a farmer:					
Not important - 1				**5 - Very important**	
C5.1 Best practices of similar farmers in my region	1	2	3	4	5
C5.2 Market information (e.g. prices)	1	2	3	4	5
C5.3 Governmental schemes and tax incentives	1	2	3	4	5
C5.4 Climate change information (news, updates)	1	2	3	4	5
C5.5 Water saving strategies	1	2	3	4	5

C5.6 Soil protection methods	1 2 3 4 5
C5.7 New farming technologies/innovations	1 2 3 4 5
C5.8 Knowledge of traditional cultivation methods	1 2 3 4 5

C6. When considering farm management practices, how important to you are the following considerations?	
Not important - 1	**5- Very important**
C6.1 Increasing profits	1 2 3 4 5
C6.2 Decreasing costs	1 2 3 4 5
C6.3 Minimizing risk of poor harvest	1 2 3 4 5
C6.4 Minimizing work/labor required	1 2 3 4 5
C6.5 Increasing environmental sustainability	1 2 3 4 5
C6.6 Maintaining soil fertility	1 2 3 4 5
C6.7 Complying with government rules & regulations	1 2 3 4 5
C6.8 Positive impact to community and society	1 2 3 4 5
C6.9 Climate Change adaptation	1 2 3 4 5

C7. When making important decisions on the farm:					
	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
C7.1 I prefer to trust my own intuition					
C7.2 Consulting with family is important					
C7.3 I am concerned with the opinions of my friends and colleagues					
C7.4 I trust recommendations by experts (agronomists, extension workers, etc.)					
C7.5 Costs vs. benefits must be analyzed					
C7.6 It is better to conduct a trial on a small area first before making changes					
C7.7 I like to see other farmers have a successful experience before changing things myself					
C7.8 Long term land management is more important than short term profitability					

Appendix 2: Farmer Choice Experiment (English)

You will now be presented with various scenarios representing a potential change in farm management practices and the effect on your overall profit, the amount of labor (personal or hired hours of work), and level of erosion (compared to current level). When making this decision we would like you consider the consequences your choice would have on your family and make this decision the same way you would make a planting decision. When picking an option please consider how your life would be if the harvest is good and if the harvest is bad. You can also select Option C, which represents no change in management and maintaining current practices.

SAMPLE

When planning for next year, you are deciding between 2 new farm management practices or whether to make no changes.

- *After implementing Option A, next year your overall profit would be reduced by 10%, labor hours increase by 10%, and the level of erosion is doubled.*
- *Option B results in profits increasing by 10%, labor hours being reduced by 10%, and zero erosion.*
- *Option C is to make no change from current practices.*

Option A	**Option B**	**Option C** *(no change)*
Profit -10% 	Profit +10% 	Current Profit 
Labor hours +25% 	Labor hours -25% 	Current amount of labor 
Erosion increases by double 	Erosion reduced to zero 	Current level of erosion 
☐	☐	☐

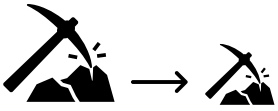
Choose either option A, B, or C

*[Note: If respondent <u>does not</u> choose **option B**, confirm they understand the game, as it is clearly superior to the alternatives]*

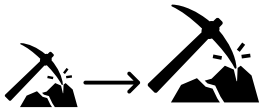
1

Option A	**Option B**	**Option C** *(no change)*
Profit -10% 	Profit +10% 	Current Profit 
Labor hours -25% 	Labor hours +25% 	Current amount of labor 
Erosion increases by double 	Erosion reduced to zero 	Current level of erosion 
☐	☐	☐

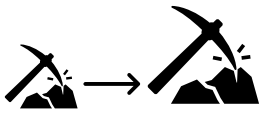
2

Option A	**Option B**	**Option C** *(no change)*
Profit -10% 	Profit +10% 	Current Profit 
Labor hours -25% 	Labor hours +25% 	Current amount of labor 
Erosion reduced to zero 	Erosion increases by double 	Current level of erosion 
☐	☐	☐

3

Option A	**Option B**	**Option C** *(no change)*
Profit -10% 	Profit +10% 	Current Profit 
Labor hours +25% 	Labor hours -25% 	Current amount of labor 
Erosion increases by double 	Erosion reduced to zero 	Current level of erosion 
☐	☐	☐

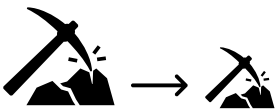
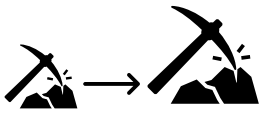
4

Option A	**Option B**	**Option C** **(no change)**
Profit -10% 	Profit +10% 	Current Profit 
Labor hours +25% 	Labor hours -25% 	Current amount of labor 
Erosion reduced to zero 	Erosion increases by double 	Current level of erosion 
☐	☐	☐

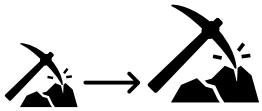
5

Option A	**Option B**	**Option C** *(no change)*
Profit +10% 	Profit -10% 	Current Profit 
Labor hours -25% 	Labor hours +25% 	Current amount of labor 
Erosion increases by double 	Erosion reduced to zero 	Current level of erosion 
☐	☐	☐

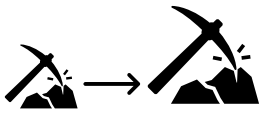
6

Option A	**Option B**	**Option C** *(no change)*
Profit +10% 	Profit -10% 	Current Profit 
Labor hours -25% 	Labor hours +25% 	Current amount of labor 
Erosion reduced to zero 	Erosion increases by double 	Current level of erosion 
☐	☐	☐

7

Option A	**Option B**	**Option C** *(no change)*
Profit +10% 	Profit -10% 	Current Profit 
Labor hours +25% 	Labor hours -25% 	Current amount of labor 
Erosion increases by double 	Erosion reduced to zero 	Current level of erosion 
☐	☐	☐

8

Option A	**Option B**	**Option C** *(no change)*
Profit +10% 	Profit -10% 	Current Profit 
Labor hours +25% 	Labor hours -25% 	Current amount of labor 
Erosion reduced to zero 	Erosion increases by double 	Current level of erosion 
☐	☐	☐

Faleminderit shumë!

Thank you for your time and assistance

Examples of water erosion on the farm:	Examples of wind erosion on the farm:
	
	

Appendix 3: General Questionnaire (Albanian)

Pyetësor – Motivimi i fermerëve për të aplikuar praktika të ruajtjes së tokës bujqësore

Ky është një projekt kërkimor që po kryhet nga Universiteti Bujqësor i Tiranës në bashkëpunim me Universitetin Çek të Shkencave të Jetës në Pragë. Rezultatet do të përdoren për kërkim shkencor dhe për të rekomanduar politika. Të gjitha përgjigjet do të mbahen krejtësisht konfidenciale.

0.0 A jeni i përfshirë në aktivitetet e fermës? 1. Po 2. Jo ***[Nëse Jo, ndalo intervistën]***

0.1 Nr _____ **Koha e fillimit** _____ **Koha e mbarimit** _____

0.2 Emri i intervistuesit _____

0.3 Emri i fermerit/es _____

0.4 Data _____

0.5 Bashkia _____

0.6 Njësia Administrative _____

0.7 Fshati _____

A1. Kush i merr vendimet për fermën? _____

A2. Shëno cili po përgjigjet? _____

7. Babai
8. Nëna
9. Djali
10. Vajza
11. Dhëndri
12. Nusja

[Per pyetjet ne vazhdim, pergjigjuni per personin qe po intervistohet.]

A3. Mosha	_____ vjeç
A4. Gjinia	1. M 2. F
A5.1 Nr i pjestarëve të familjes	A. _____persona B. nga të cilat gra_____
A5.2. Nr i pjestarëve të familjes mbi 16 vjec	A. _____persona B. nga të cilat gra_____
A5.3. Nr i pjestarëve të familjes që punojnë në fermë	A._____persona B. nga të cilat gra_____

A6. Punësimi (kryesor)	**A7. Niveli i edukimit**
1. I punësuar me pagë në sektorin publik 2. I punësuar me pagë në sektorin privat 3. I vetë-punësuar në sektorin jo-bujqësor 4. I vetë-punësuar në sektorin bujqësor	1. Pa shkollë 2. Shkollë fillore (4 vite) 3. Shkollë 9-vjeçare 4. Shkollë e mesme bujqësore 5. Shkollë e mesme e përgjithshme/ ose profesionale 6. Universitet 6.1 I diplomuar në bujqësi? 1. PO 2. JO

Shënim: Zgjidhni vetëm një opsion

A8. Sa vite eksperience keni në fermë (që merreni me aktivietetet e fermës): _____ Vite

A9. Keni emigruar ndonjëherë jashtë Shqipërisë për më shumë se 3 muaj gjatë 10 viteve të fundit ?	
1-Po	2-Jo

A10. Plotësoni tabelën me të dhëna për fermën:		
	Njësia	**Viti 2019**
A10.1. Tokë bujqësore në pronësi	Dyn	
A10.2. Tokë bujqsëore e marrë me qera	Dyn	
A10.3. Toka bujqësore totale në përdorim nga e cila:		
A. Perime të fushës	Dyn	
B. Fruta	Dyn	
C. Drithëra	Dyn	
D. Foragjere	Dyn	
E. Tjetër	Dyn	
F. Tokë djerrë (e pakultivuar)	Dyn	
A10.4 Bagëti (krerë)		
A. Gjedh (që prodhojnë qumësht)	krerë	
B. Të imta	krerë	
C. Shpendë	krerë	
D. Bletë	koshere	

A11. Shëno sa % e prodhimeve të fermës konsumohen nga familja dhe sa % shitet:
A11.1- Vetë-konsum: _____% e prodhimit total të fermës A11.2- Shitet / tregtohet: _____% e prodhimit total të fermës (Shuma e % = 100%)

A12. A është ferma juaj e <u>certifikuar</u> si një fermë BIO (organike)?	
1- Po	2- Jo
A12.1 Nëse Jo, a po planifikoni të certifikoheni në të ardhmen? 1-Po 2-Jo	

A13. A ka ferma akses në ujë për vaditje?	
1- Po	2-Jo
A13.1 Nëse Po, sa përqind e tokës ka akses në ujitje? _____%	

A14. A keni marrë ndonjëherë kredi (p.sh. hua bankare) për shpenzimet e fermës?	
1- Po	2-Jo

A15. Si e konsideroni veten kur flasim për ndërmarrje rreziqesh? Zgjidh një:						
1 (Nuk jam fare gati të ndërmarr rreziqe)	2	3	4	5	6	7 (Shumë gati të ndërmarr rreziqe)

1. Cilat nga këto sratегji (apo praktika) keni përdorur në fermën tuaj gjatë vitit 2019:

	A) A e përdorni, aplikoni: 1. Po 2. Jo	B) Nëse PO, Kur e keni aplikuar për herë të parë? (Viti)	C) Nëse PO, Në sa % të tokës bujqësore që përdorni e keni aplikuar: 5. <30% 6. 30-60% 7. 60-90% 8. >90% **zgjidh vetëm 1*	D) Nëse PO, Për cilat kultura: 6. Perime 7. Foragjere 8. Drithëra 9. Fruta 10. Tjetër **mund të zgjidhni më shumë se 1*	E) Nëse PO, Pse? (për cfarë qëllimi e keni përdorur): 1. Kontrolli i dëmtuesve/insekteve 2. Kontrolli i barërave të këqija 3. Mbrojtja e tokës 4. Rritja e fitimit 5. Rritja e rendimentit 6. Përshtatja ndaj ndryshimit të klimës 7. Shqetësim mjedisor 8. Tjetër (specifiko) **mund të zgjidhni më shumë se 1*	F) Nëse JO, A i keni aplikuar këto praktika 5 vitet e fundit? 3. Po 4. Jo	G) Nëse JO, Arsyet kryesore: 1. Shumë e kushtueshme 2. Kërkon shumë kohë 3. Jo e dobishme 4. Kam nevojë për informacion 5. Tjetër (specifiko) **mund të zgjidhni më shumë se 1*
B1.1 Qarkullimi bujqësor (bimor)							
B1.2 Mbulimi i tokës me materiale bio/organike si plehu apo copëra druri apo kompozime të tjera							
B1.3 Nivel minimal ose zero punime mekanike në parcelë/ tokë para mbjelljes [1]							

[1] *Shënime*

B1.1: Sistemi i renditjes dhe i ndërrimit të kulturave të arave në një grup ngastrash sipas viteve duke u mbështetur në kërkesat agroteknike, me qëllim që të ruhet e të rritet pjelloria e tokës dhe të shtohen rendimentet e bimëve. Qarkullimi bujqësor ose bimor do të thotë që kultura të ndryshme alternohen (mbillen) në të njëjtën parcelë në renditje për sezonet e ndryshme të mbjelljes.

B1.2: Përdorimi i plehut organik, ose bimëve mbuluese për tokën për mbulimin e tokës

B1.3: Ndërhyrje mekanike minimale në parcelë (punime mekanike), para mbjelljes.

B2. Ju lutemi tregoni se sa % e tokës suaj që e mbillni është përkeqësuar nga erozioni i tokës: (pra sa përqind e tokës së punueshme)
[Erozioni është një proces i dëmtimit natyror të tokës dhe humbjes së pjesës së sipërme të tokës nga era dhe / ose uji me kalimin e kohës. Shihni fotot.]

B2.1 Disi e përkeqësuar _____%	A. Prej erës ☐	B. Prej ujit ☐
B2.2 E përkeqësuar shumë _____%	A. Prej erës ☐	B. Prej ujit ☐

B3. Sa i përket tokës <u>që është</u> përkeqësuar prej erozionit:

B3.1 Pjesa më e madhe ka akses në ujitje Po ☐ Jo ☐
B3.2 1.Toka është më shumë shpat i pjerrët ☐ apo 2. më shumë e sheshtë/rrafshët ☐
B3.3 Cila është kultura/bima kryesore me të cilën e keni mbjellë këtë pjesë toke:
☐ 1. Perime ☐ 2. Foragjere ☐ 3. Drithëra ☐ 4. Fruta 5. Tjetër_____

B4. Gjatë 5 viteve të fundit, a keni bërë ndonjë ndërhyrje për të kontrrolluar erozionin e tokës ?

1- Po	2-Jo

B4.1 Nëse po, cilat nga këto ndërhyrje keni bërë:

1. ☐ mbjellje pemësh për të mbrojtur nga era
2. ☐ mur guri/me gurë
3. ☐ murë cimentoje
4. ☐ Barriera druri ose mbeturinash
5. ☐ Konture apo terrace
6. ☐ Tjetër, specifiko_____

B5. A po planifikoni të bëni ndonjë ndërhyrje për të kontrrolluar erozionin e tokës?

1- Po	2-Jo

B5.1 Nëse po, cilat nga këto ndërhyrje po planifikoni të bëni:

1. ☐ mbjellje pemësh për të mbrojtur nga era
2. ☐ mur guri/me gurë
3. ☐ murë cimentoje
4. ☐ Barriera druri ose mbeturinash
5. ☐ Konture apo terrace
6. ☐ Tjetër, specifiko_____

B6. Ju lutem tregoni koston e ndërhyrjes:
B6.1 Për ndërhyrjet e kryera tashmë:_____lek të reja B6.2 Për ndërhyrjet që po planifikoni të bëni në të ardhmen: _____lek të reja

C1. Ju lutem tregoni deri në çfarë mase jeni dakort me këto deklarata:					
	1. Nuk jam fare dakort	2.Nuk jam dakort	3.As dakort as kundra	4.Jam dakort	5.Jam shumë dakort
C1.1. Mbrojtja e mjedisit është e rëndësishme					
C1.2. Ndryshimi i klimës përbën rrezik për fermën time					
C1.3. Mungesa e ujit është një shqetësim me rëndësi					
C1.4. Prodhimi i bimëve po pëson rregullisht humbje prej sëmundjeve					
C1.5. Unë rregullisht kam probleme në kontrollimin e barërave të këqija					

C2. Sa shpesh i përdorni këto kanale informimi për praktikat bujqësore:					
1-Asnjëherë 2-Një ose 2 herë në vit 3-Çdo muaj 4-Çdo javë 5-Çdo ditë					
C2.1. Internet	1	2	3	4	5
C2.2. Agronomët e njësisë administrative apo shërbimi këshillimor publik	1	2	3	4	5
C2.3. Fermerë të tjerë me të cilët jam në kontakt	1	2	3	4	5
C2.4. Materiale të printuara si revista, libra, gazeta, fletpalosje, broshura etj	1	2	3	4	5
C2.5. Evente/Konferenca/panaire	1	2	3	4	5
C2.6. Tjetër (specifiko_____)	1	2	3	4	5

C3. A jeni aktualisht anëtar i një shoqate /grupi fermerësh?	
1- Po	2-Jo

C4. Në përgjithësi, sa i mirë-informuar ndjeheni për tema të rëndësishme për ju si fermer?
Aspak i informuar - 1 2 3 4 5 - Shumë i informuar

C5. Ju lutemi vlerësoni rëndësinë e llojeve të informacionit për vendimet tuaja si fermer:					
E pa rëndësishme - 1			**5 – <u>Shumë</u> e rëndësishme**		
C5.1. Njohja e praktikave më të mira që fermerë të tjerë përdorin	1	2	3	4	5
C5.2. Informacioni për tregun (psh cmimet)	1	2	3	4	5
C5.3. Informacioni për subvencionet dhe lehtësimet fiskale	1	2	3	4	5
C5.4. Informacioni për ndryshimet klimatike (lajme, përditësime)	1	2	3	4	5
C5.5. Njohja e praktikave të ndryshme të ruajtjes së ujit	1	2	3	4	5
C5.6. Njohja e metodave të ndryshme të ruajtjes së tokës	1	2	3	4	5
C5.7. Njohja e teknologjive të reja prodhuese / inovatore	1	2	3	4	5
C5.8. Njohuria mbi metodat tradicionale të prodhimit	1	2	3	4	5

C6. Kur merrni parasysh praktikat e menaxhimit të fermës, sa të rëndësishme janë për ju konsideratat e mëposhtme?					
Nuk janë të rëndësishme - 1			**5 – Janë <u>shumë</u> të rëndësishme**		
C6.1. Rritja e fitimeve	1	2	3	4	5
C6.2. Ulja e kostove	1	2	3	4	5
C6.3. Minimizimi i rrezikut të humbjeve (të prodhimit)	1	2	3	4	5
C6.4. Minimizimi i punës së nevojshme	1	2	3	4	5
C6.5. Të prodhoj pa ndikuar negativisht mjedisin	1	2	3	4	5

C6.6. Ruajtja e pjellorisë së tokës	1	2	3	4	5
C6.7. Respektimi dhe adaptimi i standarteve dhe dhe rregullave të qeverisë	1	2	3	4	5
C6.8. Efekti pozitiv tek komuniteti dhe shoqëria	1	2	3	4	5
C6.9. Përshtatja ndaj ndryshimeve klimatike	1	2	3	4	5

C7. Kur unë marr vendime të rëndësishme për fermën:					
	1.Nuk jam fare dakort	2.Nuk jam dakort	3.Neutral	4.Jam dakort	5.Jam shumë dakort
C7.1. Preferoj ti besoj intuitës sime.					
C7.2. Konsultimi me familjen është i rëndësishëm.					
C7.3. Më shqetësojnë opinionet e shokëve dhe fermerëve të tjerë					
C7.4. I besoj rekomandimet e ekspertëve (agronom, ekstensionist, etj.)					
C7.5. Duhet të analizoj kostot dhe përfitimet					
C7.6. Është më mirë të kryej një provë mbi një zonë të vogël si fillim					
C7.7. Më pëlqen ta shoh si përvojë tek fermerë të tjerë një eksperiment të suksesshëm para se ta provoj vetë					
C7.8. Menaxhimi i tokës për një synim afatgjatë është më i rëndësishëm sesa përfitimet në afatshkurtër					

Appendix 4: Farmer Choice Experiment (Albanian)

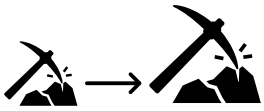
Loja “Menaxhimi i fermës”

Tani do t'ju prezantojmë me disa skenarë të cilët paraqesin praktika të ndryshme menaxhimi për fermën dhe efektin e tyre në fitimin total, orët e punës (vetjake/familjare ose e blerë/paguar), dhe nivelin e erozionit (krahasuar me nivelin aktual). Para se të merrni vendimin për të ndryshuar praktikën, do të dëshironim të merrnit parasysh pasojat që do të kishte zgjedhja juaj për familjen tuaj dhe të vendosni në të njëjtën mënyrë si në rastin kur vendosni për të kultivuar një bimë të caktuar. Kur të zgjidhni një nga opsionet, ju lutemi merrni parasysh se si do të ishte jeta juaj nëse rendimenti apo prodhimi në fermë rezulton i mirë apo i keq. Ju gjithashtu mund të zgjidhni Opsionin C, i cili përfaqëson mos ndryshimin e menaxhimit të fermës dhe mbajtjes së praktikës aktuale.

Opsionet

Për vitin e ardhshëm, ju po planifikoni të zgjidhni mes 2 praktikave të reja të menaxhimit të fermës ose praktikën aktuale (pa e ndryshuar).

- *Pas aplikimit të Opsionit A, vitin e ardhshëm fitimi juaj total pritet të ulet me 10%, puna e kërkuar në orë do të rritet me 25% dhe niveli i erozionit të dyfishohet.*
- *Opsioni B do ju sjellë rritjen e fitimeve me 10%, uljen e orëve të punës me 25% dhe zero erozion.*
- *Opsioni C është mbajtja e praktikës aktuale.*

Opsioni A	**Opsioni B**	**Opsioni C** ***(pa ndryshuar)***
Fitimi -10% 	Fitimi +10% 	Fitimi Aktual 
Orët e punës +25% 	Orët e punës -25% 	Puna aktuale 
Rritje e dyfishtë e nivelit të erozionit 	Reduktim i nivelit të erozinit në 0 	Niveli aktual i erozionit 

☐	☐	☐

Zgjidhni një ospion: A, B, ose C

*[Shënim: Nëse i intervistuari <u>nuk zgjedh</u> **opsionin B**, ju lutem merrni konfirmim nga ai/ajo nëse loja është kuptuar, duke qenë se alternative B është e duhura.]*

1

Opsioni A	**Opsioni B**	**Opsioni C** ***(pa ndryshim)***
Fitimi-10% 	Fitimi +10% 	Fitimi aktual 
Orët e punës -25% 	Orët e punës +25% 	Puna aktuale 
Nivel i dyfishtë erozioni 	Nivel i reduktuar erozioni (0) 	Niveli aktual I erozionit 
☐	☐	☐

2

Opsioni A	**Opsioni B**	**Opsioni C** ***(pa ndryshim)***
Fitimi-10% 	Fitimi +10% 	Fitimi aktual 
Orët e punës -25%	Orët e punës +25%	Puna aktuale

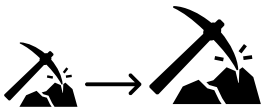
		
Reduktim i erozionit në zero 	Niveli i erozionit rritet dyfish 	Niveli aktual i erozionit 
☐	☐	☐

3

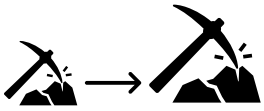
Opsioni A	**Opsioni B**	**Opsioni C** ***(pa ndryshim)***
Fitimi -10% 	Fitimi +10% 	Fitimi aktual 
Orët e punës +25% 	Orët e punës -25% 	Puna aktuale 
Niveli i erozionit rritet dyfish 	Reduktim i erozionit në zero 	Niveli aktual i erozionit 
☐	☐	☐

4

Opsioni A	**Opsioni B**	**Opsioni C** **(pa ndryshim)**

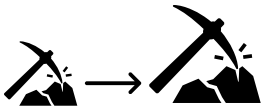
Fitimi -10% 	Fitimi +10% 	Fitimi aktual 
Orët e punës +25% 	Orët e punës -25% 	Puna aktuale 
Reduktim i erozionit në zero 	Niveli i erozionit rriten dyfish 	Niveli aktual i erozionit 
☐	☐	☐

5

Opsioni A	**Opsioni B**	**Opsioni C** ***(pa ndryshim)***
Fitimi +10% 	Fitimi -10% 	Fitimi aktual 
Orët e punës -25% 	Orët e punës +25% 	Puna aktuale 
Niveli i erozionit rritet dyfish 	Reduktim i erozionit në zero 	Niveli aktual i erozionit 

☐	☐	☐

6

Opsioni A	**Opsioni B**	**Opsioni C** *(pa ndryshim)*
Fitimi +10% 	Fitimi -10% 	Fitimi aktual 
Orët e punës -25% 	Orët e punës +25% 	Puna aktuale 
Reduktim i erozionit në zero 	Niveli i erozionit rritet dyfish 	Niveli aktual i erozionit 
☐	☐	☐

7

Opsioni A	**Opsioni B**	**Opsioni C** *(pa ndryshim)*
Fitimi +10% 	Fitimi -10% 	Fitimi aktual 

Orët e punës +25% 	Orët e punës -25% 	Puna aktuale 
Niveli i erozionit rritet dyfish 	Reduktim i erozionit në zero 	Niveli aktual i erozionit 
☐	☐	☐

8

Opsioni A	**Opsioni B**	**Opsioni C** ***(pa ndryshim)***
Fitimi +10% 	Fitimi -10% 	Fitimi aktual 
Orët e punës +25% 	Orët e punës -25% 	Puna aktuale 
Reduktim i erozionit në zero 	Niveli i erozionit rritet dyfish 	Niveli aktual i erozionit 
☐	☐	☐

Faleminderit shumë!