



CONCEPT NOTE FOR THE IMPLEMENTATION OF A BLOCKCHAIN-BASED PARAMETRIC CROP INSURANCE PRODUCT IN THAILAND

CONTRACT NO. UNEP/2024/288 (Umoja No. 4700028629)

Research Division I
Blockchain & Climate Institute
August 2025

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	The Phase 1 pilot is primarily funded by the requested donor grant. The project's design leverages and will coordinate with existing programs and infrastructure of national partners (e.g., BAAC's farmer network, university research expertise), which represents significant implicit in-kind support and is critical for the pilot's success and future sustainability. Formal agreements for these contributions will be finalized upon project initiation (Activity 1.1).	21
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EXECUTIVE SUMMARY

1. Thailand's agricultural sector faces severe vulnerability to climate-induced risks like droughts, floods, and erratic rainfall, which threaten crop yields, farmer incomes, and national food security. Existing indemnity-based insurance schemes are slow, costly, and inaccessible to many smallholder farmers, particularly women. To address this, a Blockchain-Based Parametric Crop Insurance (BBPCI) system is proposed, offering a transformative solution tailored to Thailand's climate-vulnerable regions.
2. This concept note outlines a strategic two-phase approach, with an immediate focus on a 13-month proof-of-concept (Phase 1). The BBPCI leverages blockchain and smart contracts to automate payouts based on predefined climate triggers, integrating high-resolution data from satellites, IoT sensors, and national stations to reduce basis risk by 20-25% compared to current schemes.
3. Phase 1 will target a controlled pilot group of 200-300 farmers across three high-risk agro-ecological zones—Chiang Mai, Nakhon Phanom, and Ubon Ratchathani. The project is built on human-centred and gender-inclusive design, with a target of 50% female participation in all training and enrolment activities to ensure equitable access and benefits.
4. The core activities of Phase 1 are designed to de-risk the technology and business model. These include: securing an insurance partner, obtaining regulatory sandbox approval from the Office of Insurance Commission (OIC), developing and testing the platform, and running a live pilot to validate user acceptance and operational performance.
5. The total project budget is USD 750,000, with USD 325,000 allocated to Phase 1. This initial phase is funded by a donor grant and significant in-kind contributions from national partners like the Bank for Agriculture and Agricultural Cooperatives (BAAC). A successful proof-of-concept will trigger Phase 2, which is contingent on securing co-financing from private insurers, demonstrating a clear pathway from donor-supported research and development to a commercially viable model.
6. The initiative is aligned with Thailand's national priorities, including the Second Nationally Determined Contribution (NDC) and the Digital Economy Master Plan. By providing empirical evidence and a validated implementation model, the BBPCI proof-of-concept is the critical first step toward building a scalable, sustainable, and inclusive solution for climate risk management that can empower Thai farmers and strengthen the national agricultural ecosystem.

บทสรุปผู้บริหาร

1. ภาคเกษตรกรรมของประเทศไทยเผชิญกับความเปราะบางอย่างรุนแรงต่อความเสี่ยงที่เกิดจากสภาพภูมิอากาศ เช่น ภัยแล้ง น้ำท่วม และปริมาณน้ำฝนที่ไม่อยู่กับร่องกับรอย ซึ่งคุกคามผลผลิตพืชผล รายได้ของเกษตรกร และความมั่นคงทางอาหารของชาติ แผนการประกันภัยตามการชดเชยค่าเสียหายที่มีอยู่นั้นซ้ำ มีค่าใช้จ่ายสูง และไม่สามารถเข้าถึงได้สำหรับเกษตรกรรายย่อยจำนวนมาก โดยเฉพาะผู้หญิง เพื่อแก้ไขปัญหา จึงได้เสนอระบบประกันพืชผลแบบพาราเมตริกแบบบล็อกเชน (BBPCI) โดยนำเสนอโซลูชันการเปลี่ยนแปลงที่ปรับให้เหมาะกับภูมิภาคที่เปราะบางต่อสภาพภูมิอากาศของประเทศไทย
2. หมายเหตุแนวคิดนี้สรุปแนวทางเชิงกลยุทธ์สองเฟส โดยมุ่งเน้นไปที่การพิสูจน์แนวคิด 13 เดือน (ระยะที่ 1) ทันที BBPCI ใช้ประโยชน์จากสัญญาบล็อกเชนและสมาร์ตเพื่อทำให้การจ่ายเงินอัตโนมัติตามสิ่งกระตุ้นสภาพภูมิอากาศที่กำหนดไว้ล่วงหน้า โดยบูรณาการข้อมูลความละเอียดสูงจากดาวเทียม เช่น เซอร์ IoT และสถานีระดับชาติ เพื่อลดความเสี่ยงพื้นฐานลง 20-25% เมื่อเทียบกับแผนปัจจุบัน
3. ระยะที่ 1 จะกำหนดเป้าหมายกลุ่มนำร่องควบคุมซึ่งประกอบด้วยเกษตรกร 200-300 ราย ในเขตนิเวศเกษตรที่มีความเสี่ยงสูง 3 แห่ง ได้แก่—เชียงใหม่ นครพนม และอุบลราชธานี โครงการนี้สร้างขึ้นจากการออกแบบที่เน้นมนุษย์เป็นศูนย์กลางและครอบคลุมเรื่องเพศ โดยมีเป้าหมายให้ผู้หญิงมีส่วนร่วม 50% ในกิจกรรมการฝึกอบรมและการลงทะเบียนทั้งหมด เพื่อให้มั่นใจถึงการเข้าถึงและผลประโยชน์ที่เท่าเทียมกัน
4. กิจกรรมหลักของระยะที่ 1 ได้รับการออกแบบมาเพื่อลดความเสี่ยงต่อเทคโนโลยีและรูปแบบธุรกิจ ซึ่งรวมถึง: การรักษาความปลอดภัยให้กับพันธมิตรประกันภัย การได้รับการอนุมัติแนวคิดบล็อกเชนตามกฎระเบียบจากสำนักงานคณะกรรมการประกันภัย (OIC) การพัฒนาและทดสอบแพลตฟอร์ม และการดำเนินการนำร่องสดเพื่อตรวจสอบการยอมรับของผู้ใช้และประสิทธิภาพการปฏิบัติงาน
5. งบประมาณโครงการทั้งหมดอยู่ที่ 750,000 เหรียญสหรัฐ โดยจัดสรร 325,000 เหรียญสหรัฐให้กับระยะที่ 1 ระยะเริ่มแรกนี้ได้รับทุนจากเงินช่วยเหลือผู้บริจาคและเงินบริจาคที่สำคัญจากพันธมิตรระดับชาติ เช่น ธนาคารเพื่อการเกษตรและสหกรณ์การเกษตร (BAAC) การพิสูจน์แนวคิดที่ประสบความสำเร็จจะกระตุ้นให้เกิดระยะที่ 2 ซึ่งขึ้นอยู่กับการจัดหาเงินทุนร่วมจากบริษัทประกันเอกชน ซึ่งแสดงให้เห็นเส้นทางที่ชัดเจนจากการวิจัยและพัฒนาที่ได้รับการสนับสนุนจากผู้บริจาค ไปสู่แบบจำลองที่สามารถนำไปใช้ได้เชิงพาณิชย์
6. โครงการริเริ่มนี้สอดคล้องกับลำดับความสำคัญระดับชาติของประเทศไทย รวมถึงการบริจาคที่กำหนดระดับประเทศครั้งที่สอง (NDC) และแผนแม่บทเศรษฐกิจดิจิทัล ด้วยการให้หลักฐานเชิงประจักษ์และแบบจำลองการดำเนินการที่ได้รับการตรวจสอบแล้ว การพิสูจน์แนวคิดของ BBPCI ถือเป็นก้าวแรกที่สำคัญในการสร้างโซลูชันที่ปรับขนาดได้ ยั่งยืน และครอบคลุมสำหรับการจัดการความเสี่ยงด้านสภาพภูมิอากาศ ซึ่งสามารถเพิ่มศักยภาพให้กับเกษตรกรไทยและเสริมสร้างระบบนิเวศทางการเกษตรของประเทศ

1. CONTEXT AND PROJECT DESCRIPTION

1.1 Background

Thailand's agricultural sector is increasingly vulnerable to climate-induced risks such as droughts, floods, heatwaves, and erratic rainfall. These shocks have led to significant reductions in crop yields, income instability for smallholder farmers, and increased reliance on public disaster relief. The impact is particularly severe in rain-fed regions of northern, northeastern, and central Thailand, where agriculture is the primary livelihood source.

To address these challenges, Thailand has made notable efforts through public crop insurance schemes and international partnerships. The Thailand National Crop Insurance Scheme (TNCIS), launched in 2011, provides indemnity-based coverage for rice and maize across more than 30 provinces. However, manual claims processing, fragmented data systems, and low trust among smallholders have limited its effectiveness and scalability.

Complementary pilot initiatives supported by GIZ, United Nations Development Programme (UNDP), and the Asian Development Bank have introduced index-based insurance models for flood and drought events. Despite their innovation, these pilots have struggled to scale due to high basis risk, limited community engagement, and inadequate digital infrastructure.

Thailand's policy landscape increasingly supports digital innovation in agriculture. The Second Nationally Determined Contribution (NDC) prioritizes improved climate risk management through enhanced insurance and climate data use. The National Adaptation Plan (NAP) 2021-2050 promotes digital insurance solutions to build rural resilience and reduce fiscal burdens. The Digital Economy Master Plan encourages blockchain adoption to improve transparency and efficiency in public services. Meanwhile, the evolving TNCIS framework highlights the need for low-cost, data-driven models to complement traditional insurance and improve farmer enrolment.

In this context, the blockchain-based parametric crop insurance (BBPCI) initiative aligns with Thailand's national priorities by offering a scalable, transparent, and inclusive solution to climate risk management in agriculture.

1.2 Geographical scope

Based on stakeholder consultations and climate vulnerability assessments, this concept note will focus on 3 sub-national regions in Thailand:

- (a) Chiang Mai Province (Northern region): Known for its high-value horticultural crops and susceptibility to drought and erratic rainfall;
- (b) Nakhon Phanom Province (Northeastern region): A key rice-producing area prone to floods and dry spells; and
- (c) Ubon Ratchathani Province (Lower Northeast): Frequently impacted by both flood and drought cycles, with high concentrations of smallholder farmers.

2. PROBLEM STATEMENT RELATED TO CLIMATE CHANGE

2.1 Climate risks affecting agriculture in Thailand

Thailand's agricultural sector is increasingly exposed to the adverse impacts of climate change, including prolonged droughts, erratic rainfall, heatwaves, and flash floods. These climate-induced shocks have led to significant reductions in crop yields, income instability for smallholder farmers, and increased demand for public disaster relief. The situation is particularly critical in rain-fed regions of northern, northeastern, and central Thailand, where agriculture is the primary livelihood source. In provinces such as Nakhon Phanom and Ubon Ratchathani, recent assessments indicate that annual crop losses due to droughts and floods can exceed 20%, severely affecting rice and maize production. These losses not only undermine household food security and rural incomes but also place pressure on government resources for emergency response and recovery.

2.2 Limitations of current indemnity-based insurance systems

Current agricultural insurance schemes in Thailand, which are primarily indemnity-based, face several structural and operational challenges. These include systemic delays in claims processing, limited availability and granularity of climate and crop data, high administrative costs, and a general lack of trust among farmers. Manual loss verification processes, which require on-site assessments by adjusters, hinder the speed and scalability of responses to climate-related disasters. Additionally, fragmented monitoring infrastructure and low-resolution weather data further constrain the development of accurate and responsive insurance products, limiting their effectiveness in protecting smallholder farmers from climate risks.

2.3 Gender disparities and low insurance uptake

Fewer than 5% of farmers in high-risk areas are covered by disaster insurance, with female farmers being particularly underserved. Gender disparities in digital access, insurance literacy, and household decision-making power contribute significantly to this exclusion. Trust deficits, affordability constraints, and complex enrolment procedures further limit uptake and scalability. These challenges are even more pronounced for women from ethnic minority and migrant communities, who often face compounded barriers such as language limitations, lack of formal identification, and precarious legal status. According to the International Labour Organization (ILO), migrant women in Thailand's agricultural sector frequently work in informal or undocumented conditions, which not only restricts their access to social protection schemes but also exacerbates their vulnerability to climate-related shocks—highlighting the urgent need for inclusive, tenure-neutral, and linguistically accessible insurance solutions.

2.4 Need for scalable, automated, and inclusive insurance solutions

As climate-related shocks become more frequent and severe, they threaten to erode hard-earned development gains and deepen rural poverty. The absence of scalable, reliable, and transparent insurance solutions exacerbates farmers' vulnerability and reduces incentives to invest in climate-resilient practices. There is thus a pressing need for inclusive, data-driven, and automated insurance mechanisms that can protect farmers from climate shocks while reducing reliance on ad hoc emergency responses.

3. PAST AND ONGOING EFFORTS TO ADDRESS THE PROBLEM

3.1 Overview of Thailand's National Crop Insurance Scheme

Thailand has made notable efforts to mitigate climate-related agricultural risks, primarily through public crop insurance and international development partnerships. The TNCIS, launched in 2011, provides indemnity-based coverage for rice and maize. While this scheme has reached over 30 provinces, it remains limited in scope and responsiveness due to manual claims processes, inconsistent data quality, and limited farmer trust—especially among smallholders.

3.2 International development partnerships

In collaboration with development partners, Thailand has explored inclusive insurance and risk financing models. Projects supported by GIZ, UNDP, and the Asian Development Bank have promoted climate risk transfer instruments, including early-stage index insurance pilots for flood and drought events. However, these initiatives have not been scaled nationally, often due to high basis risk, low community engagement, and insufficient digital infrastructure.

3.3 Digital innovation initiatives and feasibility studies

On the digital innovation front, Thailand's Digital Economy Master Plan supports the integration of blockchain and fintech in public services. However, insurance applications of blockchain remain nascent. Recent initiatives have explored the potential of blockchain-based parametric insurance to enhance transparency, automate payouts, and improve access for underserved farming communities.

These efforts have helped identify gaps in regulatory frameworks, stakeholder coordination, and user-centred design. They also catalysed early dialogue with key institutions such as the Office of Insurance Commission (OIC), Bank for Agriculture and Agricultural Cooperatives (BAAC), Department of Climate Change and Environment (DCCE), and agricultural cooperatives to co-develop scalable, automated solutions for climate risk protection.

3.4 Development of the technology concept

The BBPCI concept was initiated in 2024 by the Blockchain & Climate Institute (BCI) in collaboration with Thammasat University and the National Science and Technology Development Agency (NSTDA). It emerged from national stakeholder discussions on the need for scalable, digital climate adaptation tools in agriculture.

Its development was shaped through field visits and stakeholder workshops in Chiang Mai, Ubon Ratchathani, and Nakhon Phanom. These consultations engaged cooperatives, insurers, meteorological experts, and government agencies to identify barriers, assess technology readiness, and co-design a pilot framework.

The concept was presented in national dialogues organized jointly with the OIC and the National Science and Technology Development Agency (NSTDA), where regulatory gaps and sandbox opportunities were explored. Input was also received from the BAAC on financial integration, and from farmer associations on gender and accessibility. The Designated Authority was informed early in the process, and a draft version of the concept was reviewed by the Ministry of Natural Resources and Environment (MoNRE), with endorsement anticipated before submission.

This approach ensures alignment with Thailand's national priorities and reflects broad multi-stakeholder participation across government, academia, and civil society.

4. SPECIFIC TECHNOLOGY BARRIERS

4.1 Inadequate climate and agricultural data infrastructure

The lack of localized, high-resolution weather and crop data limits the precision of parametric index calibration, increasing the risk of basis errors. Thailand's current data infrastructure relies heavily on national-level meteorological stations with insufficient spatial granularity, especially in remote or mountainous regions. This constrains the deployment of effective parametric triggers.

4.2 Cybersecurity risks, data integrity, and user protection

The BBPCI system, while leveraging blockchain's inherent security, faces potential cyber risks that could undermine its integrity and user trust. These threats span the entire technical stack, from data oracles to end-user devices, and must be proactively mitigated to ensure regulatory approval and farmer adoption.

Key risks and the project's mitigation strategy are outlined below:

(a) Oracle manipulation and data integrity:

Malicious actors could attempt to manipulate the decentralized oracles that supply climate data, leading to inaccurate trigger activations and fraudulent payouts. Recent incidents in decentralized finance (DeFi) highlight this vulnerability.

Mitigation: The project will deploy redundant oracle networks (e.g., Chainlink) sourcing data from multiple, independent providers (e.g., satellite, TMD, IoT). Data feeds will be cryptographically signed and verified on-chain to ensure integrity.

(b) Smart contract exploits:

Vulnerabilities in the smart contract code could be exploited to drain funds or disrupt insurance operations.

Mitigation: Rigorous, independent smart contract code audits and penetration testing will be mandated prior to deployment. A bug bounty program will further incentivize the identification of vulnerabilities.

(c) End-user security and data privacy:

In rural contexts with low digital literacy, end users are particularly exposed to phishing, SIM swap attacks, and malware targeting mobile wallets. Unauthorized access to personal data would also violate Thailand's Personal Data Protection Act (PDPA).

Mitigations: The platform will implement ISO/IEC 27001-compliant cybersecurity protocols across all components. This includes end-to-end encryption for data and multi-factor authentication (MFA) for wallet access and e-KYC processes. A privacy-preserving data architecture will be embedded into the platform's design. In addition, user education on basic digital hygiene will be integrated into the training modules to enhance awareness and reduce exposure to common cyber threats.

(d) Systemic and operational risks:

A broader security breach or system failure could halt operations and erode confidence.

Mitigation: Continuous monitoring, structured incident response protocols, and a clear audit trail will ensure accountability and regulatory assurance. A manual backup process for payouts will be in place to maintain service in the event of a technical failure.

These comprehensive measures are designed to build a resilient system, protect user assets and data, and enhance the project's acceptability under OIC and fintech oversight frameworks.

4.3 Limited digital and technological readiness among end users

A significant barrier to adoption is the limited access to technology and low digital literacy among the target demographic, particularly women and older farmers. Many lack smartphones, stable internet connectivity, or familiarity with digital payment tools. Furthermore, general insurance literacy remains low, with significant knowledge gaps regarding how parametric products function.

This barrier necessitates a dual-focused strategy: designing an exceptionally simple and intuitive user interface, and implementing a robust, cooperative-led training program that builds trust and understanding from the ground up.

4.4 Regulatory uncertainty around blockchain and smart contracts

Thailand's insurance regulatory environment currently lacks a clear legal framework for the use of smart contracts and decentralized data oracles in financial services, including insurance. This regulatory gap creates uncertainty for insurers, investors, and technology providers, potentially delaying adoption and innovation. Key concerns include the legal enforceability of automated agreements, data privacy compliance, and the absence of standardized protocols for blockchain-based transactions. Without the establishment of regulatory sandboxes, updated insurance laws, or formal guidance from oversight bodies such as the OIC, the scalability and integration of blockchain-based parametric insurance solutions will remain constrained.

4.5 Fragmented stakeholder ecosystem and limited interoperability

Existing efforts—such as the TNCIS—often operate in institutional silos, with limited coordination and data sharing between key actors such as insurers, meteorological agencies, agricultural cooperatives, and financial institutions. This lack of data interoperability hampers the development of integrated, technology-enabled insurance products. For example, weather data used for risk assessment is not consistently linked to claims processing systems, and farmer databases are fragmented across different platforms. These disconnects slow down innovation, reduce efficiency, and make it difficult to scale digital solutions that rely on real-time data and automated decision-making.

5. TECHNOLOGY CONCEPT

5.1 Overall objective

The objective is to develop and pilot a BBPCI system that delivers timely, transparent, and automated payouts to smallholder farmers in climate-vulnerable regions of Thailand. The system will address recurrent risks—particularly floods and droughts—by combining granular climate data with smart contracts to reduce basis risk, strengthen financial resilience, and

support climate-smart agricultural practices. This design is informed directly by the 2025 Technical and Economic Feasibility Studies.

5.2 Target area and key approaches and norms of program implementation

The initial pilot will target three high-risk agro-ecological zones—Chiang Mai, Nakhon Phanom, and Ubon Ratchathani—identified through climate hazard mapping and stakeholder consultations. These regions are particularly vulnerable to droughts and floods and have a high concentration of smallholder farmers reliant on rain-fed agriculture.

Implementation will follow four guiding principles:

- (a) Human-centred, gender-inclusive design: Onboarding and training will be tailored to the needs of women farmers, using simplified mobile interfaces and cooperative-led outreach to ensure equitable participation and digital inclusion;
- (b) Data redundancy and high-resolution calibration: The system will integrate multiple data sources—including CHIRPS satellite rainfall data, Sentinel-2 imagery, Thai Meteorological Department (TMD) ground stations, and cooperative-owned IoT sensors—to achieve spatial granularity below 10 km. This is expected to reduce basis risk by 20-25% compared to current schemes; and
- (c) Regulatory readiness: A phased engagement strategy with the OIC will include sandbox trials during the mid-term pilot phase and a legal review of smart contract enforceability to ensure compliance with Thai insurance law.
- (d) Open interoperability standards: The platform will use Chainlink oracles, API gateways, and open-source smart contracts to enable seamless integration with existing systems such as BAAC’s digital wallets, the TNCIS, and private insurer platforms.

5.3 Anticipated core activities and results of the project

This concept note focuses on the refinement of use-cases and proof-of-concept (PoC), which will be executed over a 13 months period. The project serves as a demonstration project for a potential scale-up thereafter.

The activities include:

- Activity 1.1: Project initiation and partner formalization
 - Key actions: Finalize grant agreements with the donor; execute formal contracts and memoranda of understanding with the committed insurance provider, technology vendor, and other key partners identified during the concept development phase.
 - Responsibilities: Lead implementing organization(s), donors, private insurers (e.g., Sompo, Dhipaya).

- Activity 1.2: Regulatory engagement and product finalization
 - Key actions: Finalize the detailed pilot scoping to confirm the final selection of specific zones, precise farmer targeting, and crop parameters. Submit the BBPCI product for approval under the OIC regulatory sandbox and conduct a legal review on smart contract enforceability and data privacy. Compile the outcomes and recommendations from these processes into a formal Regulatory and Legal Pathway Document. These outputs are critical to secure initial operational legitimacy. Develop a validated financial model projecting the path to break-even and long-term sustainability, which will inform the Phase 2 financing strategy.
- Activity 1.3: PoC system development and integration
 - Key actions: Develop the blockchain backend and smart contracts; integrate decentralized oracles with climate data sources (satellite, Thai Meteorological Department (TMD), internet of things (IoT)); build and test the mobile application with e-Know Your Customer and wallet integration.
 - Responsibilities: Tech vendor, data partners, BAAC.
- Activity 1.4: Limited pilot implementation and monitoring
 - Key actions: Onboard a controlled pilot group (200-300 farmers); conduct gender-responsive training; monitor the platform through at least one full climate season; collect technical performance data and user feedback.
 - Responsibilities: Cooperatives, non-governmental organizations (NGOs), BAAC, monitoring and evaluation (M&E) team, insurers.
- Activity 1.5: Review of PoC results and scale-up decision
 - Key actions: Analyse pilot results (basis risk, payout efficiency, user satisfaction, operational costs); prepare a comprehensive PoC validation report; make a formal go/no-go decision for scale-up.
 - Responsibilities: Research division, steering committee, insurers, OIC.

Activities of Phase 1	Start-end period
1.1. Resource mobilization and partner onboarding (critical path: insurance provider must be secured by end of Month 4 to avoid delays)	Months 1-4
1.2. Regulatory engagement and product finalization (can start once an insurer is engaged, runs in parallel with later part of 1.1)	Months 2-5
1.3. Proof-of-concept system development and integration (dependent on regulatory clarity from 1.2 and funding from 1.1)	Months 5-9
1.4. Limited pilot implementation and monitoring (directly follows system development. The 3-4 month duration allows for a full crop season)	Months 9-12
1.5. Review of proof-of-concept results and scale-up decision (a focused, final-month activity to conclude the phase)	Month 13

Table 1: Detailed timeline for Phase 1

5.4 Anticipated products to be delivered by the project

The successful implementation of the pilot project will yield a suite of concrete products and knowledge assets that validate the BBPCI concept and provide the foundation for a decision on scaling up the platform.

The key anticipated products are:

- (a) A validated PoC platform: A functional, limited-scale prototype of the BBPCI system, comprising:
 - A secure blockchain backend (e.g., Hyperledger Fabric or R3 Corda) hosting the core smart contract architecture for automated policy management and payouts.
 - Integrated decentralized oracles (e.g., Chainlink) configured to pull and verify high-resolution climate data from multiple sources (e.g., satellite feeds, TMD stations).
 - A user-friendly mobile application (Android) beta version with features for farmer e-KYC, policy enrolment, and payout notifications for the pilot group.
- (b) A regulatory and legal pathway document: This critical deliverable, produced as a direct output of Activity 1.2, will consolidate the findings from the regulatory sandbox engagement and legal review to provide clarity for future scaling. It will include:
 - A documented report on the regulatory sandbox trial and its outcomes.
 - A legal review with recommendations on the enforceability of smart contracts under Thai insurance law and compliance with the PDPA.
- (c) A suite of calibrated parametric indices for the pilot: For the key crops (e.g., rice, maize, horticulture) in the target provinces, the project will deliver :
 - Technically sound parametric triggers for drought and flood, calibrated using multi-source data.
 - Documentation of the index calibration methodology and an initial validation report against the pilot data.
- (d) A PoC validation report and recommendation: This decisive deliverable will synthesize all findings from the pilot, containing include:
 - A comprehensive analysis of the pilot's technical performance, basis risk, payout efficiency, and user satisfaction.
 - A validated financial model projecting the path to breakeven and sustainability at scale.
 - A clear recommendation and a preliminary roadmap for transitioning to a scaled up platform: Full-Scale Implementation.

6. EXPECTED TIMEFRAME¹

The timeline below outlines the 13-month duration of the pilot project. A potential scale-up phase is contingent upon a successful **piloting**.

	Year 1												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Activity 1.1 - Resource mobilization and partner onboarding	█	█	█	█	█	█	█	█	█	█	█	█	█
Activity 1.2 - Regulatory engagement and product finalization	█	█	█	█	█	█	█	█	█	█	█	█	█
Activity 1.3 - Proof-of-concept system development and integration	█	█	█	█	█	█	█	█	█	█	█	█	█
Activity 1.4 - Limited pilot implementation and monitoring	█	█	█	█	█	█	█	█	█	█	█	█	█
Activity 1.5 - Review of proof-of-concept results and scale-up decision	█	█	█	█	█	█	█	█	█	█	█	█	█

Table 2: Proposed Gantt chart

7. ANTICIPATED BENEFITS FROM THE TECHNOLOGY CONCEPT

The proposed BBPCI concept is designed to generate immediate value during the PoC and create a clear pathway for transformative long-term impact. The benefits are structured across the two-phase project lifecycle.

7.1 Benefits from the PoC

The pilot phase is designed to de-risk the technology and business model, yielding critical foundational benefits:

- (a) Validation of a scalable solution: The PoC will provide empirical evidence on the technical functionality, basis risk reduction (targeting 20-25%), and operational feasibility of the BBPCI model, reducing uncertainty for insurers and investors;
- (b) Regulatory clarity: The sandbox trial and legal review will produce a clear pathway for the regulatory acceptance of blockchain-based insurance in Thailand, lowering a major barrier to innovation in the sector;
- (c) Proof of user acceptance and inclusion: The pilot will demonstrate that a diverse group of farmers, including women and those from marginalized communities, can and will use a digital parametric insurance product. The gender-responsive and inclusive design will be validated, providing a model for equitable digital financial services; and

¹ The project rollout is contingent upon the enactment of the *Emergency Decree on Digital Asset Businesses (No. 2) B.E. 2568 (2025)*, which clarifies licensing requirements for offshore service providers and updates Thailand's digital asset regulatory framework.

- (d) Strengthened stakeholder ecosystem: The process will formalize a multi-stakeholder partnership between technology providers, insurers, government bodies, and farmer cooperatives, creating a powerful coalition for future climate resilience efforts.

7.2 Pathway to long-term impact

A successful PoC is the critical prerequisite to achieving the following long-term benefits through full-scale implementation:

- (a) Economic and social resilience: At scale, the BBPCI system will strengthen household financial resilience for tens of thousands of farmers through reliable, timely payouts, reducing dependence on ad hoc disaster relief and boosting trust in formal financial systems. It will also build the capacity of local cooperatives to deliver tech-enabled services;
- (b) Gender equity and empowerment: The gender-inclusive design, validated in Phase 1, will enable the large-scale empowerment of women farmers by increasing their access to insurance, credit, and decision-making power in agricultural risk management, thereby reducing the gender gap in climate adaptation capacity;
- (c) Cultural inclusion and intersectional empowerment: The project's commitment to ethical inclusion ensures its benefits extend to the most vulnerable. At scale, it will enhance the inclusion of ethnic minorities, landless farmers, and migrant workers by providing tenure-neutral insurance linked to crops rather than land titles, using local languages, and embedding their representation in governance structures; and
- (d) Environmental co-benefits and institutional strengthening: A scaled program can incentivize the widespread adoption of climate-smart agricultural practices. Furthermore, integration with the TNCIS would modernize Thailand's national approach to climate risk management, making the public insurance system more efficient, transparent, and resilient, directly supporting the goals of the National Adaptation Plan.

8. KEY STAKEHOLDERS

The successful delivery of the pilot project relies on a core consortium of partners, each playing a critical role in the refinement, development, and validation of the BBPCI PoC. Their anticipated contributions are outlined below.

Stakeholders	Roles in Phase 1 implementation
Office of Insurance Commission	Grant regulatory sandbox approval for the proof-of-concept; provide oversight and guidance on compliance with Thai insurance law.
Lead insurance provider (e.g., Sampo, Dhipaya)	Co-design the insurance product parameters; underwrite the risk for the pilot group of 200-300 farmers; participate in claims validation.
Bank for Agriculture and Agricultural Cooperatives	Facilitate integration with its digital wallet/payment systems (e.g., PromptPay) for premium collection and payout distribution; support farmer outreach through its network.
Thai Meteorological Department	Provide access to historical and real-time ground-station climate data for index calibration and validation during the pilot.
Local agricultural cooperatives	Act as the primary channel for last-mile outreach; facilitate farmer enrolment, deliver gender-responsive training, and collect user feedback.
Tech vendor	Lead the development of the blockchain backend, smart contracts, and mobile application; integrate data oracles; manage overall project coordination.
Legal and academic partners (e.g., Thammasat University)	Conduct the legal review on smart contract enforceability and data privacy; provide independent analysis of PoC results.

Table 3: Key stakeholders and their roles in the BBPCI

9. BACKGROUND DOCUMENTS AND OTHER RELEVANT INFORMATION

The following documents were used to inform the development of this technology concept and provide essential context for understanding its alignment with national climate priorities and technical viability:

- (a) Technical Feasibility Study (BCI, 2025): It provides technical architecture, climate data requirements, stakeholder analysis, and pilot recommendations.
- (b) Economic Feasibility Study (BCI, 2025): It includes cost-benefit analysis, market readiness, gender impact analysis, and financing models.
- (c) Implementation roadmap with financing plan (BCI, 2025): This companion document details the two-phase strategy, the specific activities, timeline, and budget for the 13-month PoC (Phase 1) outlined in this concept note.
- (d) Thailand's second NDC (Ministry of Natural Resources and Environment, 2020): Focuses on climate risk management in agriculture and supports the need for data-driven adaptation tools like the BBPCI. (<https://unfccc.int/documents/267416>)
- (e) Thailand Digital Economy Master Plan (Ministry of Digital Economy and Society, 2020): Endorses blockchain adoption for inclusive digital financial services, providing policy alignment for the project. (<https://www.eta.or.th/publishing/Digital-Economy-Plan.aspx>)

10. MONITORING AND EVALUATION FOR THE PROOF-OF-CONCEPT

A robust M&E framework will be embedded into the project to ensure transparency, validate the core technology and business assumptions, and provide a clear data-driven basis for the decision whether to scale up.

10.1 Key monitoring mechanisms

Blockchain audit trails: All transactions (enrolment, premium payments, trigger activations, and payouts) will be immutably recorded, enabling real-time, transparent monitoring and verification of system performance.

PoC feedback loops: Structured feedback from farmers and cooperatives will be collected through mobile-based surveys and focus groups to assess usability, trust, and perceived value.

10.2 Project indicators and expected results for Phase 1

The project indicators and expected results for the PoC are tabulated below:

Indicator	Target / expected result for Phase 1
Number of farmers enrolled in the proof-of-concept	200-300
Female participation rate	≥ 50% of total enrolment and training
Platform uptime and reliability	> 99% during the pilot period
Average payout processing time	< 7 days from trigger activation
Farmer satisfaction rate (via post-pilot survey)	≥ 80% satisfaction with clarity and process
Number of successful smart contract executions	100% of eligible claims during the pilot
Basis risk assessment	Quantitative analysis completed against reported field losses

Table 4: Key performance indicators and expected outcomes of the pilot project

10.3 Gender and inclusion metrics

Gender-disaggregated data will be collected across all activities. Intersectional indicators (e.g., enrolment and feedback from ethnic minority women) will be monitored to validate the inclusive design.

10.4 Periodic reporting and evaluation

Mid-term PoC review (Month 6-7): Assessment of platform development, initial integration success, and enrolment progress against gender targets.

Final PoC validation report (Month 13): Comprehensive report analyzing all technical performance data, basis risk, user feedback, and financial metrics. This report will contain the considerations for a potential scale-up project.

10.5 Data governance and compliance

The BBPCI system will be developed and operated in compliance with Thailand's PDPA. ISO/IEC 27001-compliant cybersecurity protocols will be implemented to ensure data integrity and user privacy.

11. RISK EVALUATION

The following table identifies the primary risks to the successful execution of the PoC phase and the corresponding mitigation strategies.

Risk	Mitigation strategy
1. Inability to secure a committed insurance partner for the pilot.	Early and intensive stakeholder engagement; clearly defined and limited pilot scope to de-risk participation for insurers; present strong feasibility studies.
2. Regulatory uncertainty or delays in OIC sandbox approval	Proactive and collaborative engagement with the OIC from the outset; structuring the proof-of-concept as a limited-scale trial to fit within existing regulatory flexibility.
3. Technical failures in the blockchain platform or smart contracts during the pilot	Rigorous smart contract audits and comprehensive testing before deployment; implementing a robust bug bounty program; having a manual backup process for payouts if needed.
4. Low enrolment or engagement from the target pilot group of farmers	Partnering closely with trusted local cooperatives for outreach; designing a simple and intuitive user interface; offering tailored training and support.
5. Inaccurate data or oracle failure leading to basis risk or incorrect payouts	Using multiple, redundant data sources (satellite, TMD, IoT) for trigger calibration; transparent communication with farmers about how triggers work.
6. Cybersecurity breach compromising user data or funds	Implementing strict cybersecurity protocols (ISO 27001), end-to-end encryption, and regular penetration testing.
7. Failure to achieve gender and social inclusion targets	Embedding gender and inclusion experts in the design team; setting clear targets; partnering with women-led cooperatives and community leaders for outreach.

Table 5: Risk evaluation and mitigation strategies for the BBPCI proof-of-concept

12. PATHWAY TO SUSTAINABILITY AND REPLICABILITY

The BBPCI initiative is designed not as a standalone pilot, but as the first critical step in a pathway toward a financially sustainable and widely replicable model. The PoC is explicitly structured to de-risk the technology and business model, thereby creating the conditions necessary for long-term impact.

12.1 Building the foundation for financial sustainability

The financial sustainability of the BBPCI model will be demonstrated in phases:

- (a) PoC: This phase is funded by a donor grant and in-kind contributions to cover the high initial costs of research and development, regulatory engagement, and system development without the burden of immediate profitability. Its primary financial

objective is to produce a validated business case and financial model that demonstrates a clear path to breakeven; and

- (b) Pathway to Phase 2 (scale-up): A successful PoC, evidenced by the validation report, is the prerequisite for transitioning to a sustainable model. The financing is designed to be led by co-financing from private insurers and public subsidies, significantly reducing reliance on donor grants and moving the model toward commercial viability.

12.2 Establishing replicability through a validated prototype

The replicability of the BBPCI model is embedded in the design of the PoC:

- (a) Modular technology design: The platform is being built on interoperable components (open-source smart contracts, API gateways) from the outset, ensuring the PoC can be easily adapted for other regions, crops, or hazard types; and
- (b) Generation of a replicability toolkit: The key outputs of Phase 1—the validated technical architecture, legal pathway document, and implementation toolkit—will serve as a "replicability package" for other ASEAN countries, providing them with a proven starting point and helping them avoid initial pitfalls.

12.3 Socio-political adoption within Thailand

The PoC directly addresses the key socio-political barriers to scaling within Thailand:

- (a) Regulatory readiness: The sandbox trial and legal review conducted in Phase 1 will create a clear regulatory pathway, which is the single biggest enabler for national scaling; and
- (b) Stakeholder buy-in: By demonstrating a working, inclusive, and efficient system to key national institutions (OIC, BAAC, insurers), the PoC builds the essential political and institutional will required for integration into national programs like the TNCIS.

13. BUDGET AND FINANCING PLAN

This section outlines the budget and financing strategy for the PoC, which is the focus of this concept note.

13.1 Budget breakdown

The budget is allocated across key cost categories essential for the successful delivery of the PoC.

Activity / work package	Description	Allocation (USD)
1.1 Project initiation and partner formalization	Formalize the project consortium by executing grant agreements, MOUs, and contracts with key implementation partners (insurance provider, technology vendor)	15,000
1.2 Pilot design, regulatory engagement and financial modelling	Finalizing pilot scoping, OIC sandbox submission, legal reviews, and developing the validated financial model	40,000
1.3 Proof-of-concept system development and integration	Development of blockchain backend, smart contracts, mobile application, and integration with climate data oracles	200,000
1.4 Limited pilot implementation and monitoring	Onboarding 200-300 farmers, conducting gender-responsive training, and monitoring through a full climate season (M&E)	55,000
1.5 Review of proof-of-concept and scale-up decision	Analysis of pilot results, preparation of the validation report, and stakeholder review for the go/no-go decision	15,000
Phase 1 total		= 325,000

Table 6: Phase 1 budget allocation

13.2 Financing plan

The Phase 1 pilot is primarily funded by the requested donor grant. The project's design leverages and will coordinate with existing programs and infrastructure of national partners (e.g., BAAC's farmer network, university research expertise), which represents significant implicit in-kind support and is critical for the pilot's success and future sustainability. Formal agreements for these contributions will be finalized upon project initiation (Activity 1.1).

Source	Type	Phase 1 contribution (USD)
Donor grant (e.g., Adaptation Fund Climate Innovation Accelerator)	Grant	260,000
Private insurers (e.g., Sompo, Dhipaya)	Co-financing (cash for premium subsidies, actuarial support, risk capital)	0
BAAC	In-kind (system integration, fee waivers, staff time for onboarding and training)	35,000
Government (subsidy reserve)	Public funding	0
Agricultural cooperatives	In-kind (farmer outreach, training venues, local staff time)	15,000
Other partners (e.g., technical universities)	In-kind (research, data analysis, legal review)	15,000
Total		= 325,000

Table 7: Phase 1 financing sources

14. CONCLUSION

In conclusion, the BBPCI initiative presents a targeted and strategic approach to addressing climate risk in Thailand's agricultural sector. This concept note outlines the 13-month PoC phase designed to demonstrate the technical, commercial, and regulatory viability of a blockchain-based parametric insurance model.

By focusing initially on a controlled pilot, the project smartly mitigates risk while generating the critical evidence—on platform performance, basis risk reduction, user adoption, and regulatory pathways—required to unlock larger-scale investment and implementation. The

defined budget of USD 325,000 represents a focused investment to de-risk a potential scale-up project that can be of transformative nature.

A successful PoC will create an irrefutable case for transitioning to a financially sustainable, co-financed scale-up phase, ultimately aiming to integrate this innovative model into TNCIS. With its strong institutional partnerships, robust implementation roadmap, and clear-eyed strategy, the BBPCI PoC is the essential first step toward building a more resilient, inclusive, and digitally empowered future for Thai smallholder farmers.