THE EFFECTS OF WEATHER UNCERTAINTY ON THE PRODUCTIVITY OF WORKERS IN THE AGRICULTURAL SECTOR

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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SUPERVISOR'S AND PANEL APPROVAL

I hereby declare that I have read this thesis research, and in my opinion, this thesis is sufficient in terms of scope and quality for the award of Bachelor of Technology Management and Technopreneurship with Honours.

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Date: 25 Januari 2025

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This report is submitted in partial fulfillment of the requirement for the award Bachelor’s Degree in Technopreneurship with honor

Faculty of Technology Management and
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DECLARATION OF ORIGINAL WORK

I hereby declare that this final year project with the title

THE EFFECTS OF WEATHER UNCERTAINTY ON THE PRODUCTIVITY OF WORKERS IN THE AGRICULTURAL SECTOR

Is the result with my research except as the cited in references.

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NAME : NURUL SYAMIMI BINTI EEZAHAN

DATE : 25 Januari 2025

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DEDICATION

To my dearest family and friends,

This final year project is the apex of years of commitment and diligent effort. At this important point in my academic path, I want to sincerely thank you for your consistent support and encouragement. Despite occasional periods of uncertainty and annoyance, your unwavering faith in me remained steadfast. Your unwavering encouragement motivated me to pursue perfection, and your empathy during nocturnal hours and challenging time limits rendered everything feasible.

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRACT

This study investigates how weather uncertainty can have multifaceted impacts on the agricultural sector, influencing various aspects of production, economic stability, and sustainability. Utilizing a quantitative research methodology, data was collected through structured surveys from stakeholders directly affected by such events. Key metrics including R-squared, F-value, and t-value were employed to analyze the relationship between weather uncertainty and its impact on the agricultural sector. The independent variables examined include rainfall patterns, extreme weather events, and weather-related market instability, all of which were found to have a significant influence on agricultural outcomes. Key findings suggest that fluctuations in weather conditions, such as unexpected rainfall, extreme temperatures, and droughts, directly affect workers' physical capacity, scheduling, and overall output. Moreover, weather-related market instability significantly disrupts the supply chain, pricing, and income levels within the sector. Additionally, the study explores how weather-related stress affects workers' mental health and decision-making abilities. Mitigation strategies, such as advanced weather forecasting, adaptive farming techniques, and worker training programs, are evaluated for their effectiveness in enhancing productivity under uncertain weather conditions. The findings of this research are crucial for policymakers, agricultural managers, and labor organizations aiming to improve resilience and productivity in the agricultural sector amidst increasing climate variability. This data was collected from 278 respondents through a questionnaire in Tumpat, Kelantan.

Keywords: Weather Uncertainty, Agricultural sector, Quantitative Research, Productivity, climate.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRAK

Kajian ini menyiasat bagaimana ketidaktentuan cuaca boleh memberi impak pelbagai rupa ke atas sektor pertanian, mempengaruhi pelbagai aspek pengeluaran, kestabilan ekonomi dan kemampanan. Menggunakan metodologi penyelidikan kuantitatif, data dikumpul melalui tinjauan berstruktur daripada pihak berkepentingan yang terjejas secara langsung oleh peristiwa tersebut. Metrik utama termasuk R-kuasa dua, nilai F dan nilai-t digunakan untuk menganalisis hubungan antara ketidaktentuan cuaca dan kesannya terhadap sektor pertanian. Pembolehubah bebas yang dikaji termasuk corak hujan, kejadian cuaca ekstrem dan ketidakstabilan pasaran berkaitan cuaca, yang kesemuanya didapati mempunyai pengaruh yang signifikan terhadap hasil pertanian. Penemuan utama mencadangkan bahawa turun naik dalam keadaan cuaca, seperti hujan yang tidak dijangka, suhu yang melampau dan kemarau, secara langsung mempengaruhi kapasiti fizikal pekerja, penjadualan dan output keseluruhan. Selain itu, ketidakstabilan pasaran berkaitan cuaca dengan ketara mengganggu rantaian bekalan, harga dan tahap pendapatan dalam sektor tersebut. Selain itu, kajian ini meneroka bagaimana tekanan berkaitan cuaca mempengaruhi kesihatan mental pekerja dan kebolehan membuat keputusan. Strategi mitigasi, seperti ramalan cuaca lanjutan, teknik pertanian adaptif, dan program latihan pekerja, dinilai untuk keberkesanannya dalam meningkatkan produktiviti di bawah keadaan cuaca yang tidak menentu. Penemuan penyelidikan ini adalah penting untuk penggubal dasar, pengurus pertanian, dan organisasi buruh yang bertujuan untuk meningkatkan daya tahan dan produktiviti dalam sektor pertanian di tengah-tengah peningkatan kebolehubahan iklim. Data ini dikumpul daripada 278 responden melalui soal selidik di Tumpat, Kelantan.

Kata kunci: Ketidakpastian Cuaca, Sektor Pertanian, Penyelidikan Kuantitatif, Produktiviti, iklim.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENT

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF TABLES

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 1

INTRODUCTION

1.0 Background of study

In recent years, the world has witnessed an increase in the frequency and intensity of weather uncertainty events due to climate change. These events, ranging from hurricanes and floods to heatwaves and droughts, pose significant challenges to various aspects of human life, including the workplace (Ebi et al. 2021). The impact of extreme weather on the quality of work has become a topic of growing interest and concern among researchers, policymakers, and organizations (Beillouin et al. 2020) Understanding how extreme weather affects the quality of work is crucial for developing strategies to mitigate its negative consequences and ensure the well-being and productivity of workers.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

In addition, the significant disruption caused by extreme weather events, such as property damage and loss of infrastructure, has a growing recognition of its subtle but significant impact on the quality of work (Garbarino et al. 2021). The workplace, often considered a haven of professional productivity and engagement, becomes vulnerable to climate change when extreme weather strikes. Although conventional wisdom may suggest that work quality depends solely on internal organizational factors, this assumption ignores the profound influence exerted by external environmental conditions. Understanding how extreme weather phenomena permeate the fabric of work quality is important not only to protect economic productivity but to foster a resilient and adaptive work environment that is able to face the challenges ahead due to climate change.

Furthermore, weather uncertainty events linked to climate change, such as heatwaves, heavy rainfall, and hurricanes, pose challenges to workplace productivity. The increasing frequency and intensity of these events disrupt work routines, infrastructure, and supply chains, leading to delays, damages, and safety concerns that impact the quality of work output Industries like agriculture, construction, and manufacturing are particularly vulnerable to weather-related disruptions, affecting the efficiency and effectiveness of operations. Addressing the implications of weather uncertainty productivity requires proactive measures to adapt to changing environmental conditions and ensure business continuity (Cruz et al. 2020).

Moreover, the economic repercussions of extreme weather events on work quality are substantial, with studies highlighting the financial costs associated with productivity losses due to climate-related factors. The negative impact of extreme temperatures on worker productivity can result in reduced output, lower wages, and increased absenteeism, affecting both individual workers and the overall economy (Behrer 2023). As extreme weather events become more frequent and severe, businesses and policymakers need to prioritize strategies that increase workplace resilience, protect worker well-being, and reduce the adverse effects of climate change on productivity (Gallup 2020).

Researching the effect of extreme weather on work performance is crucial as climate change increases the frequency and severity of these events. Understanding their impact on productivity and work environments is essential for developing strategies to mitigate negative effects, protect economic stability, and ensure worker well-being. Insights from this research can inform adaptive measures and policies, enhancing organizational resilience and safeguarding the workforce against climate-related disruptions. This study is vital for fostering a sustainable, productive, and resilient work environment amidst growing climate challenges (Behrer, A.p 2013).

1.2 Operational Definition

An operational definition is a precise measurement or observation method. It ensures everyone knows and can reproduce a concept's application or measurement. It's like a recipe that instructs you on how to measure or examine something for accurate results.

1.2.1 Weather Uncertainty

The word "weather" refers to the state of the atmosphere at a particular place and time, including temperature, humidity, precipitation, wind, and visibility. It encompasses short-term variations from minutes to weeks, distinguishing it from climate, which describes long-term average conditions and trends. Weather is influenced by various factors such as latitude, altitude, and proximity to water bodies, as well as atmospheric pressure systems and solar radiation (Kids, 2019). Meanwhile, Uncertainty refers to the lack of complete certainty, or the existence of more than one possibility. It is a situation where the probabilities of outcomes are unknown or indeterminate, affecting predictions, decisions, and understanding in various fields. Uncertainty can arise from incomplete knowledge, random variability, and inherent unpredictability of systems.

The existence of weather uncertainty events can be attributed to the complex interplay of various factors influenced by climate change. These events are becoming more frequent and severe due to rising global temperatures and changing atmospheric conditions. Research indicates that anthropogenic activities, such as greenhouse gas emissions, deforestation, and industrial processes, contribute significantly to the intensification of extreme weather phenomena like heatwaves, floods, and wildfires (Furtak et al.2023). The warming climate alters atmospheric dynamics, leading to disruptions in weather patterns and the occurrence of more intense and prolonged extreme weather events (Cutis et al. 2017).

The article "Rainmakers: Why Bad Weather Means Good Productivity" provides insights into the surprising relationship between weather conditions and work productivity. Contrary to common belief, the research suggests that bad weather can actually enhance productivity by reducing distractions that individuals may face during good weather. The study conducted by Lee et al. (2014) explores how cognitive distractions are minimized on bad weather days, leading to increased focus on work tasks. This finding challenges the traditional assumption that good weather conditions are conducive to higher productivity levels.

1.2.2 Productivity of Worker in the Agriculture Sector

Productivity refers to the efficiency with which outputs are produced from a given set of inputs. It is often measured as the ratio of output to input in a production process and is a key indicator of economic performance, reflecting how well resources such as labor and capital are utilized to produce goods and services. Next, the agriculture sector encompasses all activities related to the cultivation of plants and the raising of animals for food, fiber, biofuel, medicinal plants, and other products essential for human life. It plays a critical role in the global economy and is fundamental to human survival, providing essential commodities for nutrition and various other needs. This sector includes crop production, which involves growing food and industrial crops using techniques that range from traditional subsistence farming to advanced industrial agriculture. Livestock farming involves breeding and raising animals such as cattle, poultry, sheep, and pigs for meat, dairy products, eggs, and other animal products like wool and leather. Fisheries and aquaculture focus on harvesting fish and other aquatic organisms, either from natural water bodies or through controlled farming. Forestry involves managing forests for timber, non-timber products, conservation, and recreation. Agricultural services support farming activities through research and development, agricultural extension services, supply of farm equipment and inputs, and financial services tailored to farmers (FAO, 2021)

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The agriculture sector faces numerous challenges, including climate change, soil degradation, water scarcity, and pest and disease outbreaks. Sustainable agricultural practices, such as crop rotation, agroforestry, organic farming, and integrated pest management, are increasingly important for addressing these challenges and ensuring long-term food security. Agricultural policy and technology significantly influence the sector, with governments and international organizations implementing policies to support farmers, regulate food safety, and promote trade. Technological advancements, including genetically modified organisms (GMOs), precision farming, and improvements in irrigation and fertilization techniques, have significantly increased productivity and efficiency. The agriculture sector is vital for economic development, especially in developing countries where a large proportion of the population is employed in agriculture. It is also essential for ensuring food security and managing natural resources sustainably. (Adeniyi et al., 2020).

1.3 Research Question

1. What is the impact of climate change on the productivity of agricultural workers?

2. What is the seriousness of weather uncertainty on agricultural productivity?

3. Which type of weather condition aggressively influence the agricultural activities?

1.4 Research Objective

1. To examine the impact of climate change on the productivity of agricultural workers

2. To determine the seriousness of weather uncertainty on agricultural productivity.

3. To identify the most aggressive weather conditions that influence the agricultural activities.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

1.5 Problem Statement

The agricultural sector is highly vulnerable to weather conditions, which are increasingly becoming unpredictable due to climate change. Weather uncertainty, characterized by erratic rainfall, temperature fluctuations, and extreme weather events, poses significant challenges to agricultural productivity. In Malaysia, distinct monsoon seasons bring unpredictable rainfall patterns, causing delays in planting and harvesting, and necessitating increased reliance on irrigation systems. This not only strains the physical and financial resources of farmers but also increases the workload and reduces the efficiency of agricultural workers. The damage to agricultural machinery and infrastructure from extreme weather events further disrupts farming operations and exacerbates productivity losses. Additionally, the health and safety risks posed by severe weather conditions can lead to decreased labor efficiency and higher absenteeism among workers. Despite the critical impact of weather uncertainty on the agricultural sector, there is limited understanding of how these factors specifically affect the productivity of agricultural workers. This research aims to investigate the multifaceted impacts of weather uncertainty on worker productivity in the agricultural sector, focusing on the mechanisms through which weather-induced disruptions translate into productivity losses. The study will also explore adaptive strategies and their effectiveness in mitigating these impacts to enhance resilience and sustainability in agricultural practices. (IPCC, 2021).

However, there are potential benefits of extreme weather on certain industries, to recognize that these positive effects are often overshadowed by significant challenges and limitations. One of the main issues arises from the uncertainty and variability of extreme weather events, which can disrupt workflow schedules and planning in industries that depend on weather conditions (Curtis et al. 2017). For example, sudden and unpredictable changes in weather patterns, this can cause project delays, resource allocation problems and increased operational costs and ultimately affect the overall quality of work. Extreme weather conditions can also be a serious health and safety hazard for workers, especially in outdoor environments exposed to high temperatures, strong winds or heavy rain can cause accidents, deaths or injuries (Bouwer et al. 2019).For this case, the selected respondents are individuals who have concerns about the weather uncertainty on the productivity of workers in agriculture at Tumpat, Kelantan. Therefore, it is very interesting to expect new discoveries in research topics that can explain the impact the weather uncertainty on the productivity of workers in agriculture

1.5.1 Research Significant

Understanding the impact of weather uncertainty on worker productivity in the agricultural sector is important for several reasons. First, agriculture is an important component of the Malaysian economy, contributing significantly to GDP and employment. Weather uncertainty, such as erratic rainfall, temperature fluctuations and extreme weather events, directly affects crop yields and agricultural operations. By examining these effects, this research aims to provide valuable insights into how climate variability affects agricultural productivity and worker efficiency. This knowledge is essential to develop effective strategies to reduce the adverse effects of climate change on the agricultural sector, thereby ensuring food security and economic stability.

Second, the findings from this research will have important implications for policy formulation and resource allocation. Policy makers can use the insights gained to design and implement policies that increase the agricultural sector's resilience to uncertainties. This includes investing in infrastructure improvements, such as advanced irrigation systems and weather-resistant agricultural machinery, as well as encouraging the use of climate-smart agricultural practices. Additionally, understanding the specific challenges faced by agricultural workers due to climate variability will enable the development of targeted support programs that address their needs, improve working conditions and increase overall productivity.

Finally, this research contributes to the broader discourse on climate change adaptation and sustainable agriculture. By identifying effective adaptation strategies, such as the use of drought-resistant crops and better water management techniques, this study provides a framework for farmers and agricultural stakeholders to weather the challenges posed by climate uncertainty. This not only helps in maintaining agricultural productivity but also supports the livelihood of millions of workers who depend on agriculture for their income. Ultimately, this research aims to foster a more resilient and sustainable agricultural sector that can withstand the effects of climate change and continue to contribute to economic growth and food security in Malaysia.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The important things that this chapter talked about were the study's independent and dependent variables. The data for both categories of variables were collected from previous research reviews, which include relevant articles in extreme weather journals, global weather websites, and national weather services. The theory and previous models were carefully studied to ensure that only appropriate arguments were considered. Additionally, the author employed an identical methodology to ascertain the variables critical for developing the survey questionnaires for the research. Apart from that, the write-up was also mixed with critical reviews where the author tried to contribute his opinions in enlightening the discussion. Aside from that, the write-up included critical reviews in which the author attempted to give his viewpoints to enlighten the topic. Finally, all the inputs would be transformed into a theoretical framework that reflected the understudied independent and dependent variable relationships and was used for analysis in Chapter 3. The hypotheses should represent the assumptions made about the variable connection.

2.2 Weather Uncertainty

Weather uncertainty occurrences are one of the most visible manifestations of climate change in public view. Individual events that cause disasters are frequently explained by climate change. This is challenging from a scientific standpoint because, while climate change alters the likelihood of extremes occurring, this may not be sufficient to explain the specific event in question. However, there are many indications that weather uncertainty events have increased in frequency and size due to human induce climate change (Portner HO et al 2023). Every year, extreme weather events like heavy rain and violent storms kill and injure people. Climate change can affect the frequency, timing, intensity, and duration of these events. Heavy rains have become more often within the past few generations. Precipitation during storms and other extreme weather events is anticipated to become more common in the future, according to climate change projections, which could lead to more frequent floods. Storms and storm frequencies are notoriously difficult to forecast (Greenough et al. 2001).

Weather uncertainty refers to the unpredictability and variability of weather conditions, including temperature, precipitation, wind, and other meteorological factors, arising from natural climate variability, limitations in forecasting models, and the complexity of atmospheric processes (Trenberth et al., 2015; Bauer et al., 2015). This uncertainty significantly impacts sectors like agriculture, construction, and transportation, where unexpected weather changes can disrupt operations, reduce efficiency, and affect productivity. In agriculture, for example, weather uncertainty can influence crop growth, harvest timing, and yields, necessitating adaptive strategies such as diversified cropping and weather insurance to mitigate adverse effects (Lobell et al., 2016) In construction, it can cause project delays and increased costs, while in transportation, it can lead to accidents and delays, underscoring the need for real-time weather monitoring and flexible scheduling (Zavadskas et al., 2018). Example of the effect or independent variable are variable rainfall pattern, extreme weather event and weather affect market instability.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.1 Variable rainfall pattern

Malaysia experiences distinct monsoon seasons which can vary in intensity and duration. Unpredictable rainfall patterns, including droughts can disrupt planting and harvesting schedules (Mondelson et al, 2019). This uncertainty forces farmers to adjust their cultivation practices, impacting worker productivity as they may need to wait for suitable weather conditions or work longer hours during brief windows of optimal weather. Malaysia's distinct monsoon seasons bring unpredictable rainfall patterns that significantly disrupt agricultural activities. Erratic rainfall, including droughts, forces farmers to adjust planting and harvesting schedules, impacting worker productivity. Workers often need to wait for suitable weather or work longer hours during brief periods of optimal conditions, leading to fatigue and inefficiency (IPCC,2019).

Additionally, the variability in rainfall necessitates labour-intensive efforts such as constructing drainage systems during excessive rain or seeking alternative water sources during droughts. These disruptions and the need for constant adaptation strain the agricultural workforce and reduce overall productivity (FAO,2018). Some variable of variable rainfall pattern is delayed planting and harvesting, increased workload for irrigation, risk of crop loss and health and safety concern.

2.2.1.1 Delayed planting and harvesting

Variable rainfall can delay the planting of crops as farmers wait for suitable moisture levels in the soil (Rosenzweig et al., 2014). Similarly, unpredictable rain patterns can disrupt harvesting schedules, requiring workers to adjust their timing and potentially work longer hours to complete tasks when weather conditions permit. Agriculture in Malaysia relies heavily on irrigation systems, particularly during dry spells (FAO, 2018). Inconsistent rainfall and water scarcity can lead to water shortages, impacting crop productivity and requiring workers to spend additional time and effort on irrigation activities.

Variable rainfall in Malaysia creates significant challenges for agricultural activities, particularly in terms of delayed planting and harvesting (Easterling et al., 2017). Farmers often face delays in planting crops as they wait for suitable moisture levels in the soil, which can push back the entire growing season. Unpredictable rain patterns further complicate harvesting schedules, forcing workers to adjust their timing and work extended hours to complete tasks during brief windows of favorable weather. This unpredictability demands increased flexibility and effort from the workforce, contributing to fatigue and reduced overall productivity.

Moreover, agriculture in Malaysia heavily relies on irrigation systems, especially during dry spells. Inconsistent rainfall and resultant water scarcity can

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

exacerbate water shortages, directly impacting crop yields. Consequently, workers must devote additional time and resources to manage irrigation activities, such as setting up and maintaining irrigation systems and manually watering crops, which adds to their workload and diminishes productivity.

2.2.1.2 Increased Workload for Irrigation

In periods of erratic rainfall, farmers may need to rely more heavily on irrigation systems to supplement water for crops. This increases the workload for workers who are responsible for managing and maintaining irrigation infrastructure, ensuring that crops receive adequate moisture during dry spells. Erratic rainfall patterns also can lead to variability in crop quality and yield. Inconsistent moisture levels can result in uneven ripening of fruits or grains, affecting marketability and overall productivity (IPCC,2019). Workers may need to spend more time sorting and managing crops to ensure consistent quality. Erratic rainfall in Malaysia often necessitates increased reliance on irrigation systems to ensure crops receive adequate moisture during dry spells. This significantly heightens the workload for agricultural workers who must manage and maintain irrigation infrastructure. Tasks such as setting up irrigation lines, monitoring water distribution, and performing maintenance become more frequent and labour-intensive.

Additionally, erratic rainfall can cause variability in crop quality and yield due to inconsistent moisture levels, leading to uneven ripening of fruits or grains. This inconsistency affects marketability and overall productivity, requiring workers to spend more time sorting and managing crops to ensure a consistent quality standard (Tadesse et al., 2015). Consequently, the increased demands on workers for both irrigation and crop management further strain their productivity and efficiency.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.1.3 Risk of Crop Loss

Unpredictable rainfall patterns increase the risk of crop loss due to droughts, floods, or waterlogged conditions. This not only affects the livelihoods of farmers but also impacts the income and job security of agricultural workers who depend on consistent crop production for employment. Coping with erratic rainfall requires adaptive strategies such as the use of drought-resistant crops, improved water management techniques, and diversification of income sources. Implementing these strategies often requires additional labor and resources, which can strain productivity if not managed effectively.

To mitigate these risks, farmers must adopt adaptive strategies (Lesk et al., 2016). For instance, using drought-resistant crops can help ensure some level of yield during dry spells, but these crops might require different cultivation techniques and management practices, necessitating additional training and labor. Improved water management techniques, such as installing efficient irrigation systems or developing rainwater harvesting methods, are critical in managing water resources effectively during periods of inconsistent rainfall (Benami et al., 2021) However, these systems require significant investment in infrastructure and ongoing maintenance, further straining labor and financial resources.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.1.4 Health and Safety Concerns

Workers in the agriculture sector are exposed to weather-related risks, such as working in extreme heat or during heavy rainfall, which can impact their health and safety. Erratic weather patterns may necessitate adjustments in work practices to mitigate these risks, potentially affecting productivity. Heat-related illnesses can have severe health consequences, particularly during periods of extreme heat. When temperatures soar, death and illness rates often rise temporarily due to various biological factors. One critical aspect is the body's ability to regulate its temperature, known as thermoregulation. When individuals are exposed to high temperatures, their bodies respond by redirecting blood flow from vital organs towards the skin's surface to dissipate heat.

However, individuals who cannot effectively thermoregulate due to factors such as dehydration, age, medication use, or underlying health conditions like diabetes may experience complications. In such cases, the increased stress on the heart and lungs as blood is diverted away from vital organs can lead to serious illnesses and, in severe cases, death. Bell et al. (2018) highlights the importance of understanding these mechanisms to prevent and mitigate the adverse health effects of extreme heat. Promoting hydration, providing access to cooling centers, and implementing heat-safety guidelines are crucial strategies to protect vulnerable individuals and reduce the incidence of heat-related illnesses and fatalities. Additionally, healthcare providers should be vigilant in monitoring high-risk individuals during periods of extreme heat and provide appropriate medical interventions to prevent complications and ensure optimal outcomes. Finally, some variables of health problems are trauma, heat related illnesses, respiratory issue and waterborne diseases. (D'Amato et al, 2014; Levy et al, 2018)

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2.2.2 Extreme Weather Event

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Extreme weather events, such as tropical storms and hurricanes originating in the Pacific Ocean, can have adverse effects on the agricultural sector. These events often bring heavy rain and strong winds, which can cause widespread damage to crops, agricultural infrastructure and equipment. For example, heavy rains can cause flooding, causing soil erosion, nutrient loss, and waterlogging, all of which are detrimental to crop health and yield (Mendelsohn et al., 2019). The strong winds associated with these storms can physically damage plants, topple trees, and destroy greenhouses and other shelter structures. This physical damage not only reduces crop yields immediately but can also have long-term effects by damaging perennial crops or delaying the planting of subsequent crops (Easterling et al., 2017).

In addition, infrastructure important to agriculture, such as irrigation systems, storage facilities and transport networks, can be severely affected, leading to disruptions in supply chains and increased costs for repairs and rehabilitation (FAO, 2018). The safety of agricultural workers is also an important concern during and after extreme weather events. High winds and flooding present immediate physical hazards, while the effects of storms can create dangerous working conditions due to debris, damaged equipment and unstable structures (IPCC, 2019). These safety risks can cause injury or death, further reducing the available workforce and affecting productivity. Post-storm recovery efforts can also significantly delay normal agricultural activities. The time and labor required to clear debris, repair infrastructure, and replant crops can affect other important agricultural tasks, reducing overall productivity and efficiency (Wheeler & Von Braun, 2013).

Additionally, the financial costs associated with recovery can affect resources, making it more difficult for farmers to invest in the inputs and labor needed for the next planting season (Tadesse et al., 2015). Finally, some variable of extreme weather event are increase workload for recovery, machinery and equipment damage, infrastructure damage and health and safety risks.

2.2.2.1 Increase Workload for Recovery

Following extreme weather events, workers often face increased workload to repair infrastructure, clear debris, and salvage crops. This additional labor can detract from regular farming activities and reduce productivity in the short term. Salvaging crops affected by extreme weather such as those damaged by floods or high winds requires additional effort to assess and salvage any usable produce while discarding irreparably damaged goods. This increased workload directly detracts from regular farming activities, such as planting new crops, tending to growing plants, and other routine agricultural tasks (Partridge, 2021). As a result, the short-term productivity of agricultural operations is significantly reduced. Workers must often balance recovery tasks with their usual responsibilities, leading to extended hours and physical strain, which can contribute to worker fatigue and decreased efficiency.

Moreover, the immediate focus on recovery can delay critical farming activities and disrupt the agricultural calendar, affecting future crop cycles and potentially leading to reduced yields. The diversion of resources and labor to recovery efforts also places a financial burden on farmers and agricultural businesses, impacting their economic stability and long-term productivity (IPCC,2019).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.2.2 Machinery and Equipment Damage

Agricultural machinery and equipment, essential for planting, harvesting, and processing crops, are vulnerable to damage during extreme weather events. Repairing or replacing damaged machinery can disrupt farming operations and increase downtime, affecting overall productivity. Agricultural machinery and equipment, which are critical for efficient planting, harvesting, and processing of crops, are highly susceptible to damage during extreme weather events. Heavy rains, floods, strong winds, and other severe weather conditions can cause significant harm to tractors, plows, harvesters, and other essential machinery (Wu et al., 2015). For example, water damage can lead to rusting and malfunction of mechanical parts, while strong winds can cause physical damage or displacement of equipment. Repairing or replacing damaged machinery often requires substantial time and financial resources, disrupting normal farming operations. The downtime associated with waiting for repairs or new equipment can delay crucial agricultural tasks, leading to missed planting or harvesting windows and subsequently reducing crop yields. Moreover, the financial burden of repairing or replacing machinery can strain farmers' budgets, particularly in the aftermath of an extreme weather event when other recovery efforts are also demanding attention and resources (Wu Cai Cong et al., 2017).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.2.3 Infrastructure Damage

Extreme weather events can damage agricultural infrastructure such as irrigation systems and greenhouses. High winds or heavy precipitation can damage greenhouses and other structures used for protecting crops from adverse weather conditions or for controlled environment agriculture. Repairing or replacing these structures can be costly and time-consuming, impacting productivity. Repairing or replacing damaged infrastructure requires time, resources, and skilled labor, diverting attention and effort away from productive farming activities. Extreme weather events can severely damage agricultural infrastructure such as irrigation systems, greenhouses, and storage facilities (Smith et al., 2015). High winds, heavy precipitation, and floods are particularly detrimental, often causing significant structural damage that disrupts agricultural operations. For instance, greenhouses, which are crucial for protecting crops from adverse weather and for controlled environment agriculture, can be severely damaged or destroyed by strong winds or heavy rain.

This damage not only affects the immediate crops within these structures but also hinders future production until repairs are made. Repairing or replacing damaged infrastructure is both costly and time-consuming. It requires substantial financial investment and the availability of skilled labor, diverting attention and resources away from regular farming activities (Bouwer et al., 2019). The time spent on repairing infrastructure means less time for planting, tending, and harvesting crops, which can lead to delays in production cycles and reduced agricultural output.

2.2.2.4 Health and Safety Risks

Workers in the agriculture sector are exposed to heightened health and safety risks during extreme weather events. For example, working in flooded fields increases the risk of waterborne diseases, while exposure to extreme heat or storms poses immediate dangers to worker safety. These risks can lead to decreased productivity as workers prioritize safety over work tasks or require additional recovery time. Workers in the agriculture sector are exposed to heightened health and safety risks during extreme weather events. For example, working in flooded fields increases the risk of waterborne diseases (Belesova et al., 2017), while exposure to extreme heat or storms poses immediate dangers to worker safety (Crimmins et al., 2017). These risks can lead to decreased productivity as workers prioritize safety over work tasks or require additional recovery time (Xiang et al., 2018).

Additionally, extreme heat conditions can lead to heat stress, heat exhaustion, and heatstroke, posing immediate dangers to worker safety. These conditions are exacerbated when workers are required to perform physically demanding tasks in high temperatures, potentially leading to severe health consequences (Crimmins et al., 2016).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.3 Weather affect market instability.

Weather-related fluctuations in crop yields can affect market supply and prices, impacting the profitability of agricultural enterprises. Uncertainty in market conditions can influence investment decisions and financial planning, indirectly affecting the job security and motivation of agricultural workers. When extreme weather events such as droughts, floods, or unseasonable temperatures disrupt crop production, the resulting variations in yield can create inconsistencies in market supply (Zhang et al., 2020).

This volatility can drive up prices when supplies are low or cause prices to plummet when there is an unexpected surplus, making it difficult for farmers to predict and plan for their financial future. This uncertainty in market conditions influences investment decisions and financial planning, as agricultural enterprises may hesitate to invest in new technologies, equipment, or expansions without reliable forecasts (Hamsa et al., 2017). The financial instability resulting from weather-related market fluctuations can lead to budget cuts and reduced labor costs, directly impacting the job security of agricultural workers. Workers may face layoffs or reduced hours during periods of low profitability, affecting their income and overall job stability. Some variables of weather affect market instability are quality and consistency, policy and regulatory factor, global and regional supply chains and crop yield and supply (Gray et al., 2023).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.3.1 Quality and Consistency

Inconsistent weather patterns can affect the quality and consistency of agricultural products. For example, excessive rainfall or humidity can lead to meld or spoilage of crops, reducing their market value. Inconsistent quality can make it challenging for farmers to meet contract specifications or consumer preferences, affecting market stability. Weather-related uncertainties can lead to price volatility in agricultural markets. Sudden changes in weather forecasts or the occurrence of extreme weather events can trigger speculative trading and rapid price movements.

This volatility can create uncertainty for farmers, traders, and consumers, affecting decision-making and market behavior. Weather-related uncertainties can also lead to significant price volatility in agricultural markets. Sudden changes in weather forecasts or the occurrence of extreme weather events can trigger speculative trading and rapid price movements, creating a volatile market environment (Tadesse et al., 2015). This price volatility introduces uncertainty for farmers, traders, and consumers, complicating decision-making processes and influencing market behavior (Glauber, 2019). Farmers may struggle to plan their planting and harvesting schedules, while traders face difficulties in setting prices and managing inventories. Consumers may experience fluctuating food prices, affecting their purchasing power and demand patterns (OECD-FAO, 2019).

2.2.3.2 Policy and Regulatory Factors

Government policies, subsidies, trade agreements, and regulations also play a role in shaping market stability in response to weather-related fluctuations. Policy responses to weather-related disasters, such as disaster relief programs or import/export restrictions, can influence market dynamics and stability. For instance, subsidies can help stabilize agricultural markets by providing financial support to farmers during periods of adverse weather conditions, enabling them to maintain production levels and manage financial risks (OECD, 2015).

Trade agreements and regulations also play a crucial role by facilitating or restricting the flow of agricultural goods between countries, which can affect supply and demand dynamics (Glauber, 2019). Market dynamics can be influenced by import/export restrictions that are put in place as a response to weather-related changes. As an illustration, a nation experiencing a severe drought may impose limitations on exports in order to guarantee an adequate local supply. This might result in price hikes in global markets and impact the patterns of international commerce (FAO, 2018). On the other hand, import restrictions might restrict the availability of essential agricultural inputs or food items, making the impact of local weather-related disruptions on food security and market stability worse.

2.2.3.3 Global and regional Supply Chains

Agricultural commodities are often traded globally, making the agricultural sector highly sensitive to weather-related disturbances in any part of the world. For example, a severe drought in a major exporting country such as the United States or Brazil can reduce the global supply of key commodities such as soybeans, corn or wheat, leading to increased prices and market instability worldwide (Glauber, 2019). This interconnectedness means that even local weather events can have far-reaching effects on global food security and prices. Regional weather events, such as floods, droughts, or persistent unseasonal rains, can disrupt local supply chains by damaging crops, infrastructure, and transportation networks (Mbow et al., 2019). Such disruptions can cause immediate shortages in local markets, causing price spikes and reducing the availability of essential foodstuffs. These localized effects can spread through global supply chains, especially for commodities that are highly dependent on a particular region for production. For example, extreme weather events in Southeast Asia which is the main producer of rice can affect global rice prices and supply stability (FAO, 2018).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.2.3.4 Crop Yields and Supply

Weather conditions directly impact crop yields. A period of adverse weather, such as droughts or floods, can reduce crop production. Although, weather events also can disrupt daily farm operations, delay planting or harvesting schedules, and increase the physical demands on workers. For example, excessive heat can lead to heat stress, reducing workers' ability to perform tasks effectively. Conversely, prolonged rainy periods can limit field access and operational efficiency. These disruptions can affect worker morale, job satisfaction, and overall productivity levels.

Therefore, this decrease in supply can lead to a shortage of agricultural commodities in the market, causing prices to increase due to higher demand relative to supply. For example, excessive heat can cause heat stress among workers, reducing their ability to perform tasks effectively and safely. Heat stress not only lowers productivity but also increases the risk of heat-related illnesses, which can further strain labor resources (IPCC, 2019). On the other hand, prolonged periods of rain can make fields inaccessible, preventing planting, weeding, and harvesting activities. These delays can disrupt the entire agricultural calendar, leading to inefficient use of resources and reduced crop yields (Folberth et al., 2016).

2.3 Productivity of Worker in the Agriculture Sector

The productivity of workers in the agricultural sector is a multifaceted concept involving various dimensions of labor efficiency and output. It is often measured by the amount of produce generated per worker over a specific period and can be influenced by factors such as technology, worker skills, farm management practices, and environmental conditions. Technological advancements, including mechanized tools, automated systems, and precision farming techniques, have significantly enhanced worker productivity by enabling more efficient and accurate task performance (Anderson & Feder, 2017). Training and education programs aimed at improving workers' skills and knowledge further boost productivity by enabling effective use of advanced technologies and best practices (Johnson et al., 2021).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Environmental factors, particularly weather conditions, also have a profound impact on agricultural productivity. Uncertain weather patterns, such as unpredictable rainfall or extreme temperatures, can disrupt farming activities and reduce labor efficiency. Adverse weather conditions can lead to lower productivity by causing delays, reducing produce quality, and increasing physical strain on workers (Smith & Brown, 2019). Effective farm management practices, such as crop rotation, soil management, and efficient resource allocation, are crucial for optimizing productivity. Policymakers and agricultural managers are increasingly focusing on sustainable practices that enhance productivity while promoting environmental conservation and worker well-being. However, we have several variables of the productivity of worker on the agriculture sector are efficient of labor, output quality, attendance and work hours and workers satisfaction and health. (Lee & Wang, 2020).

2.3.1 Efficient of Labor

Labor efficiency in the agricultural sector is important to optimize productivity and resource utilization. It refers to maximizing output with minimum input, influenced by worker skills, technology and management practices. Advanced machinery and precision farming techniques significantly increase efficiency by enabling workers to perform tasks more quickly and accurately (Anderson & Feder, 2017). Training programs are important because they equip workers with the necessary skills to adapt to new technologies and agricultural practices, thus improving their performance (Johnson et al., 2021).

Effective management practices, such as proper task distribution and workflow optimization, also play an important role in improving labor efficiency, with organized farms often seeing higher productivity and profitability (Lee & Wang, 2020). Environmental conditions can have a significant impact on labor efficiency; bad weather can hinder workers' ability to perform tasks effectively, while favorable conditions can increase efficiency (Smith & Brown, 2019). Therefore, developing strategies to reduce the effects of bad weather and ensure optimal working conditions is essential to maintain high labor efficiency in the agricultural sector.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.3.2 Output Quality

Output quality in the agricultural sector refers to the characteristics and attributes of produce that determine its market value and suitability for consumption or processing. High output quality is essential for economic viability and meeting consumer demand, influenced by genetic varieties, cultivation practices, environmental conditions, and post-harvest handling. Genetic improvements and high-quality seeds significantly enhance output quality by developing crop varieties with improved taste, nutritional value, and resistance to pests and diseases (Zhao et al., 2017). Sustainable farming practices, such as organic farming and integrated pest management, maintain and enhance output quality by reducing chemical inputs and promoting soil health (Khan et al., 2019).

Environmental factors, particularly weather conditions, substantially impact output quality; optimal conditions support healthy crop growth, while adverse conditions can compromise quality. Effective post-harvest handling and storage practices, including proper drying, refrigeration, and packaging, are critical in preserving output quality, maintaining freshness, and extending shelf life (Singh et al., 2018). Continuous monitoring and adherence to quality standards throughout the production and supply chain are essential for delivering high-quality agricultural products to the market.

2.3.3 Attendance and Work Hours

Attendance and work hours are critical factors affecting the productivity of workers in the agricultural sector. Consistent attendance ensures that farming operations run smoothly, and tasks are completed on time, while the number of work hours directly impacts the amount of labor available for various agricultural activities. Factors such as weather conditions, health issues, and socioeconomic circumstances can significantly influence both attendance and work hours. For instance, adverse weather conditions can reduce attendance and shorten work hours as workers may be unable or unwilling to work in unsafe or uncomfortable conditions (Smith & Brown, 2019). Conversely, favorable weather can enhance attendance and extend work hours, thereby boosting productivity.

Health and safety are also major determinants of attendance and work hours. Workers exposed to harsh environmental conditions or inadequate safety measures are more likely to experience health issues, leading to increased absenteeism and reduced work hours. Implementing proper health and safety protocols can mitigate these risks and ensure a more consistent and productive workforce (Johnson et al., 2021). Additionally, socioeconomic factors such as wage levels, job security, and access to transportation can influence workers' ability to maintain regular attendance and long work hours. Higher wages and better job security tend to motivate workers to attend work regularly and put in more hours, enhancing overall productivity (Lee & Wang, 2020).

2.3.4 Worker Satisfaction and Health

Worker satisfaction and health are crucial for productivity in the agricultural sector. Satisfied and healthy workers are more engaged, motivated, and efficient, which boosts productivity. Key factors include fair wages, job security, safe working conditions, and opportunities for career advancement. Providing healthcare and promoting well-being through supportive policies are essential, as poor health and unsafe conditions lead to absenteeism and lower productivity (Smith & Brown, 2019). Implementing ergonomic practices and offering mental health support enhances job satisfaction and reduces stress (Johnson et al., 2021). Access to training and development opportunities empowers workers with skills and knowledge, improving performance and job fulfilment (Lee & Wang, 2020). Investing in worker satisfaction and health is vital for the long-term viability of the agricultural sector (Khan et al., 2019).

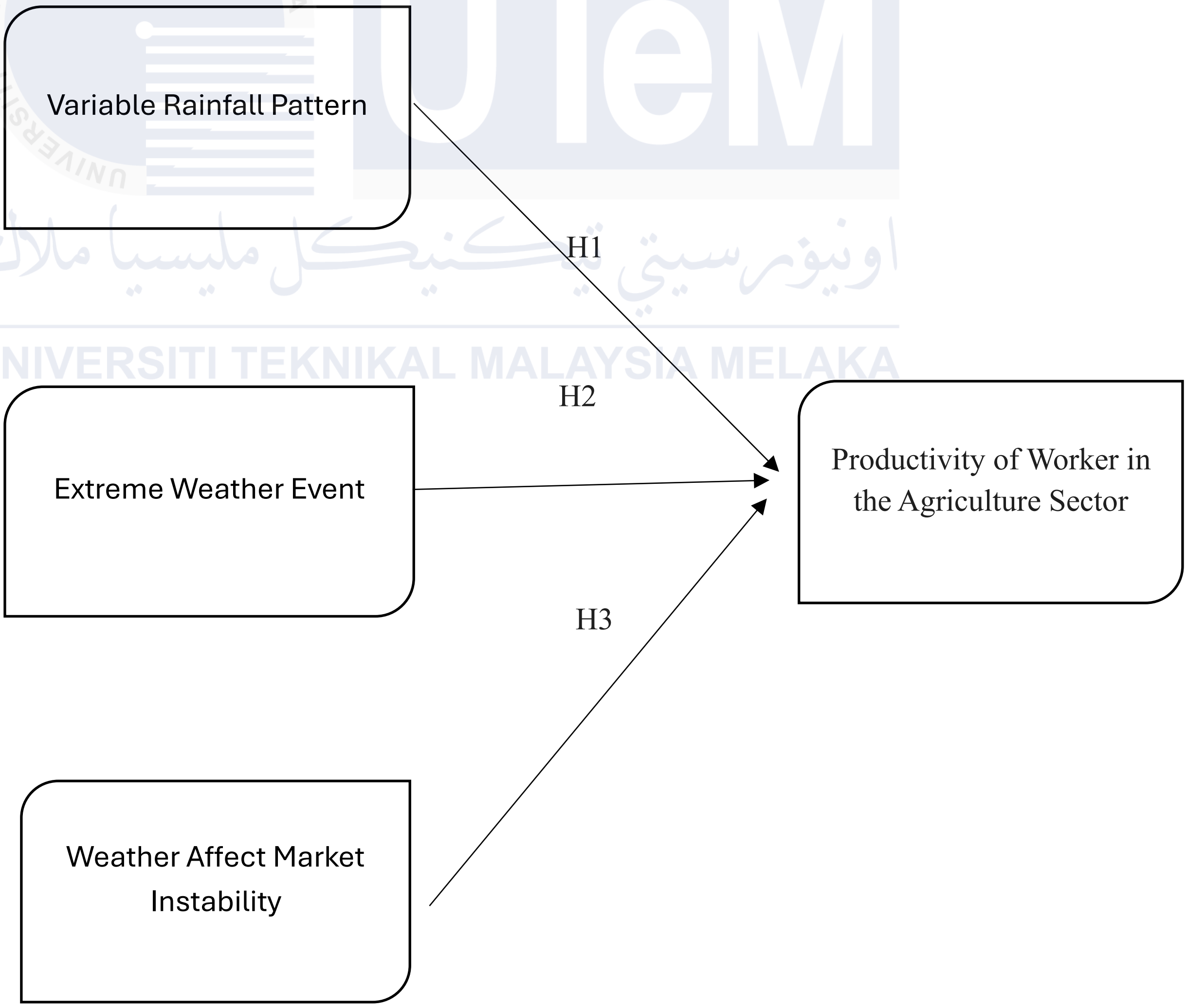
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.3 Theoretical Framework

This chapter includes an important feature: a theoretical framework. When viewed through the framework, an investigation into the nature of the connection may yield clearer results. The research frameworks represent the interaction variables with the independent variables.

IV: Weather Uncertainty

DV: Productivity of Worker in the Agriculture Sector



2.5 Hypothesis of the study

Hypothesis 1:

HO: There is no significant relationship between changes rainfall patterns with productivity of worker in the agriculture sector.

HI: There is a significant relationship between changes rainfall pattern with productivity of worker in the agriculture sector.

Hypothesis 2:

HO: There is no relationship between extreme weather event with productivity of worker in the agriculture sector.

HI: There is a significant relationship between extreme weather event with productivity of worker in the agriculture sector.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Hypothesis 3:

HO: There is no relationship between weather affects market instability with productivity of worker in the agriculture sector.

HI: There is a significant relationship between weather affects market instability with productivity of worker in the agriculture sector.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

In the introduction to the research methodology chapter, it is essential to provide a comprehensive overview of the methodological approach adopted for the investigation. This section serves as a roadmap for readers, outlining the key components and procedures involved in the research process. Firstly, it is crucial to emphasize the rationale behind selecting a quantitative study approach and the significance of adhering to prescribed stages. This highlights the rigor and systematic nature of the research process, instilling confidence in the reliability and validity of the findings.

Next, the introduction should provide a detailed explanation of the various components integral to conducting research, such as research design, location, strategy, time horizon, and data analysis methodologies. This helps readers understand the context within which the research is conducted and the specific considerations guiding the methodological choices. Furthermore, the introduction should underscore the importance of research methodology as a systematic and step-by-step approach. By emphasizing the structured nature of the research process, readers gain insight into the rigor and discipline required to generate credible and actionable research outcomes.

Overall, the introduction to the research methodology chapter serves as a foundation for understanding the methodological framework underpinning the study. It sets the stage for subsequent sections to delve into greater detail regarding the specific procedures and methodologies employed in the research.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.2 Research Design

The goal of the research study has guided the selection of the research design in this section. A research design is a broad strategy explaining the researcher's approach to addressing the issues or research questions raised by the investigation. (William et al.2017). The research design highlights the specific study design to propose, the methodologies for data collection from the participants, the process of selecting possible respondents, the analysis of the acquired information, and the communication of the findings. (Kumar,2019). The strategic plan guides the researcher's data collecting and analysis. Put simply, research design acts as a set of instructions that must be adhered to during the entire research effort (Solanki, 2022). The primary purposes of this research design are to establish the step-by-step methods for carrying out a study and to ensure that there is a significant influence between the independent variables and the dependent variable (Kumar, 2019). In order to get more comprehensive data using exploratory, descriptive, and explanatory methods, it is necessary to have a study design. The majority of these strategies can assist researchers in formulating a plan for acquiring relevant information.

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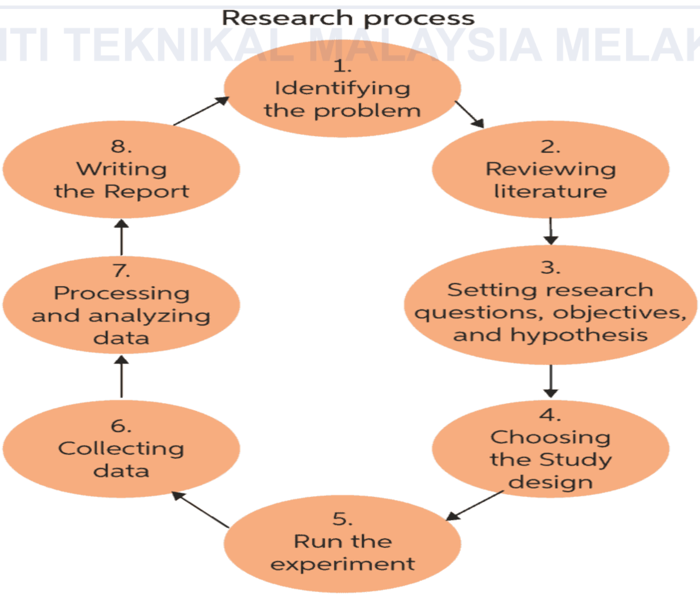

Figure: 3.1 Research process

3.3 Research Method

In this study, quantitative research methods will be used to investigate the effect of weather uncertainty on the productivity of worker in the agricultural sector. This quantitative research was chosen because of its ability to provide numerical data that can be analysed statistically, allowing objective conclusions to be drawn from the data collected. This method involves the use of data collection instruments such as questionnaires or structured surveys, where respondents will provide information that can be translated into numbers. This data can then be analysed using various statistical techniques to test hypotheses and determine relationships or patterns in the data.

The main advantage of quantitative research is its reliability in producing data that can be measured and compared. This allows researchers to accurately assess the effects of external factors, such as extreme weather, on the variable being studied, in this case the quality of work performance. In addition, quantitative methods also facilitate the generalization of study results to a larger population, provided that the sample taken is representative.

The deductive approach will be used in this study, starting with a theory or hypothesis about the relationship between effect of weather uncertainty and the productivity of worker in the agricultural sector. This methodology includes the examination of hypotheses by gathering and analysing evidence to either validate or disprove the original notion. Through the methodical testing of hypotheses obtained from established theory or literature, this methodology enables us to reach conclusions based on empirical data (Zhu et al 2022).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The research will use a single quantitative method, namely a survey to collect data from participants. A survey will be distributed to employees to gather information about the effect, challenge and effective strategy of different weather uncertainty, on the productivity of workers in the agriculture sector. This mono-quantitative method ensures consistency in the collection and analysis of data facilitating an examination focused on the research question. By using a quantitative approach, deductive reasoning and mono quantitative methods, this study aims to provide a comprehensive understanding of the effects of extreme weather on the quality of work performance.

3.4 Location of Research

Data collection locations will focus on locations with high average weather uncertainty. Tumpat, Kelantan is the sampling site. Tumpat, Kelantan was chosen by the researcher as the area that will be studied in this research, and it will have a diverse demographic. Set aside rather than that, the researcher chose this location because it has many cases involving weather uncertainty faced by the residents of the state. The researcher did not select a large population in to complete the research at a certain time during the period. The researchers distribute questionnaires to this population to collect information on effect on weather uncertainty on the productivity workers in the agricultural sector.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.5 Research Strategy

Research strategy refers to the overarching plan or approach adopted by researchers to address a research question, achieve research objectives, and gather relevant data. It encompasses the systematic steps, methods, and procedures employed throughout the research process to ensure the validity and reliability of findings. Common research strategies include experimental research, survey research, case study research, qualitative research, quantitative research, and mixed-methods research (Bryman, 2008). The choice of research strategy depends on various factors, including the nature of the research question, the level of control required, the availability of resources, and the preferences of the researcher. Researchers should carefully select and justify their chosen research strategy to ensure that it aligns with the objectives of the study and allows for the rigorous investigation of the research problem.

3.5.1 Survey method

Decision makers and researchers across all academic and industry sectors conduct surveys to uncover answers to specific, significant question (Taherdoost, 2016). The survey method involves collecting data from a sample of individuals or organizations through structured questionnaires or interviews. In assessing the effect of weather uncertainty on the productivity of workers in the agricultural sector, the survey method can be employed to gather information on the experiences, perceptions, and responses of stakeholders directly affected by such events. A survey technique can help the researcher collect quantitative data, analyse descriptive and inferential statistics, and identify potential relationships between independent and dependent variables (Saunders et al. ,2016). Surveys can be administered online, via online forms or face-to-face, depending on the accessibility and preferences of the target population. Survey methods enable quantitative data collection, facilitate statistical analysis and identify trends and patterns in quality of work performance and resilience. This study chose to use an online survey form because it is easy to manage because it can be distributed to respondents through social media and email.

In addition, this survey will be made in relation to extreme weather on quality work performance. Questions asked may relate to the extent of infrastructure damage, the effectiveness of response and recovery efforts, and the socio-economic impact on affected communities. This questionnaire will be used for a survey strategy to study quantitatively after collecting data according to the standards. This is because it is the best instrument to collect a large amount of data and information with a large population of respondents in a simple and effective way. Therefore, this survey method is suitable for data collection and analysing the relationship between the accuracy of information obtained by an individual's work performance against extreme weather.

3.5.2 Questionnaire method

A questionnaire is a research instrument consisting of a series of questions designed to gather information from respondents. It can be used for various purposes, including assessing attitudes, opinions, behaviors, or characteristics of a particular group. Questionnaires can be administered in multiple formats, such as online, via mail, face-to-face, or over the phone. They can include open-ended questions, which allow for detailed responses, and closed-ended questions, which offer predefined response options (Groves et all 2009). The questionnaire method is a common data collection technique in research, involving the administration of a set of structured questions to collect information from respondents. This method is very versatile and can be used in many fields, including social science, health, marketing and education. (Groves et al., 2009; Fowler,2014).

For this research, questionnaires will be distributed to people working in various sectors to collect primary data in this research. The researcher has designed a questionnaire to see the effects of employee behavior caused by extreme weather. It contains three parts in the questionnaire design for survey research. The first part of the questionnaire was designed to analyze the demographics of the respondents. Questions addressing the demographic characteristics of the respondents were prepared in a closed multiple choice format. In the second part, the researcher has focused on the independent variable in this research that studies the effects of extreme weather. Finally, for the third part, it examines the effect on quality work performance. In this questionnaire, it is based on a 5-point Likert scale. The Likert scale is a five-point rating scale where 1 represents "strongly disagree", 2 represents "disagree", 3 represents "somewhat agree", 4 represents "agree" and 5 represents "strongly agree. The Likert scale is often used to measure attitude " in a scientifically recognized and justified way, the attitude can be defined as a preferred way of reacting in a given situation embedded in a relatively durable organization of beliefs and ideas developed through social interaction (Joshiet al., 2015).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.5.3 Population and sample

The sample population for this research will consist of individuals, organizations and working communities that are directly affected by weather uncertainty leading to worker productivity in the agricultural sector. This can include residents of disaster-affected areas from the agricultural sector. The target population of the study is agricultural workers in Tumpat, Kelantan. Probability sampling was chosen as the sampling design for this study. There are several probability sampling approaches; cluster sampling, multistage sampling, stratified random sampling, simple random sampling and systematic random sampling. The most suitable for this study is simple random sampling. This was chosen because it was easy to identify possible samples. As Adam Hayes (2019) points out, a simple random sample refers to a measurable subset of the population where each part of the subset has an equal chance of being selected. A random sample can be considered an unbiased representative of the group. Saunders et al., (2016) mentioned that each person is randomly selected and in that case the number that has been randomly selected is accepted in selecting a sample that does not have any bias in the sampling method used.

The sample for the population used is the population of Tumpat Kelantan, which is 1000 people. Table 3.1 shown as stated in the Krejcie and Morgan Table, the population sample size I got was 278 people. Each respondent will be given enough time to complete the questionnaire, maximizing the possibility of sampling in case of errors. The researcher has chosen a simple unplanned sample as a sampling approach. According to Alvi (2016), each element of the population has an equal chance of being selected in simple random sampling. A population must contain a limited number of components that can be recorded or mapped. (Frerichs 2014), admits that sample selection is more significant as well as the basic process of selection and this is the best way to get a sample. For the case of this study, the investigators have chosen simple random sampling as the best approach.

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	330	181	2400	331
65	56	340	186	2600	335
70	59	360	191	2800	338
75	63	380	196	3000	341
80	66	400	201	3500	346
85	70	420	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	207	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Table 3.1: Table for Determining Sample Size for a Finite Population

Sources: Krejcie & Morgan, 1970

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.5.4 Pilot testing

A pilot test is primarily employed to guide the implementation of large-scale analyses. (Thabane et al., 2010). Eldridge et al. (2016) The goal of a pilot test is mostly emphasised in research to assess the progress made in the creation of an approaching large test, endeavour, or project. This test acts as a tool to aid in decision-making and is used as a small-scale test or observation set to determine how and if to proceed with a whole project. In accordance to Dikko (2016), The inclusion of a quiz in the pilot framework can improve the understanding of the questions by preventing any confusion in the explanations provided in the research agreement. A pilot test might reveal both the mistakes and weaknesses of the questionnaires employed. It may be utilised to adjust the surveys in order to confirm their effectiveness before distributing them to the respondents. Due to the time constraints, a minimum of ten responders are chosen (Tappin, Ruth. 2014).

3.6 Time Horizon

The concept of "time horizon" in research refers to the duration over which a study is conducted and the temporal dimension within which data is collected. Time horizon is a fundamental consideration in research design, as it influences the scope, methodology, and interpretation of findings. Longitudinal research involves the collection of data at multiple points in time, allowing researchers to track changes and trends over an extended period. This approach enables the examination of relationships, patterns, and developments over time, providing insights into the dynamics of phenomena and processes. Longitudinal studies are particularly useful for investigating the effects of interventions, observing developmental trajectories, and exploring long-term trends (Kelly & Booth, 2013).

On the other hand, cross-sectional research involves collecting data at a single point in time, providing a snapshot of a specific moment or period. This approach offers a snapshot of the current situation, allowing researchers to assess the prevalence, distribution, and associations among variables at a particular point in time. Cross-sectional studies are valuable for generating descriptive data, identifying correlations,

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

and exploring relationships between variables at a specific point in time. Both longitudinal and cross-sectional research designs have their respective strengths and limitations. Longitudinal studies provide insights into temporal dynamics and allow for the analysis of change over time but require significant resources and time commitment. Cross-sectional studies, on the other hand, offer a snapshot of a particular moment and are relatively quicker and more cost-effective but may not capture temporal changes or causality. Therefore, because the researcher was given limited time to complete this study, the researcher chose to use a horizontal cross-sectional period.

3.7 Data Analysis

Data analysis is the systematic procedure of collecting, structuring, and scrutinising data to extract valuable information that may be utilised for decision-making purposes. Analysis methods and methodologies vary depending on the sector and study objectives. Effective data analysis transforms raw data into meaningful insights and supports evidence-based conclusions. The approaches mentioned are mostly derived from two fundamental fields of study quantitative and qualitative research (Calzon, 2022).

3.7.1 Reliability

Reliability refers to the consistency and stability of the results obtained from a research study or measurement tool over time. It indicates the extent to which the instrument produces the same results under consistent conditions. High reliability means that the results are reproducible and dependable, which is crucial for ensuring the credibility of research findings. Reliability can be assessed using various methods, such as test-retest reliability, inter-rater reliability, and internal consistency (Creswell et all 2017).

The researcher can determine the scale's overall index of repeatability or internal consistency and identify problematic items that should be deleted. Cronbach's Alpha is an additional measure of scale reliability that may be employed to assess the degree of association among a set of items. It is commonly employed when a researcher wishes to assess the reliability of a scale developed by a survey or questionnaire containing many Likert items. According to Deng, Lifang, and Wai Chan (2017), the Rule of Thumb table is a practical guideline for understanding the Alpha coefficient. It is particularly useful for dichotomy questions, which have two possible replies, or Likert scale questions.

Table 3.2: Cronbach's Alpha Interpretation

Source: (Zahreen Mohd Arof et al., 2018)

NO	**Coefficient of Cronbach' Alpha**	**Internal Consistency**
1	More than 0.90	Excellent
2	0.80-0.89	Good
3	0.70-0.79	Acceptable
4	0.6-0.69	Questionable
5	0.5-0.59	Poor
6	Less than 0.59	Unacceptable

Table 3.2 shows the Cronbach's Alpha Coefficient Range and Strength of Association. According to the table above, Cronbach's Alpha values equal to or greater than 0.70 were deemed acceptable. If the Cronbach's Alpha is more than 0.80, it's good; 0.90 and higher are regarded as excellent. If the Cronbach's Alpha was less than 0.6, it was deemed poor, and if it was less than 0.59, it was deemed unacceptable.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.7.2 Validity

Validity clarifies how well the collected information covers the real range of investigation (Ghauri and Gronhaug, 2005). Validity can be described as a method for measuring what should be measured (Saunders et. al., 2016). It ensures that the results and conclusions drawn from a study accurately reflect the concept being investigated. There are several types of validity, including construct validity the degree to which a test measures the theoretical construct it aims to measure, content validity the extent to which a measurement reflects the specific intended domain of content, and criterion-related validity the effectiveness of a test in predicting an individual's behavior in specific situations.

3.7.3 Correlation

Correlation is a statistical term that quantifies the degree to which two or more variables change in conjunction. Put simply, it indicates the presence and strength of relationships between pairs of variables. A positive correlation indicates that there is a consistent tendency for one variable to rise or decrease in conjunction with the growth or decrease of another variable. A negative correlation indicates an inverse relationship, where a rise in one variable is typically accompanied by a drop in the other variable, and vice versa. Correlation is commonly assessed by employing a correlation coefficient, such as Pearson's correlation coefficient (r), which spans from -1 to +1. A coefficient around +1 signifies a robust positive association, whereas a value near -1 signifies a robust negative correlation. A coefficient around 0 shows the absence of a linear relationship between the variables (Bryman et all. 2015).

The Pearson's correlation coefficient, sometimes referred to as the item correlation, is denoted by in a sample and in the population from which the sample is derived. The coefficient may be determined irrespective of units and can vary between +1, 0, and -1. (Sedgwick, 2012). It is a quantitative metric that assesses the magnitude of a linear relationship between two variables. Moreover, positive numbers signify a positive linear correlation, whilst negative values imply a negative linear correlation

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

(Saunders et. al.2016). A value of 0 indicates the absence of a linear connection, whereas values closer to 1 or -1 suggest a higher linear correlation (Statstutor, 2015).

Pearson's correlation coefficient, often denoted as rr, is a measure of the linear relationship between two variables. It ranges from -1 to +1, where:

- **$r = +1$: Perfect positive correlation**
- **$r = -1$: Perfect negative correlation**
- **$r = 0$: No correlation**

The formula for Pearson's correlation coefficient *r* is:

$$r = \frac{\sum(x-\bar{x})(Y-\bar{Y})}{\sqrt{\sum(X-\bar{X})^2 \sum(Y-\bar{Y})^2}}$$

Where:

- X and Y are the variables
- $\bar{X}$ and $\bar{Y}$ are the means of X and Y, respectively

Pearson's correlation coefficient is widely used in research to measure the strength and direction of the linear relationship between two continuous variables.

Table 3.3: The scale of Correlation Coefficient

(Sources: Statstutor, 2015).

Person, r	
The scale of Correlation Coefficient	**Value**
0 < r ≤ 0.19	Very Low
0.2 ≤ r ≤ 0.39	Low Correlation
0.4 ≤ r ≤ 0.59	Moderate Correlation
0.6 ≤ r ≤ 0.79	High Correlation
0.8 ≤ r ≤ 1.0	Very High

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3.7.4 Linear regression analysis

Linear regression is a statistical model that estimates the linear relationship between a dependent variable and one or more independent variables. It is commonly used in various fields such as finance, economics, environmental science, building science, and machine learning. The main idea behind linear regression is to fit a line through a set of data points in a scatter plot. The line summarizes the relationship in the data and can be used for making predictions. The equation of the line is typically written as $y=\beta 0+\beta 1x$ where y is the dependent variable, x is the independent variable, $\beta 0$ is the y-intercept, and $\beta 1$ is the slope of the line. The slope and intercept are estimated using techniques such as the method of least squares. The quality of the linear regression model can be assessed using measures like the coefficient of determination (R-squared), which indicates how much of the variability in the dependent variable is explained by the independent variables (Moore et al. 2021).

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3.7.4.1 R-squared

R-squared, also known as the coefficient of determination, measures the proportion of the variance in the dependent variable that is predictable from the independent variables. It is a statistical measure that indicates how well the regression predictions approximate the real data points (Nau et al. 2021).

R-squared values range from 0 to 1. A value of 0 indicates that the model does not explain any of the variability in the response data around its mean. A value of 1 indicates that the model explains all the variability in the response data around its mean. However, a high R-squared does not necessarily mean the model is good; it is possible to have a high R-squared for a model that is overfitting the data. If this High R^2 indicates that most of the variance in the dependent variable is explained by the independent variable. While if this low R^2 would indicate that the independent variable does not explain much of the variance in the dependent variable (Kenton et al 2020).

$$R^2 = 1 - \frac{SS_{res}}{SS_{lot}}$$

Where:

- *SS*res (Sum of Squares of Residuals) is the sum of the squared differences between the observed actual values and the values predicted by the model.
- *SS*tot (Total Sum of Squares) is the sum of the squared differences between the observed actual values and the mean of the observed values.

3.7.4.2 F-Value

The F-value in regression is used to determine whether the overall regression model is a good fit for the data. It is the ratio of the mean regression sum of squares divided by the mean error sum of squares. The F-value is compared against a critical value from the F-distribution to determine the statistical significance. A high F-value that exceeds the critical value implies that at least one predictor variable is significantly related to the outcome variable. If the high F Value of the model explains a large part of the variance in the dependent variable, it indicates that the model fits well if the F value is low then the model does not explain much variance, indicating that it may not be appropriate (Frost et al. 2020).

$$F = \frac{Mean\ Sum\ of\ Square\ Regression(MRS)}{Mean\ Sum\ of\ Square\ Error\ (MSE)}$$

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3.7.4.3 T- Value

The T-value in regression analysis tests the hypothesis that a particular coefficient is different from zero. Each predictor variable has its own T-value which tells you how much a single predictor variable contributes to the model (Frost et al. 2020).

$$t = \frac{\hat{\beta} - \beta_0}{SE(\hat{\beta})}$$

Where:

- $\hat{\beta}$ is the estimated coefficient,
- $\beta 0$ is the hypothesized value of the coefficient (usually 0),
- $SE(\hat{\beta})$ is the standard error of the estimated coefficient.

This high absolute T value would indicate that the predictor variable is statistically significant in explaining the dependent variable. While if the absolute T Value is low it indicates that the predictor variable is not statistically significant. The T value is compared to the critical value from the T distribution to determine statistical significance. If the absolute T value is greater than the critical value, the null hypothesis (that the coefficient is zero) is rejected (Montgomery et al. 2021).

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CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

The analysis and discussion of the research will be discussed in this chapter 4. The results of the objectives of this study, which have been achieved, will be shown. This survey, which also included a pilot test, was conducted for about two months. However, only 164 respondents out of 278 respondents were successfully collected. Then, a total of 14 pilot tests for respondents also participated in this survey. SPSS software will use to coded and key in all the result that received from the questionnaires. The data will then be analysed and interpreted. The purpose of this survey is to help researchers investigate the relationship between independent and dependent variables. In this questionnaire is divided into 3 parts. In part A contains demographic profiles, while part B contains independent variables and part C contains dependent variables.

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4.2 Result of Descriptive analysis

In this research, descriptive statistics was used by the researcher to analyse the demographic background for the total of 164 respondents. In this section, the background of respondents is analysed include gender, age, education level, work position and duration of work experiences.

4.2.1 Gender

Table 4.1 Gender of Respondents

(Sources: SPSS Output)

Gender

Valid		**Frequency**	**Percent %**
	Male	96	58.5
	Female	68	41.
	Total	164	100.0

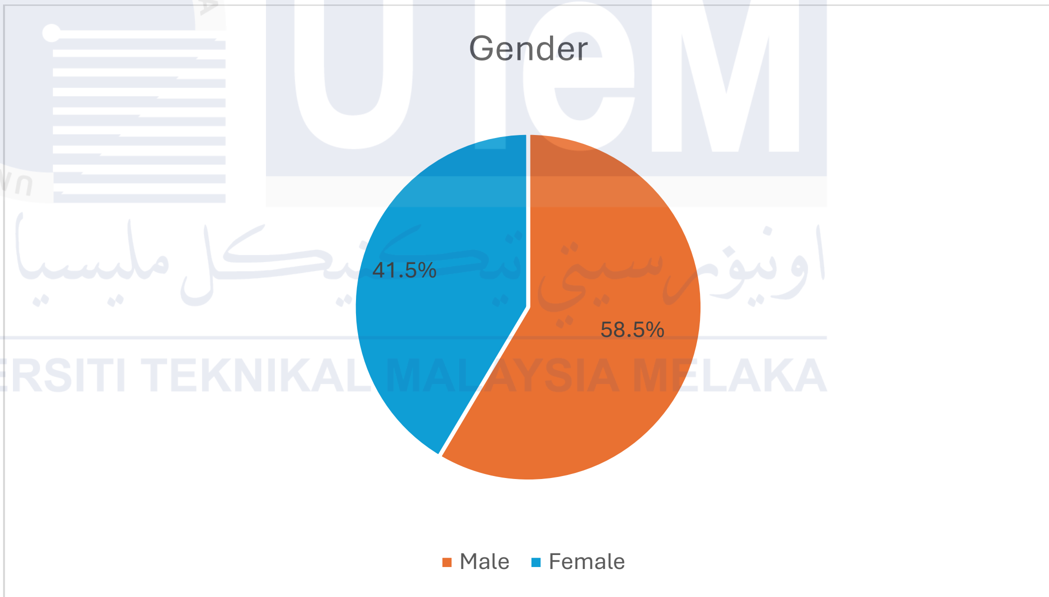

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Figure 4.1: Gender of Respondents

Table 4.1 and figure 4.1 shows that the gender of all 164 respondents who were answering the questionnaires. It shows that the total for male were 96 respondents which were 58.2% from the total, which the total for female was 68 respondents which were 41.2% from the total. From the data analysis of this research, the male respondents participated more than the number of female respondents. However, this research is randomly distributed by the researcher and not select the gender of respondent systematic.

4.2.2 Age

Table 4.2: Age Of Respondents

(Sources: SPSS Output)

	Age	Frequency	Percent
Valid	Below 30 years old	64	39.0
	30-45 years old	47	28.7
	46-60 years old	42	25.6
	Above 60 years old	11	6.7
	Total	164	100.0

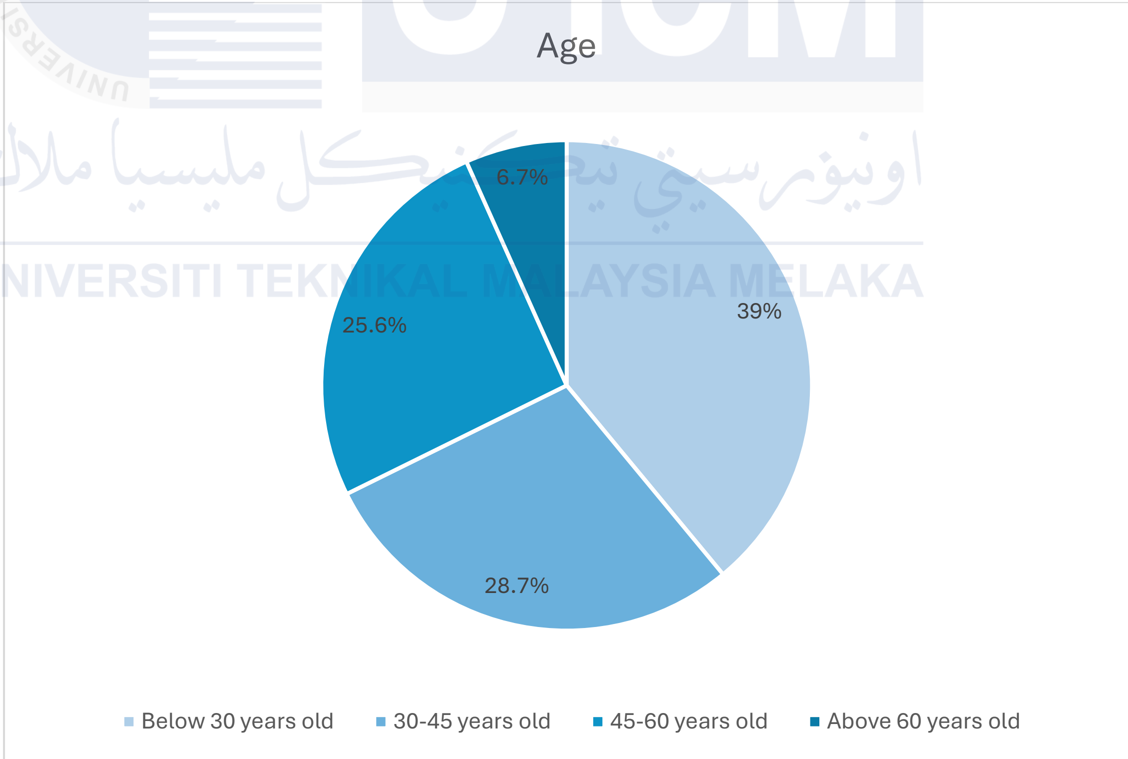

Figure 4.2: Age of Respondents

Table 4.2 and figure 4.2 shows that the range of age of all 164 respondents who were answering the questionnaires, the range of age is between below 30 years old to 60 years old and above. Most of the respondents are below 30 years old, which are 64 respondents made up of 39% from the total of respondents. 47 respondents are between 30 to 45 years old which is 28.7% from the total of respondents. Then, respondents of age 45 to 60 are 25.6% which made up of 42 respondents from the total of respondents. Only 11 respondents which 6.7% from respondents above 60 years old. The highest average of respondents was below 30 years old which was 39% from the total then followed by average age of 30 to 45 years old which was 28.7%. The major category of respondent's age was below 40 years old. A finding from Clement (2020) was stated that the most average people that will use the email were between 25 to 44 years old.

4.2.3 Education

Table 4.3: Education of Respondents

(Sources: SPSS Output)

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	Education Level	**Frequency**	**Percentage**
	No education	42	25.6
	Primary Education	50	30.5
Valid	Junior High School	42	25.6
	Secondary/ Vocational Institute	30	18.3
	Total	100.0	100.0

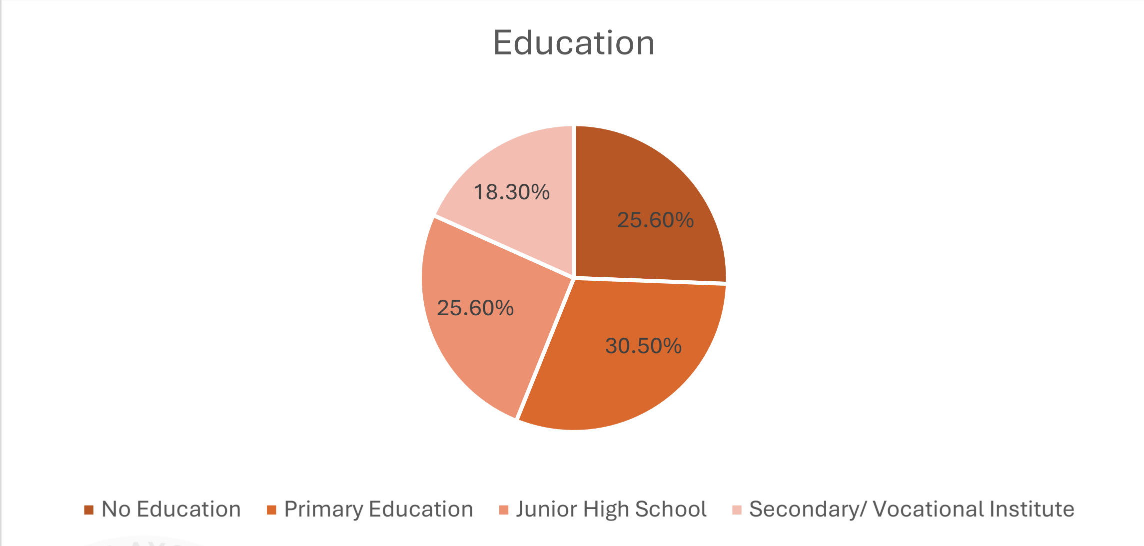

Figure 4.3: Education of Respondents

Table 4.3 and figure 4.3 shows that the education level of all 164 respondents who were answering the questionnaires. Most of the respondents were from the no education level with represent 42 respondents with 25.6%. There were 50 respondents which from primary education with 30.5% of the total of respondents. The number of respondents which is from junior high school is 42 respondents with 25.6% of the total of respondents. There were only 30 respondents from secondary school with 18.30% of the total respondents.

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4.2.4 Marital Status

Table 4.4 Marital Status of Respondent

(Source: SPSS output)

	Status	**Frequency**	**Percentage**
Valid	Single	57	34.8
	Married	84	51.2
	Divorced	14	8.5
	Widowed	9	5.5
	Total	100.01	100.0

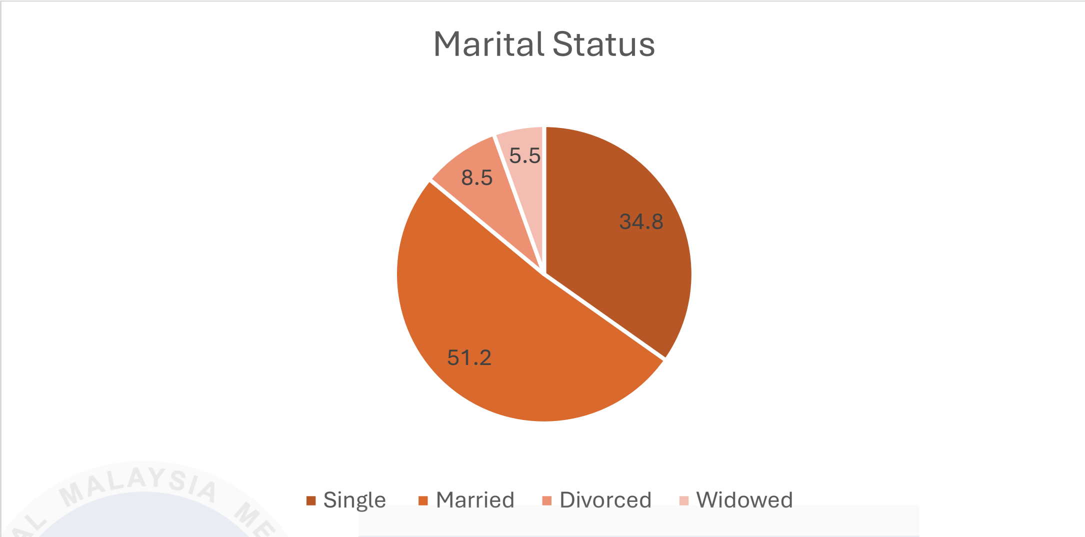

Figure 4.4: Marital Status of Respondents

Table 4.4 and figure 4.4 shows the marital status of 164 respondents. The highest total of 84 respondents with the percentage of 51.2% has the status of married. Then it followed by 57 respondents with the percentage of 34.8% which is single. Next, 14 respondents with the percentage of 8.5% which is divorced. Lastly the lowest total of percentage is 5.5% with the 9 respondents of the total respondents which is widowed.

4.2.5 Years of Experience in Agriculture

Table 4.5: Year Experience of Respondents

(Source: SPSS Output)

	Years of Experience	**Frequency**	**Percentage**
Valid	Less than 1 years	53	32.3
	5- 10 years	68	41.5
	More than 10 years	43	26.2

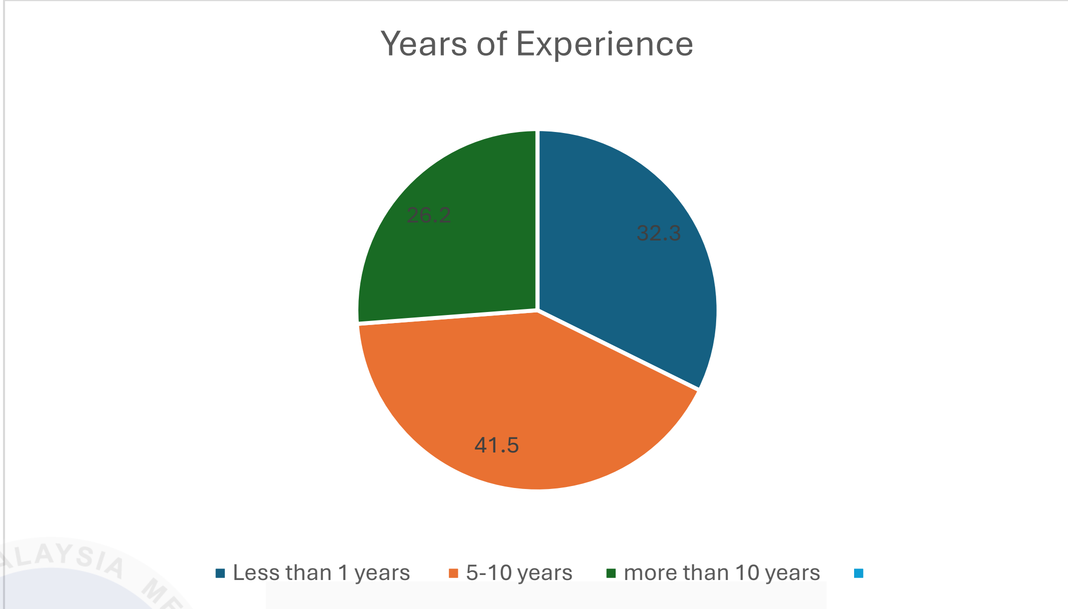

Figure 4.5: Year experience of Respondents

Table 4.5 and figure 4.5 indicated that the range for duration of work experience for all the 164 respondents. The highest total of 68 respondents with the percentage of 41.5% has the 5 to 10 years of years' experience in agriculture. Then, it followed by 53 respondents with the percentage of 32.3% which has less than 1 years of experience in agriculture. Lastly, the lowest total of 43 respondents with the percentage of 26.2% has the more than 10 years of experience in agriculture.

4.3 Result of Data Analysis

4.3.1 Normality Test: Skewness and Kurtosis

A normality test is a fundamental step in statistical analysis to determine whether a dataset follows a normal distribution, which is a key assumption for many statistical methods. Among the various techniques available, skewness and kurtosis are widely used to assess the normality of data. Skewness measures the asymmetry of the data distribution. A value of zero indicates perfect symmetry, while positive skewness (> 0) indicates a longer tail on the right side, and negative skewness (< 0) suggests a longer tail on the left side (Kim, 2013). Typically, skewness values between -1 and 1 are considered acceptable for assuming normality, but stricter thresholds (e.g., -0.5 to 0.5) may be applied in some fields. While Kurtosis evaluates the "tailedness" of the data distribution. A kurtosis value of 3 indicates a mesokurtic distribution, which is typical of a normal distribution. Values greater than 3 suggest a leptokurtic (heavy-tailed) distribution, while values less than 3 indicate a platykurtic (light-tailed) distribution (DeCarlo, 1997). In practical applications, adjusted kurtosis values (e.g., excess kurtosis, where 0 indicates normality) are often used for interpretation. Kurtosis values between -2 and 2 are commonly considered acceptable for normality in many disciplines. These measures are essential for understanding the nature of data and ensuring the appropriateness of statistical models applied. For instance, data that deviate significantly from normality may require transformation or the use of non-parametric statistical methods. A study by DeCarlo (1997) underscores the importance of assessing skewness and kurtosis as part of exploratory data analysis to identify potential violations of normality assumptions in behavioral sciences. Understanding these indicators helps researchers ensure the validity and reliability of their analyses.

4.3.1.1 Descriptive Statistics

Table 4.6: Descriptive Statistics

(Source: SPSS Output)

Descriptive Statistics				
	Skewness		Kurtosis	
	Statistic	Std Error	Statistic	Std error
Irrigation system must be carefully managed.	-1.851	.190	2.138	.377
Weather uncertainties can impact farmer's incomes.	-2.174	.190	3.768	.377
Wet condition will risk farmers safety.	-1.851	.190	4.615	.377
Workers need to take more efforts to protect the crops from bad weather.	-1.475	.190	3.484	.377
Damaged machineries may disrupt farming process.	-1.611	.190	1.999	.377
Agricultural infrastructure can become damage.	-2.523	.190	1.946	.377
Worker's health can be risked by extreme hot weather.	-2.326	.190	7.547	.377
Inconsistent weather makes it difficult for farmers to achieve product quality.	-1.851	.190	6.401	.377
Policies are needed to support producers' financial burden	-1.475	.190	1.642	.377
Disrupt global supply chains prices for agriculture product.	-1.611	.190	2.760	.377
The global price for agricultural supplies can be disrupted.	-2.523	.190	6.262	.377
Extreme weather events will have negative impacts on the agriculture worker performance.	-2.326	.190	3.208	.377
Safety and health issues among agricultural workers can lead to decreased productivity and rate.	-1.380	.190	9.348	.377

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Advanced technology tools boost agricultural productivity compared to manual labor.	-1.751	.190	5.525	.377

In Table 4.6, the skewness of all items indicates a negatively skewed distribution or left-skewed distribution. The highest skewness is observed for "Agricultural infrastructure can become damaged" and "The global price for agricultural supplies can be disrupted" (both at -2.523), showing strong consensus. The lowest skewness is for "Safety and health issues among agricultural workers can lead to decreased productivity" (-1.380), indicating slightly more varied responses. Overall, the results reflect strong agreement on the challenges and risks highlighted.

In Table 4.6, the kurtosis of all items further provides insight into the distribution shapes, reflecting the peakedness or flatness relative to a normal distribution. The highest kurtosis is observed for "Safety and health issues among agricultural workers can lead to decreased productivity" (9.348), followed by "Workers' health can be risked by extreme hot weather" (7.547), and "Inconsistent weather makes it difficult for farmers to achieve product quality" (6.401). These values indicate a sharp peak and heavier tails, suggesting extreme agreement from respondents with some outliers. The lowest kurtosis is found in "Policies are needed to support producers' financial burden" (1.642), "Agricultural infrastructure can become damaged" (1.946), and "Damaged machinery may disrupt the farming process" (1.999). These lower values suggest a flatter distribution with less extreme responses. Overall, the kurtosis values reflect a mix of concentrated and more distributed responses across the items, emphasizing varying levels of consensus and variability on key issues.

IV1.1 (Harvesting season can be affected) and DV1 (Weather uncertainty can affect the productivity of the agriculture sector) were rejected due to their high kurtosis values. High kurtosis suggests that responses are excessively peaked with extreme outliers, indicating that these items may not provide a balanced representation of opinions and could skew the analysis. This choice guarantees a more representative and trustworthy dataset for additional analysis.

4.3.2 Reliability Test

According to Saunders et al. (2016), reliability and replication are what constitute dependability. The Cronbach's Alpha technique was employed by the researcher to assess reliability, and the variety of values in the Cronbach's Alpha Coefficient was utilized to study the level of reliability. The range of the Cronbach's Alpha coefficient and the degree of relationship are displayed in Table 4.7 below.

Table 4.7: Cronbach's Alpha Coefficient Value

NO	Coefficient of Cronbach' Alpha	Internal Consistency
1	More than 0.90	Excellent
2	0.80-0.89	Good
3	0.70-0.79	Acceptable
4	0.6-0.69	Questionable
5	0.5-0.59	Poor
6	Less than 0.59	Unacceptable

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4.3.2.1 Pilot Test

Pilot testing is defined as a type of software testing that instantly tests a system's individual parts or the system. Pilot testing serves as a "small-scale experiment or collection of observations conducted to assess how and when a full-scale project should be launched" since it promotes decision-making (Collins English Dictionary, 2014). Furthermore, pilot testing guarantees that participants understand the questions and finish the provided questionnaire. To make sure the study performance goes well, pilot testing is crucial. Furthermore, pilot testing guarantees that participants understand the questions and finish the provided questionnaire. To make sure the study performance goes well, pilot testing is crucial. All the relationships between all the independent variables and the dependent variables are revealed through pilot testing. 14 respondents were selected using a questionnaire to carry out the pilot testing (Tappin, Ruth. 2014).

Table 4.8: Case Processing of Pilot Study

(Source: SPSS Output)

		N	%
Cases	Valid	14	100.0
	Excluded	0	.0
	Total	14	100.0

Table 4.9: Pilot Study Reliability Analysis

(Source: SPSS Output)

Variable	Cronbach Alpha	No of Items
Variable Rainfall Pattern	0.906	4
Extreme Weather Event	0.944	4
Weather Affect Market Instability	0.937	4
Productivity of Worker in the Agriculture Sector	0.904	4

Table 4.9 indicates Cronbach Alpha for pilot test result reliability. Based on the Cronbach's Alpha interpretation on variable rainfall patterns, it was found to be questionable reliability (4 items; α = .906). Cronbach's Alpha for 4 items weathers affect market instability and productivity of worker in the agriculture sector items are .944 and .937 were excellent in coefficient Cronbach Alpha. Researcher found that both have excellent reliability. The extreme weather event was found to be the highest reliability (4 items; α = .944).

4.3.3 Correlation Test

Any variable may be manipulated or the connection between variables examined using this correlational study approach. Additionally, this correlation will show how strongly two or more variables are related, and it may be positive or negative in direction (Pritha Bhandari, 2021).

Table 4.10: Correlation

(Sources: SPSS Output)

Correlations					
		Variable Rainfall Pattern	Extreme Weather Event	Weather Affect Market Instability	Productivity of Worker in the Agriculture Sector
Variable Rainfall Pattern	Pearson Correlation	1	.626**	.591**	.792**
	Sig. (2-tailed)		.000	.000	.000
	N	164	164	164	164
Extreme Weather Event	Pearson Correlation	.626**	1	.577**	.588**
	Sig. (2-tailed)	.000		.000	.000
	N	164	164	164	164
Weather Affect Market Instability	Pearson Correlation	.591**	.577**	1	.674**
	Sig. (2-tailed)	.000	.000		.000
	N	164	164	164	164
Productivity of Worker in	Pearson Correlation	.792**	.588**	.674**	1

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the Agriculture Sector	Sig. (2-tailed)	.000	.000	.000	
	N	164	164	164	164

Correlation is significant at the 0.01 level (2-tailed). **

Table 4.10 shows the relationship between the independent and dependent variables and explains the study's result on the effect of weather uncertainty on the productivity of workers in the agriculture sector. The variable rainfall pattern shows a high positive correlation with extreme weather events (r = .626, p < .01), indicating that changes in rainfall patterns are strongly associated with the occurrence of extreme weather events. This suggests that as rainfall patterns become more irregular, the likelihood of extreme weather events increases significantly. Additionally, there is a moderate positive correlation between rainfall pattern and weather affecting market instability (r = .591, p < .01). This implies that unpredictable rainfall patterns moderately influence market instability, possibly due to their impact on crop yields, supply chains, and overall agricultural output. This indicates that consistent and predictable rainfall patterns are crucial for maintaining high productivity levels among agricultural workers. The high correlation highlights the direct dependency of agriculture productivity on favourable weather conditions. Similarly, extreme weather events are moderately correlated with weather affecting market instability (r = .577, p < .01)

4.3.4 Regression Test

In this chapter, multiple regression analysis helps investigate the relationship between a single dependent variable and several independent factors. Multiple regression analysis was used to assess the elements of interactive data visualization, job matching, and instructive content to explain the variance in the characteristics of prospective graduates.

4.3.4.1 R-square

Table 4.11: R Square

(Sources: SPSS Output)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.759[a]	.576	.568	.33145
a. Predictors: (Constant), MEAN_IV3, MEAN_IV1, MEAN_IV2				

The model summary result, which illustrates the relationship between the independent and dependent variables, is shown in table 4.11. the correlation coefficient (R) was 0.759, indicating a high correlation relationship between the dependent variable (productivity of workers in the agriculture sector) and the dependent variable (variable rainfall pattern, extreme weather event and weather affect market instability).

The value of the coefficient of determination (R-Square) was 0.576, meaning that 57.6% of the variation in productivity of workers by the 3 independent variables. This result indicates that the predictors collectively have a significant effect on the productivity of workers in the agriculture sector. This suggests that the independent variables significantly influence the productivity of workers in the agriculture sector.

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4.3.4.2 F-Value

Table 4.12: F-Value

(Sources: SPSS output)

ANOVA					
Model	Sum of Square	df	Mean Square	F	Sig.
Regression	23.867	3	7.956	72.417	.000[b]
Residual	17.577	160	.110		
Total	41.444	163			
a. Dependent Variable: MEAN_DV					
b. Predictors: (Constant), MEAN_IV3, MEAN_IV1, MEAN_IV2					

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The ANOVA result was displayed in Table 4.12, with an F-Value of 72.417 at a significance level of p = 0.000 ($p < 0.05$). The overall regression model fits the data well, as indicated by the F-value of 72.417, which also suggests a significant relationship between the dependent variable (agricultural worker productivity) and the independent variables (rainfall patterns, extreme weather events, and weather-related market instability). Since the p-value is less than the significance level of 0.05, we may rule out the null hypothesis. This suggests that independent factors play a major role when weather uncertainty affects worker productivity.

4.3.4.3 Multiple Regression Analysis

Table 4.13: Multiple Regression Analysis

(Sources: SPSS Output)

Coefficients								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std Error	Beta	t	Sig	Tolerance	VIF
1	(Constant)	.655	.282		2.321	.022		
	MEAN_IV1	.429	.071	.385	6.001	.000	.644	1.552
	MEAN_IV2	.116	.059	.134	1.954	.052	.565	1.770
	MEAN_IV3	.321	.054	.384	5.913	.000	.627	1.595

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The result of the example regression analysis coefficient is shown in Table 4.13. For MEAN_IV1 (Variable Rainfall Pattern) has a significant positive effect on the dependent variable, as indicated by its unstandardized coefficient B=0.429B with significant value of 0.000, which is well below the 0.05 threshold. Means that the variance significantly influences the dependent variable. The standardized coefficient (Beta=0.385) also highlights its strong influence relative to the other predictors.

MEAN_IV2 (Extreme Weather Event) shows a marginal effect with an unstandardized coefficient B = 0.116 with a highest significant at 0.052. although the significant is slightly above the conventional 0.05 threshold, it suggests a weak or borderline statistically significant relationship. For the standardized coefficient (Beta=0.134) indicates a relatively small contribution to the model.

For the last MEAN_IV3 (weather affect market instability) demonstrates a significant positive effect on the dependent variable, with an unstandardized coefficient B=0.321 with a significant value of 0.000. This indicates a strong and statistically significant relationship. The standardized coefficient Beta=0.384 is comparable to that of MEAN_IV1, emphasizing its importance in explaining the dependent variable.

Based on table 13, the linear equation was developed as below:

Equation: $y = \beta_{0+}\beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_{n+}\beta_n + \epsilon$

Mean_DV = 0.655 +0.429 (Changes Rainfall Pattern) + 0.116 (Extreme Weather Event) + 0.321 (Weather Affect Market Instability)

4.4 Result Discussion

4.4.1 Descriptive Analysis

In the descriptive analysis of demographic respondents, the researcher found that Male (58.5%) which is 96 respondents are more interested in answering survey question related to this topic. This because of topic relevance. Men are more likely to participate if they believe the survey issue is more relevant to their hobbies or experiences. Furthermore, Becker (2022) looked at how gender affected survey participation in a multi-wave panel research and discovered consistent gender variations, suggesting that response rates may be impacted by perceived relevance and interest in the survey issue. Next, in the age of below 30 years old was highest number of respondents which is (38%) 63 respondents than other age. For the education 30.5% which 50 respondent was the highest respondent education in primary school. This is because the percentage of people whose formal education stops at the elementary level is frequently greater in rural areas or places with inadequate educational facilities. Furthermore, the majority of respondents were married, accounting for 51.5% (84 respondents), making it the highest among all marital statuses. It is possible that the poll was carried out in an area or community where a sizable percentage of people are married. Married people are more common in older or middle-aged groups than in younger ones, for instance. Lastly, the research found that the majority of respondents had 5-10 years of experience in agriculture, accounting for 41.5% (68 respondents). One possible explanation for this pattern is that people with five to ten years of

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experience are frequently in a period when they have accumulated a significant amount of practical knowledge and abilities while still being actively involved in the area. A balance between novices who are still learning and seasoned professionals who may have moved into management positions or different industries is represented by this spectrum of experience. They could thus feel more competent or inclined to take part in an agricultural survey as a result.

4.4.2 Reliability Analysis

Table 4.14: Reliability Analysis

	Variable	Cronbach's Alpha	Result
Independent Variable	Variable Rainfall Pattern	0.722	Acceptable
	Extreme Weather Event	0.874	Good
	Weather Affect Market Instability	0.875	Good
Dependent Variable	Productivity of Worker in the Agriculture Sector	0.773	Acceptable

The table 4.14 shown the reliability of Cronbach Alpha for independent and dependent variables. This reliability test's objective is to determine whether the collected data are reliable enough to be tested. The result shown, the extreme weather event and weather affect market instability received the higher level of reliability of this test, which 0.874 and 0.875 (good in the reliability). For variable rainfall pattern in acceptable in scale of reliability which are 0.722. For the dependent variable (productivity of worker), manage to obtain about 0.773 and acceptable scale as well.

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4.4.3 Correlation Analysis

The correlation analysis revealed several significant relationships between the variables studied. Similarly, changes rainfall patterns were strongly correlated with extreme weather events (r=.626, p<.001) and weather affect market instability (r=.591, p<.001), suggesting that unpredictable rainfall impacts both weather extremes and market stability. Extreme weather events also demonstrated significant positive correlations with weather affect market instability (r=.577, p<.001) These findings underscore the interconnectedness of climatic factors, market dynamics, and productivity within the agricultural sector. Addressing these variables holistically is essential for enhancing resilience and stability in agriculture.

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4.4.4 Regression Analysis

The multiple regression analysis revealed that all independent variables rainfall patterns, extreme weather events, and market instability caused by weather had a significant impact on the dependent variable, weather uncertainty, influencing worker productivity in the agricultural sector.

4.4.4.1 R-Squared

The model summary showed that the (R^2) value is 0.576, which means that the independent variables in the model explain about 57.6% of the variation in the dependent variable. The corrected R^2 (which accounts for the number of predictors and sample size) is somewhat lower at 0.568, indicating a high and trustworthy explanatory power of the model after allowing for potential overfitting. The standard error of the estimate (0.33145) is the average distance between the observed values and the regression line, suggesting a pretty good model fit. These findings indicate that the independent variables have a significant influence on the dependent variable, making the model an effective tool for analyzing the causes influencing the outcome.

4.4.4.2 F-Value

The ANOVA test results (F = 72.417, $p < 0.001$) confirm that the regression model is a strong fit for the data, with a highly significant relationship between the independent variable, weather uncertainty, and the dependent variable, worker productivity in the agricultural sector. The high F-value indicates that the model explains a substantial portion of the variation in productivity, while the very low p-value confirms this relationship is statistically significant and not due to chance. This highlights the critical impact of weather uncertainty on agricultural productivity.

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4.4.4.3 T-Value

From Table 4.13, the coefficients revealed the individual contributions of the independent variables, with changes in rainfall patterns having the highest beta value (0.385). This indicates that reliability is the most influential factor in the effect of extreme weather on the productivity of workers in the agricultural sector.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter will provide an overview of the whole study considering Chapter 4's conclusions and findings. The investigation's findings and outcomes will be used to assess the proposed hypotheses. The research questions and the accomplishment of the goals will be covered in this chapter. This research has a number of implications. Lastly, suggestions for more pertinent research will be provided in the chapter's closing section.

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5.2 Research Objectives Achievement

5.1.1 Research Objective 1

RO1: To examine the impact of climate change on the productivity of agricultural workers

Based on the results in chapter 4, the objectives can be achieved. Three effects of worker productivity in the agricultural sector were identified for this research, changes rainfall patterns, extreme weather events and weather-related market instability. These three effects are independent variables in this research. All effects were tested for validity through pilot testing and reliability analysis. In this research, the researcher selected 14 people to participate in the pilot test and answer the questions. Then, the survey was made through reliability testing to determine its internal validity, and the Cronbach's Alpha value was calculated.

The researcher employed a multiple regression model with R2 to show how well the data fit the regression model. A crucial phase in the structural model assessment process is the *R* 2 evaluation (Joe F. Hairn et al. 2011). The range of R2 has been prescribed from 0 to 1. The value of R2 in between 0 to 1 shows the positive and negative variance. Therefore, based in the table 4.12 shows 57.6% of the variance (R2 = .576, F (72.417), P< .000).

5.1.2 Research Objective 2

RO2: To determine the seriousness of weather uncertainty on agricultural productivity.

The person correlation analysis was conducted to examine the relationship among the independent variables, focusing on the seriousness of weather uncertainty on agricultural productivity. Table 4.10 present the result which reveal the statistically significant positive correlation among all independent variables The relationship between rainfall patterns and extreme weather events showed a moderate positive correlation (r=.626, p<.001), indicating that changes in rainfall patterns are associated with increased occurrences of extreme weather events. Rainfall patterns are influenced by complex interactions within the Earth's atmospheric and oceanic systems, including phenomena such as El Niño-Southern Oscillation (ENSO), which has been shown to disrupt regional precipitation cycles and increase extreme weather occurrences (Trenberth et al., 2015).

Similarly, the correlation between rainfall patterns and weather affecting market instability was also positive and significant (r=.591, p<.001), suggesting that variability in rainfall patterns contributes to market instability within the agricultural sector. Changes in rainfall patterns, such as irregular timing or uneven distribution, can disrupt farming activities. For instance, excessive rainfall may lead to flooding, which destroys crops and delays harvesting, while insufficient rainfall can result in droughts, reducing crop yields (FAO, 2020). The association between extreme weather events and weather affecting market instability was moderate (r=.577, p<.001), reflecting that extreme weather events are likely to disrupt market stability. Additionally, extreme

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weather events can exacerbate logistical challenges in the agricultural sector. Damaged infrastructure, such as roads and storage facilities, can delay the transport of goods to markets, resulting in spoilage and additional losses. These disruptions are particularly pronounced in regions with fragile supply chains or inadequate adaptive infrastructure (Lenton et al., 2019).

5.1.3 Research Objective 3

RO3: To identify the most aggressive weather condition that influence the agricultural activities.

Table 4.13 shown the unstandardized coefficients (β) in the regression analysis provide insights into the individual contributions of the independent variables to the dependent variable, weather uncertainty affecting worker productivity in the agricultural sector. Among the variables, changes in rainfall patterns demonstrated the highest B-value (B=0.429), suggesting that it has the most aggressive influence on weather uncertainty compared to the other variables.

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Next, Weather affecting market instability had the second-highest B-value. This suggests that disruptions in market conditions, such as price volatility caused by weather events, are another significant driver of uncertainty. Farmers and stakeholders depend on stable markets for planning and investment, and instability amplifies unpredictability in agricultural operations (FAO, 2018).

Extreme weather events exhibited the lowest B-value among the variables (B=0.116). While significant, their lower B-value implies that, relative to rainfall patterns and weather affecting market instability, their direct impact on weather uncertainty is less pronounced. This may be because extreme events, though severe, are less frequent and have more localized impacts compared to the broader and more persistent effects of rainfall variability.

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5.3 Research Hypothesis Achievement

Table 5.1: Summary of Hypothesis Testing

(Resources: SPSS Output)

Hypothesis	Sig	Result
HI: There is a significant relationship between changes rainfall pattern with productivity of worker in the agriculture sector.	0.000 < 0.05	Accepted
HI: There is a significant relationship between extreme weather event with productivity of worker in the agriculture sector.	0.052 < 0.05	Accepted
HI: There is a significant relationship between weather affects market instability with productivity of worker in the agriculture sector.	0.000 < 0.05	Accepted

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Change of Rainfall Pattern

Hypothesis 1: There is a significant relationship between changes rainfall pattern with productivity of worker in the agriculture sector.

Hypothesis 1: There is a Significant Relationship Between Changes in Rainfall Patterns and the Productivity of Workers in the Agricultural Sector

The hypothesis that changes in rainfall patterns significantly affect worker productivity in the agricultural sector is supported by the findings of the multiple regression analysis presented in Chapter 4. The results show a p-value of 0.000 for the relationship between changes in rainfall patterns and productivity, which is lower than the generally accepted significance threshold of 0.05. Additionally, the t-value for changes in rainfall patterns is t=6.001t = 6.001, indicating a strong and statistically significant relationship. These findings demonstrate that variations in rainfall patterns significantly impact the productivity of agricultural workers, leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis.

These findings are consistent with existing research that highlights the adverse effects of unpredictable rainfall on agriculture. For example, studies have found that although there is no statistically significant rainfall trend, there is an increase in the yield of certain crops, highlighting the important role of irrigation in driving crop productivity under varying rainfall distributions (Lakshmi et al., 2024). Additionally, research on soil and crop management practices has shown that waterlogging, resulting from excessive rainfall, inhibits the ability of the soil to support plant growth, thereby affecting crop yields and, consequently, agricultural productivity (Kaur et al., 2019). These studies illustrate how fluctuations in rainfall patterns disrupt agricultural activities, leading to reduced productivity among workers in the sector.

The significant value ($p<0.05p < 0.05$) and t-value ($t=6.001t = 6.001$) indicate that changes in rainfall patterns have a statistically significant impact on agricultural worker productivity. Thus, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted: there is a significant relationship between changes in rainfall patterns and the productivity of workers in the agricultural sector.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Extreme Weather Event

Hypothesis 2: There is a significant relationship between extreme weather event with productivity of workers in the agriculture sector.

In hypothesis 2, the relationship between extreme weather events and the productivity of agricultural workers was analyzed using multiple regression analysis in Chapter 4. The p-value for extreme weather events was reported as 0.052, which is less than the 0.05 threshold. This indicates that the relationship between extreme weather events and worker productivity is significant within the context of this study. As a result, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted there is a significant relationship between extreme weather event with productivity of workers in the agricultural sector. Additionally, the t-value for the extreme weather event was $t = 1.954$.

This study are consistent with past research that has highlighted the disruptive impact of extreme weather on agricultural productivity. While extreme weather events may not always have an immediate or direct impact on worker productivity, they can exacerbate existing challenges, such as delays in planting, crop damage, and logistical issues related to supply chains (IPCC, 2021). Additionally, the marginal significance could point to various moderating factors, including adaptive strategies implemented by farmers, such as the use of technology, diversified crop practices, or government interventions that reduce the severity of weather-related disruptions (Smith et al., 2019).

Given the p-value of 0.052 and the t-value (t=1.954), the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. This indicates that extreme weather events have a significant relationship with the productivity of workers in the agricultural sector.

Weather affects market instability

Hypothesis 3: There is a significant relationship between weather affects market instability with productivity of worker in the agriculture sector.

The analysis of Hypothesis 3 reveals a statistically significant relationship between weather affect market instability and the productivity of workers in the agricultural sector. The multiple regression analysis presented in Chapter 4 reports a p-value of 0.000 for this relationship, which is well below the conventional significance threshold of 0.05. This finding leads to the rejection of the null hypothesis and acceptance of the alternative hypothesis, confirming that fluctuations in weather conditions, which cause market instability, significantly impact agricultural worker productivity. Additionally, the t-value for weather affecting market instability is t=5.913, further supporting the significance of this relationship.

The p-value of 0.000 and the t-value of 5.913 indicate a strong and statistically significant relationship between weather-induced market instability and the productivity of agricultural workers. This result suggests that market instability caused by fluctuating weather conditions, such as unpredictable rainfall, droughts, or temperature extremes, creates an environment of uncertainty that adversely affects agricultural worker productivity. This conclusion aligns with existing literature examining the complex interactions between weather variability, market dynamics, and agricultural productivity. For instance, Rosenzweig and Udry (2014) explored how weather forecasts and actual rainfall influence agricultural wages and labor allocation throughout the production cycle. Their findings indicate that positive weather forecasts can lower wages during the planting stage, as reduced out-migration helps stabilize labor supply. In contrast, adverse weather conditions at the harvest stage can increase labor costs, reducing productivity. Similarly, A Hill (2024) highlights that extreme weather events—such as high temperatures and poor air quality—can reduce worker productivity, which directly impacts farm payroll, overall production, and profitability.

Given the significant p-value (p=0.000) and the high t-value (t=5.913), the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1)is accepted. This confirms there is a significant relationship between weather-induced market instability and the productivity of workers in the agricultural sector.

5.4 Significant contribution (Implication) of the study

Body of Knowledge

This study makes a significant contribution to the body of knowledge by advancing the understanding of how weather uncertainty affects the productivity of workers in the agricultural sector. The findings highlight the complex interplay between changing rainfall patterns, extreme weather events, and market instability caused by unpredictable weather conditions. By quantifying the relationships between these variables and worker productivity through robust statistical analyses, the study provides empirical evidence to support the growing concerns about climate variability's impact on agriculture.

The study enriches the existing literature by focusing on worker productivity as a critical dimension of agricultural performance, an area often overshadowed by research on crop yields or economic losses. It also emphasizes the multifaceted ways in which weather uncertainty disrupts not only physical agricultural processes but also labor dynamics, including worker efficiency, labor allocation, and wages. Furthermore, the identification of rainfall patterns and market instability as key contributors to productivity challenges offers valuable insights for policymakers, industry

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

practitioners, and researchers aiming to develop targeted interventions to mitigate these effects.

By bridging gaps in understanding, this study underscores the urgency of implementing adaptive strategies such as improved forecasting, resilient agricultural practices, and supportive policies to enhance the productivity and well-being of agricultural workers in the face of increasing weather uncertainty.

Industry

This study provides valuable insights for the agricultural industry by shedding light on the significant impact of weather uncertainty on worker productivity. The findings underscore the critical need for industry stakeholders to address the challenges posed by changing rainfall patterns, extreme weather events, and market instability caused by unpredictable weather conditions. By identifying these factors as significant contributors to productivity challenges, the study equips agricultural businesses and farm managers with the knowledge to develop proactive strategies to mitigate the adverse effects of weather variability.

For the industry, these insights translate into actionable implications, such as the adoption of advanced weather forecasting tools, the implementation of climate-resilient agricultural practices, and investments in worker training to enhance adaptability to weather disruptions. Furthermore, the study emphasizes the importance of creating policies and programs that ensure fair wages and job security during periods of market instability, thereby supporting worker morale and efficiency.

By emphasizing the human dimension of agricultural productivity, this study also highlights the need for industry-wide collaboration to create sustainable solutions that protect both workers and the overall supply chain from the uncertainties of climate variability. This knowledge empowers the agricultural sector to build resilience and maintain productivity in an increasingly unpredictable environmental context.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Nation

This study holds significant implications for the nation by highlighting the far-reaching effects of weather uncertainty on the productivity of workers in the agricultural sector, a cornerstone of the national economy and food security. The findings reveal how factors such as changing rainfall patterns, extreme weather events, and market instability adversely impact worker efficiency, with potential ripple effects on agricultural output, rural livelihoods, and national food supply chains. These insights underscore the urgent need for national strategies to address the challenges posed by climate variability and its consequences on agricultural productivity.

For policymakers, the study provides evidence-based guidance to design and implement adaptive measures, such as investment in climate-resilient infrastructure, development of early warning systems, and promotion of sustainable agricultural practices. It also calls for prioritizing initiatives that enhance social protection for agricultural workers, such as wage stabilization policies, insurance schemes, and skill development programs to prepare workers for climate-induced disruptions.

By framing agricultural productivity as a critical national issue, the study emphasizes the importance of integrating climate adaptation into the broader national development agenda. This approach not only safeguards the agricultural sector but also strengthens the nation's resilience to climate change, ensuring food security, economic stability, and the well-being of its population.

5.5 Limitation of the study

There are some limitations in the conduct of this research, such as time constraints, limited location and honestly of respondents. Firstly, the researcher only has 3 months to collect data for this research. The researcher only has the limited time which is from October 2024 to December 2024 to send the questionnaire to the respondents. Furthermore, limited location was one of the limitations to conduct this research. The research mainly focused in Tumpat, Kelantan in agriculture sector. This is because Kelantan have a lots of worker work in agriculture sector.

Due to the time limitation, the research only can distribute the survey questionnaire by using Google Form. The researcher had sent the survey questionnaire by using WhatsApp, Telegram and Facebook to different work field of respondent. This is because different work field will have different experience and evaluations. The honestly respondents also one of limitation to conduct the survey about the effect of weather uncertainty on the productivity of worker in agriculture sector. The respondents did not want to spend their time and honestly to answering the questionnaire.

5.6 Recommendation and future Direction

After having this undertaken this research, based on the finding of the study, the following recommendations are given. The research noted that more in-depth follow up investigations would be necessary to further advance understanding of the weather uncertainty. Future researcher in this area needs to address what weather uncertainty to productivity of worker. A few advice and solution that may be the researcher recommended to conduct similar research for future researchers. Recommendations can sole the current limitation that had been showed in the previous section. Approach from professional related the productivity in the agriculture sector were encourage to future researchers. The reason is time constraints for researcher to distribute and collect the questionnaire from the respondents. The agricultural worker knowledge and opinion will give by the professional and this can help researchers saving more time in gathering data and completing the research.

Future researcher should explore the long-term impact of weather variability on agricultural productivity and the effectiveness of adaptive strategies. Research could also investigate the role of specific technologies, such as weather prediction tools and precision agriculture, in improving resilience and productivity in different agricultural regions. Researcher can use the evidence to identify the hypothesis testing to evaluate the relationship between weather uncertainty effect and productivity workers in agriculture. The evidence can be collected by using observations and experience from the respondents.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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APPENDIX A

GANTT CHART FYP 1

Task/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Topic Selection															
Topic confirmation															
Formulating RQ and RO															
Find the sources that related to the topic															
Identify the problem statement															
Writing on chapter 1															
Writing on chapter 2															
Writing on chapter 3															
Discussion of FYP 1 with Supervisor															
First submission of the report															
Prepare report presentation															
Presentation of FYP 1															
Correction of FYP 1															

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APPENDIX B

GANTT CHART FYP 2

Task/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discuss about Questionnaires															
Make Corrections															
Collect samples for pilot study															
Run SPSS for Pilot study															
Collect samples															
Run SPSS for 278 sample															
Writing in chapter 4															
Writing on chapter 5															
Submission of report															
Prepare slide presentation															
Presentation for PSM 2															

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APPENDIX C

QUESTIONNAIRES

SECTION A: DEMOGRAPHIC INFORMATION

1. Assalamualaikum and greetings,

   Dear Participant,

   I am Nurul Syamimi Binti Eezahan, a final-year undergraduate student from the Faculty of Technology Management and Technopreneurship (FPTT) at Universiti Teknikal Malaysia Melaka (UTeM), currently pursuing a Bachelor Degree of Technology Management (Technology Innovation). As part of my final year project, I am conducting research to evaluate on an important research project titled " **The Effect Of Weather Uncertainty On The Productivity of Workers In The Agriculture Sector**"

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1 GENDER
- o Male
- o Female

2 AGE
- o Below 30 years old
- o 30-45 years old
- o 46-60 years old
- o Above 60 years old

3 EDUCATION
- o No Education
- o Primary Education
- o Junior High School
- o Secondary/ Vocational Institute MARITAL STATUS

4 MARITAL STATUS

- Single
- Married
- Divorced
- Widowed

5 YEAR OF EXPERIENCE IN AGRICULTURE

- Less than 1 years
- 5-10 years ago
- More than 10 years

PART B: THE EFFECT OF WEATHER UNCERTAINTY

This section is to seek your opinion regarding the factors that influence employee behavioral intention towards business intelligence system. Based on the scale given, please TICK (/) ONE which represents for your answer.

Scale:

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

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Independent Variable 1: Change of Rainfall Pattern

No	**Statement**	**1**	**2**	**3**	**4**	**5**
1	Harvesting season can be affected.					
2	Irrigation system must be carefully manage.					
3	Weather uncertainties can impact farmers incomes.					
4	Wet condition will risk farmers safety.					

Independent Variable 2: Extreme Weather Event

No	Statement	1	2	3	4	5
1	Workers need to take more efforts to protect the crops from bad weather.					
2	Damaged machineries may disrupt farming process.					
3	Agricultural infrastructure can become damage.					
4	Workers health can be risked by extreme hot weather.					

Independent Variable 3: Weather Affect market instability

No	Statement	1	2	3	4	5
1	Inconsistent weather makes it difficult for farmers to achieve product quality.					
2	Policies are needed to support producers financial burden.					
3	The global price for agricultural supplies can be disrupted.					
4	Droughts and floods reduce crop yields and overall production.					

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PART C : PRODUCTIVITY OF WORKERS IN THE AGRICULTURAL SECTOR

This section is to seek you opinion about the effect of weather uncertainty on the productivity of workers in the agricultural sector. Based on scale given, please choose which represent your answer.

Scale:

Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5

No	Statement	1	2	3	4	5
1	Weather uncertainty can affect productivity of agriculture sector					
2	Extreme weather events will have negative impacts on the agriculture worker performance					
3	Safety and health issues among agricultural workers can lead to decreased productivity and rate.					
4	Advanced technology tools boost agricultural productivity compared to manual labor.					