



TECHNOLOGY IN AN INDIGENOUS CONTEXT PROJECT

PROJECT PRESENTATION AND DEMONSTRATION

Team name: Skill-igenous

Group no.: 5

Members: Nguyen Ha Huy Hoang, Ta Quang Tung, Vu Minh Quang,
Do Tuan Dat, Tran Khai Kiet



Overview

Team member	Role
Nguyen Ha Huy Hoang	Blockchain system for farmer - business contract
Ta Quang Tung	Mis/disinformation detection with deep learning
Vu Minh Quang	Recommendation system for training personalization
Tran Khai Kiet	Content auto-translation with transformer model
Do Tuan Dat	Voice search engine with BIMASR



Project background

Although the Vietnamese government has already implemented many agricultural training programs to help ethnic minorities catch up with current development, most of these programs are not returning good results. According to Nguyen Tung Phong, only 43.5% of the training knowledge is applied to reality, which suggests that the current vocational training approach is time-consuming and impractical. This project aims to solve this problem by developing a specialized information system for ethnic agricultural training. After extensive research, our team has identified five issues:

- Impractical curriculum
- Lack of business connection
- Difficulty in searching learning content
- Spread of unverified information
- Language barrier



Project scope

- Develop meaningful curricula for ethnic farmers.
- Bridge businesses and farmers
- Have the search engine optimized
- Implement misinformation checking
- Auto-translate learning content

Exclusion

- Supporting people who are not working in agriculture
- Tasks that involve the use of expensive hardware
- AI functions that have low accuracy



DESIGN CONCEPT 1

Recommendation system for training personalization

LEARNING ISSUE

- Only **14%** of the total ethnic minority population are taking part in vocational training programs. Most ethnic workers believe that vocational training is ***time-consuming***.
 - Learners are more likely to take ***short-term classes*** instead of a 3-month course with full training content.
- Since vocational training is failing to meet the needs and expectations of ethnic learners, the solution is to personalize training using a recommendation system.



DESIGN CONCEPT 1

Recommendation system for training personalization

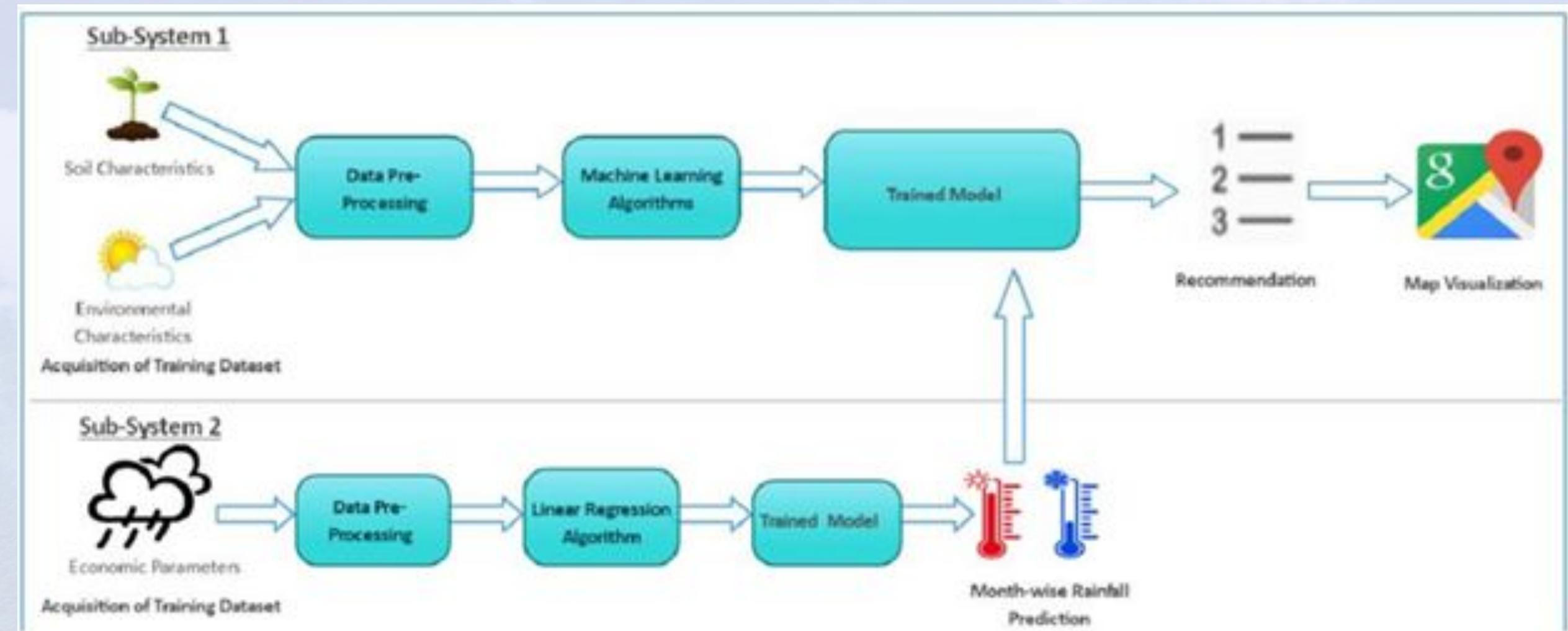
DESIGN OUTLINE

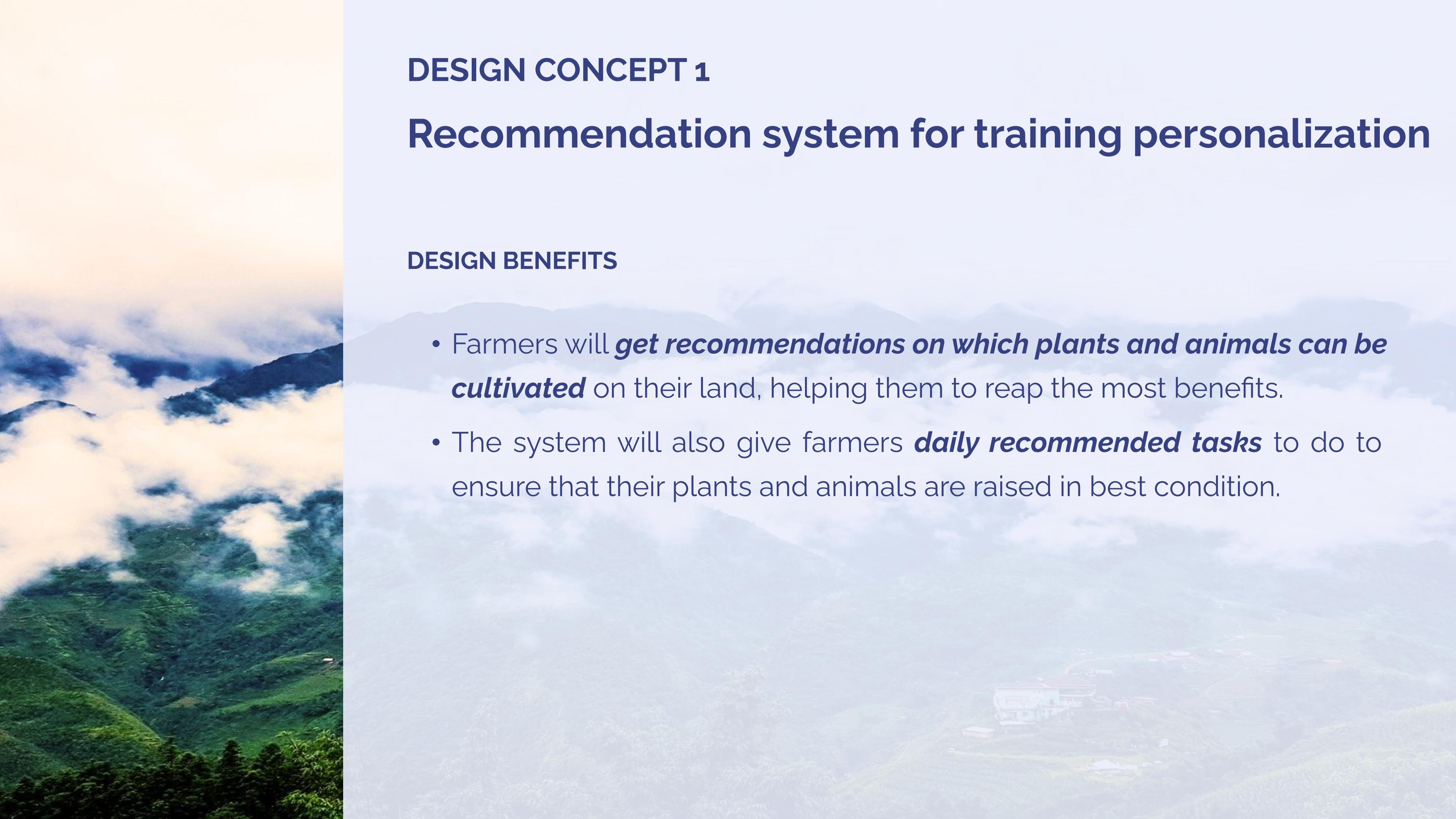
- A ***recommendation system*** is an expert system that ***gives recommendations based on input data.***
- The system will ***collect data from farmers or IOT sensors*** and then produce advice based on that information.
- The system will make recommendations based on 3 sources of information: ***soil, environment, and weather.***
- This information will be ***preprocessed then fed into a machine learning model*** to make visualized recommendation on a map. ***ANN*** (artificial neural network) will be the best machine learning algorithm for this model.

DESIGN CONCEPT 1

Recommendation system for training personalization

DESIGN OUTLINE



A vertical image on the left side of the slide shows a misty, mountainous terrain. The foreground is dominated by lush green hills, partially obscured by low-hanging white clouds. In the background, more mountains are visible under a hazy sky, with a small, isolated cluster of buildings or a village nestled in a valley.

DESIGN CONCEPT 1

Recommendation system for training personalization

DESIGN BENEFITS

- Farmers will ***get recommendations on which plants and animals can be cultivated*** on their land, helping them to reap the most benefits.
- The system will also give farmers ***daily recommended tasks*** to do to ensure that their plants and animals are raised in best condition.

DESIGN CONCEPT 1

Recommendation system for training personalization

ESTIMATION OF BUDGET

Type	Detail	Monthly costs
Equipment	Cloud Architecture (EC2, ECS and SageMaker)	\$422.42 (623.68 AUD)
	Sensor (x50)	\$1550 (2288.51 AUD)
Labor	Cloud Architect (x1)	28.900.000 VND (1789.26 AUD)
	IOT engineer (x1)	13.000.000 VND (805 AUD)
	Manager (x1)	35.000.000 VND (2167.94 AUD)
	Machine learning engineers (x1)	28.900.000 VND (1790 AUD)
	Data analyst (x1)	10.208.000 VND (632.30 AUD)
	Office (100m ² , with electricity and Wi-Fi coverage)	117.500.000 VND (7381.54 AUD)
Total		17478.23 AUD (280,139,643 VND)



DESIGN CONCEPT 2

Mis/disinformation detection with deep learning

LEARNING ISSUE

- Mis/disinformation can have disastrous effects on communities.
 - Factors that promote mis/disinformation spread: ***use of social media, fast publication, low information literacy.***
 - Our current information system allows the spread of mis/disinformation because anyone can upload learning content.
- Some mis/disinformation detection mechanism is necessary**



DESIGN CONCEPT 2

Mis/disinformation detection with deep learning

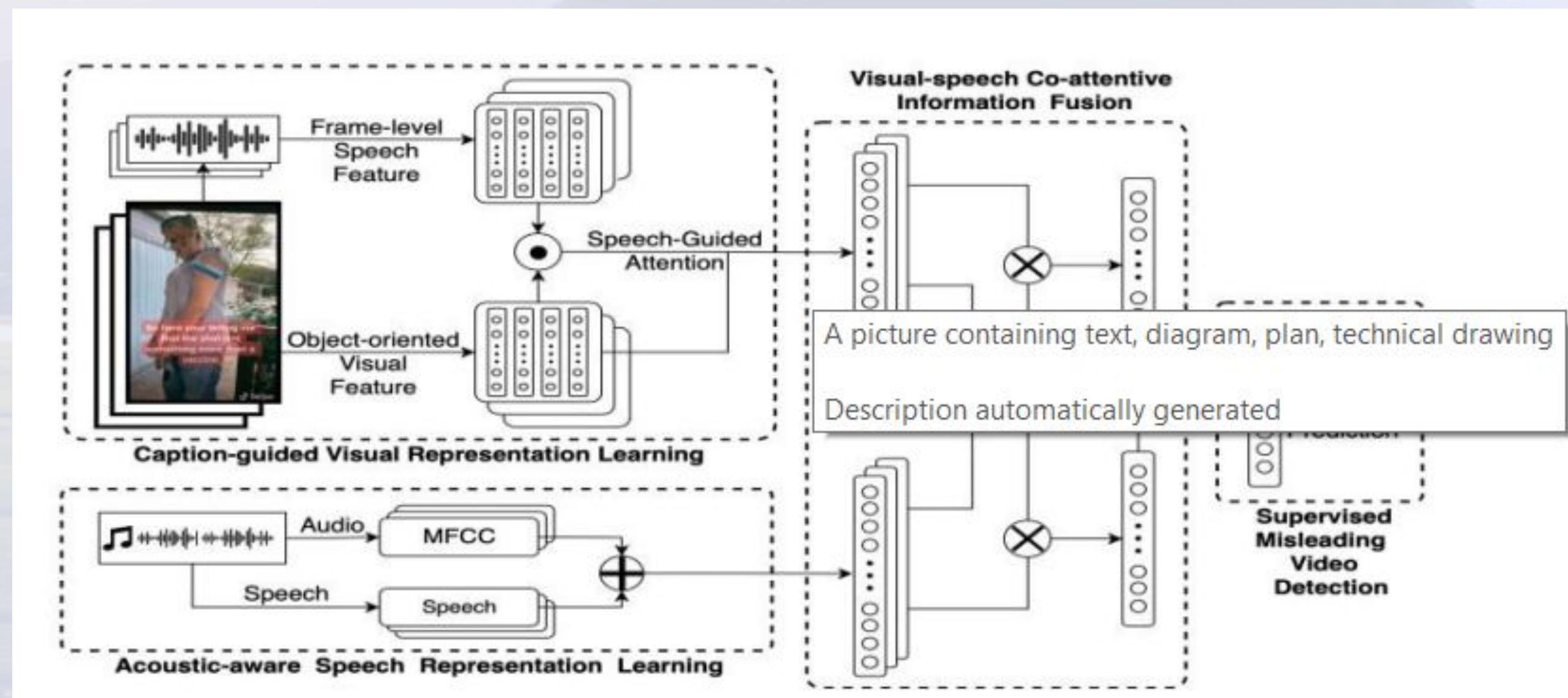
DESIGN OUTLINE

- The detector is based on a framework developed for misleading COVID-19 TikTok videos.
- Analyzes the **visual and audio features separately**, then **fuses them into a vector representation** capturing the relationship between the frames and speech words.
- Implemented with the **PyTorch** library on **Amazon SageMaker**.
- Uploaded videos are **checked** before going into the database.
- Misleading uploads can result in **warnings, penalties, or permanent bans**. Users can **request a re-verification** by human professionals to account for inaccuracy.

DESIGN CONCEPT 2

Mis/disinformation detection with deep learning

DESIGN OUTLINE





DESIGN CONCEPT 2

Mis/disinformation detection with deep learning

DESIGN BENEFITS

- Ensures that our information system will ***remain useful for ethnic users*** looking for agricultural knowledge.
- ***Prevents bad actors from spreading misleading content*** which can have serious consequences on ethnic communities.





DESIGN CONCEPT 2

Mis/disinformation detection with deep learning

ESTIMATION OF BUDGET

Type	Detail	Monthly costs
Equipment	Cloud Architecture (EC2, ECS and SageMaker)	\$422.42 (623.68 AUD)
Labor	Cloud Architect (x1)	28.900.000 VND (1789.26 AUD)
	Manager (x1)	35.000.000 VND (2167.94 AUD)
	Machine learning engineers (x2)	57.800.000 VND (3580 AUD)
	Office (100m ² , with electricity and Wi-Fi coverage)	117.500.000 VND (7381.54 AUD)
Total		249,126,512 VND (15542.42 AUD)



DESIGN CONCEPT 3

Content auto-translation with transformer model

LEARNING ISSUE

- Only ***80.9% of the ethnic population*** knows Vietnamese (GSO, 2019), meaning one out of five people gets alienated due to language.
 - The current agriculture training knowledge is ***available mostly in Vietnamese***. Ethnic learners who are not proficient in Vietnamese cannot peruse this content.
 - The learning content in our information system ***must also be available in ethnic languages*** to allow equal access.
- An auto-translation for uploaded content is necessary.**



DESIGN CONCEPT 3

Content auto-translation with transformer model

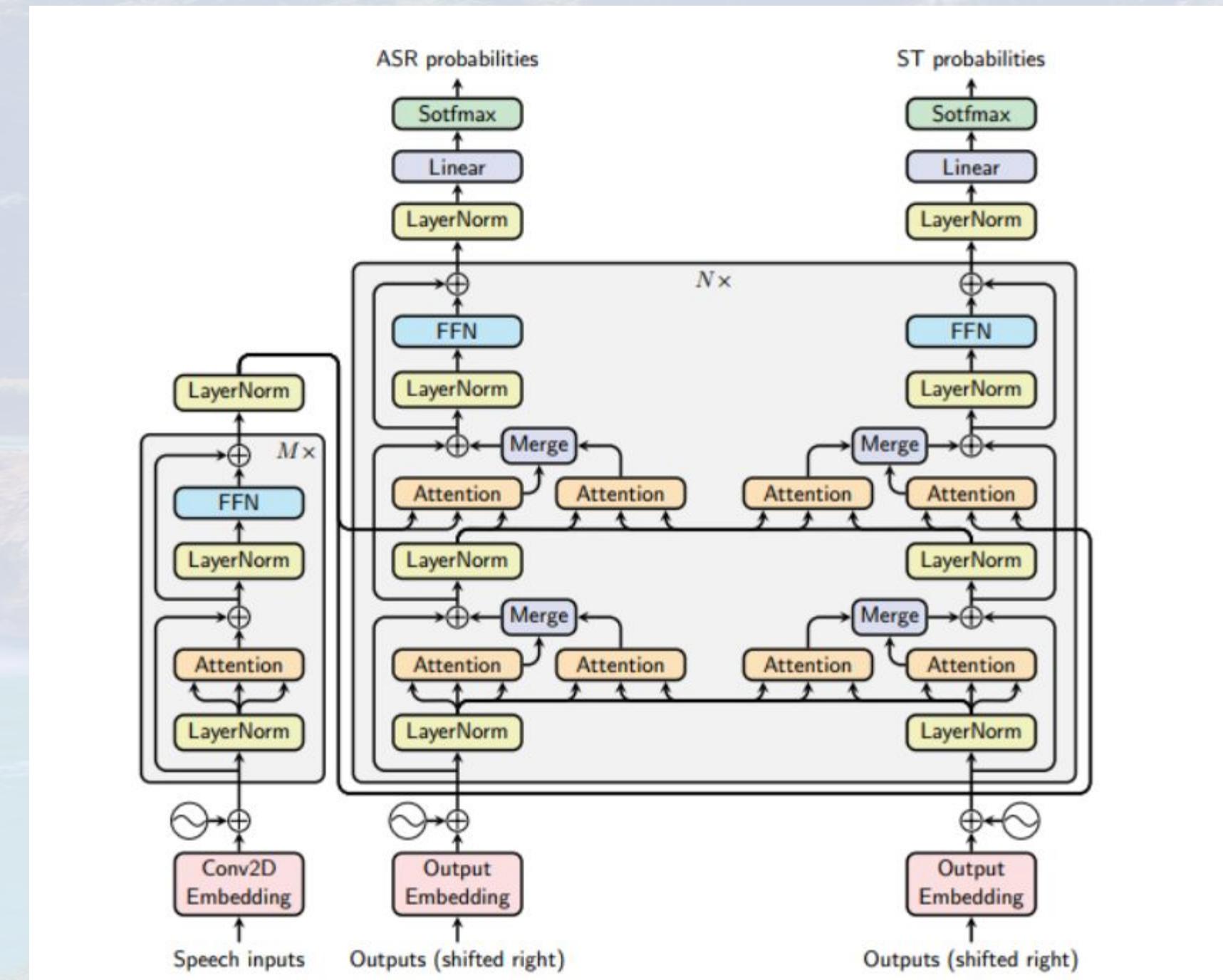
DESIGN OUTLINE

- Features a ***parallel dual-decoder Transformer*** to ***read*** the video transcript at the same time as ***translating*** it.
- An input layer will ***read the video transcript*** and ***forward it into the transformer model***.
- The transformer model will utilize the ***attention mechanism*** for natural language processing to ***boost performance on large datasets***.
- Unfortunately, the ***maximum accuracy*** yielded by this model is only ***67%***, since it has to simultaneously read the video transcript and translate it.

DESIGN CONCEPT 3

Content auto-translation with transformer model

DESIGN OUTLINE



A photograph of a lush, green mountainous landscape. In the foreground, there's a small waterfall cascading down a rocky cliff into a pool of water. The background features more mountains under a clear sky.

DESIGN CONCEPT 3

Content auto-translation with transformer model

DESIGN BENEFITS

- ***Improve accessibility*** for ethnic minorities.
- Bring ***existing training materials closer to ethnic minorities*** that are not fluent in Vietnamese.
- Result in a ***more inclusive learning platform***.
- Integrates seamlessly with the ***search engine feature*** mentioned later, allowing ethnic users to search for content in their native languages.

DESIGN CONCEPT 3

Content auto-translation with transformer model

ESTIMATION OF BUDGET

Type	Detail	Monthly costs
Equipment	Cloud Architecture (EC2, ECS and SageMaker)	\$422.42 (623.68 AUD)
	GPU Tesla T4 (x5)	\$5900 (8757.05 AUD)
Labor	Cloud Architect (x1)	28.900.000 VND (1789.26 AUD)
	Manager (x1)	35.000.000 VND (2167.94 AUD)
	Machine learning engineers (x1)	28.900.000 VND (1790 AUD)
	Office (100m ² , with electricity and Wi-Fi coverage)	117.500.000 VND (7381.54 AUD)
Total		330,166,375 VND (20720.21 AUD)



DESIGN CONCEPT 4

Voice search engine with BIMASR

LEARNING ISSUE

- According to Nisansala Vidanapthirana, poor **rural areas** are likely to have a **high illiteracy rate**, which **hinders farmers' access** to quality training content.
 - This is also true for the **mountainous areas** where learning opportunities are scarce.
 - Due to low literacy, ethnic users of our information system **might not know how to search for content by text**.
- Our system should be equipped with a voice search function implementing machine learning.



DESIGN CONCEPT 4

Voice search engine with BIMASR

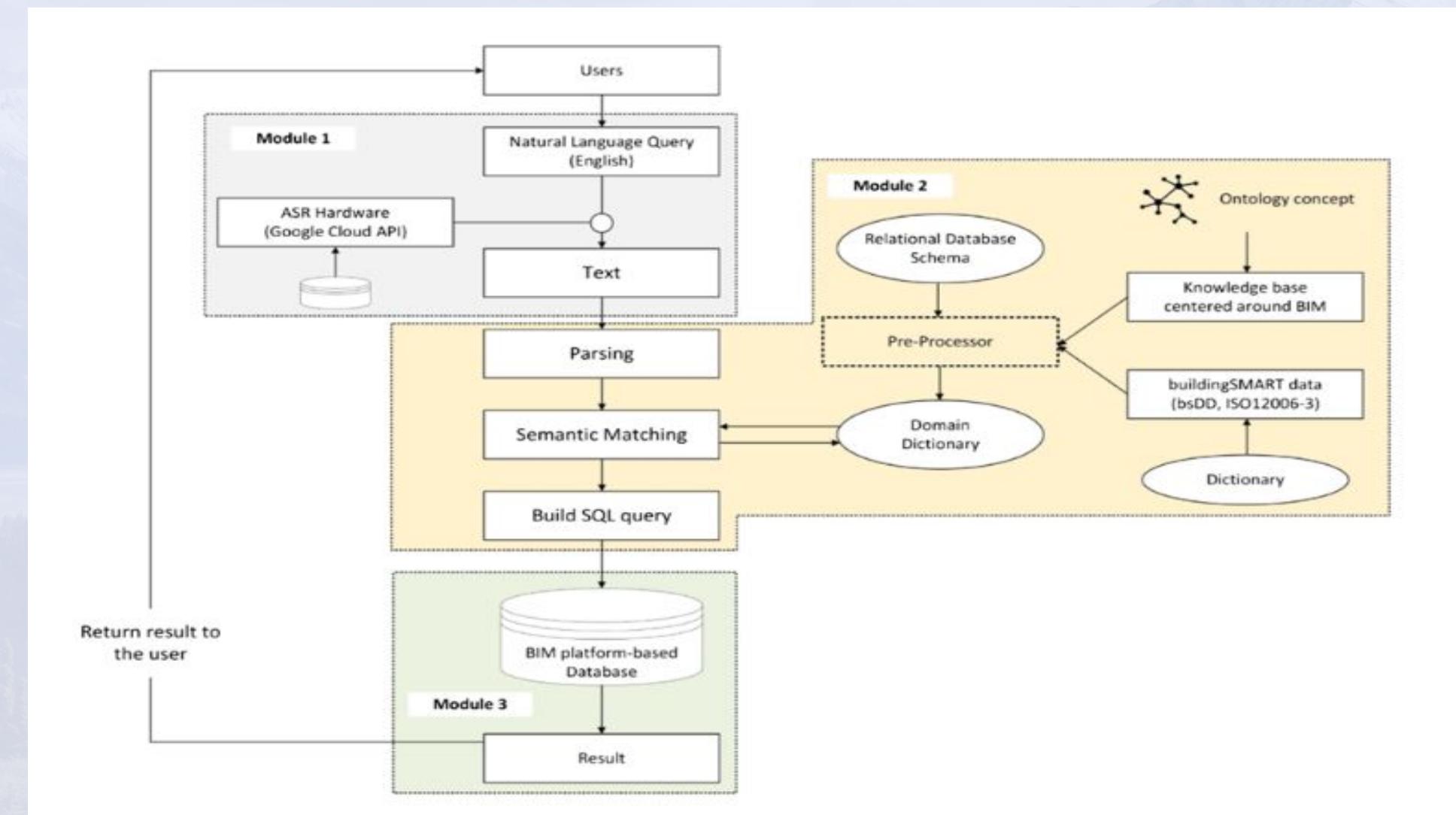
DESIGN OUTLINE

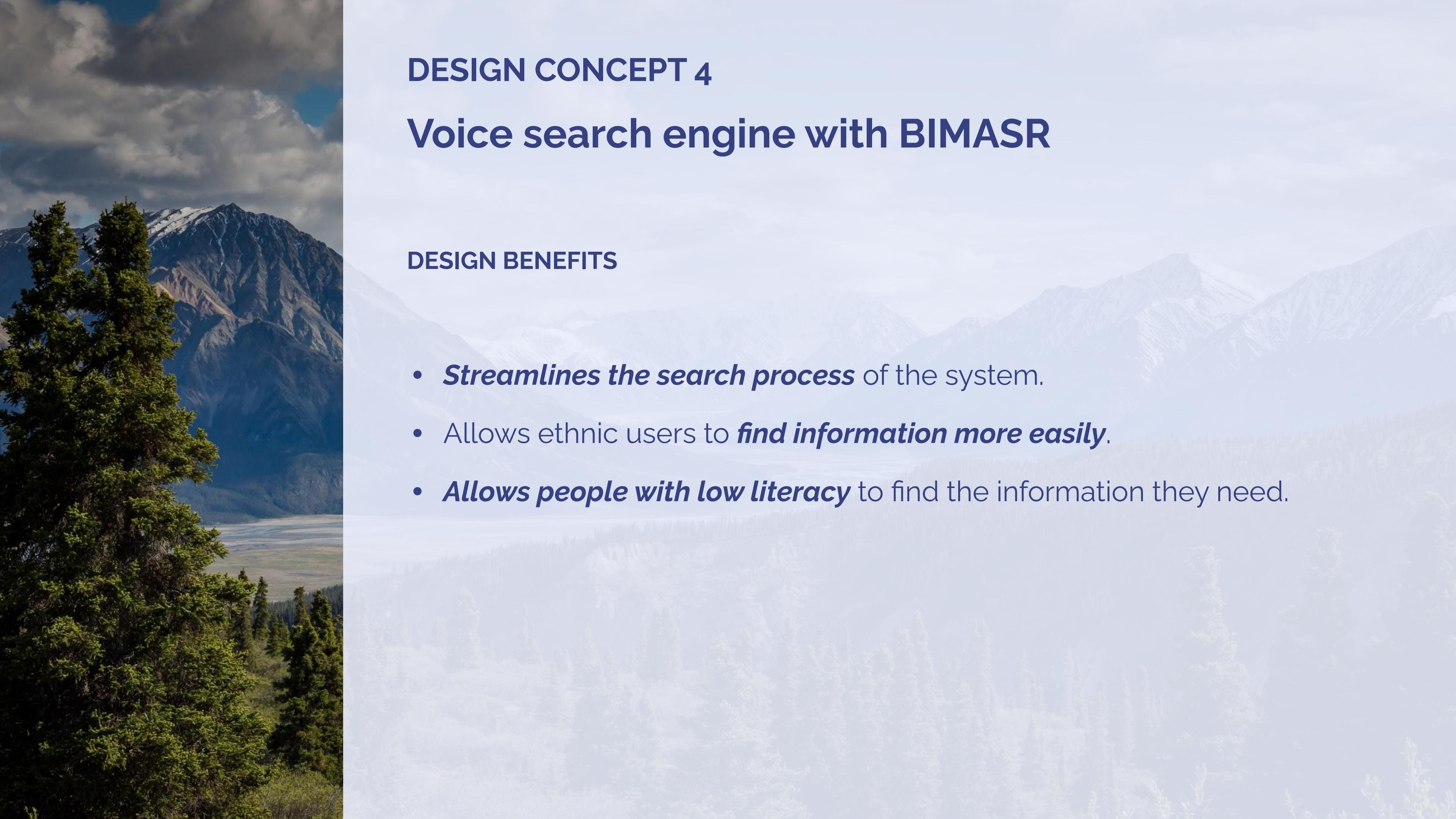
- Implement the BIMASR (Building Information Modeling Automatic Speech Recognition) framework to support the system with voice searching. It consists of 3 parts.
- The first part is the Speed-2-text module, which runs an API call to Google Cloud API (which can reach up to 97% accuracy for speed-2-text tasks)
- The second part will be the query forming module where the extracted input text will be analyzed and used to form a query before being sent to the database.
- The final part is the data retrieving module where the query from part 2 will be run and proper information from the database will be returned.

DESIGN CONCEPT 4

Voice search engine with BIMASR

DESIGN OUTLINE



A scenic landscape featuring a large, rugged mountain peak with patches of snow. In the foreground, there are several green coniferous trees. The sky is filled with dramatic, dark clouds. The overall atmosphere is natural and serene.

DESIGN CONCEPT 4

Voice search engine with BIMASR

DESIGN BENEFITS

- *Streamlines the search process* of the system.
- Allows ethnic users to *find information more easily*.
- *Allows people with low literacy* to find the information they need.



DESIGN CONCEPT 4

Voice search engine with BIMASR

ESTIMATION OF BUDGET

Type	Detail	Monthly costs
Equipment	Cloud Architecture (EC2, ECS and SageMaker)	\$422.42 (623.68 AUD)
	Database	\$846 (1248.96 AUD)
Labor	Cloud Architect (x1)	28.900.000 VND (1789.26 AUD)
	Manager (x1)	35.000.000 VND (2167.94 AUD)
	Machine learning engineers (x1)	28.900.000 VND (1790 AUD)
	Data engineer (x1)	34.746.041 VND (2152.21 AUD)
	Office (100m ² , with electricity and Wi-Fi coverage)	117.500.000 VND (7381.54 AUD)
Total		17153.59 AUD (274,936,339 VND)



DESIGN CONCEPT 5

Blockchain system for farmer - business contract

LEARNING ISSUE

- For a long time, there has been a ***weak connection between ethnic farmers and private sectors*** since there are many hindrances that prevent them from working together (such as the market price, logistic costs,...).
 - Ethnic farmers are ***separated from the supply chain of the whole country***, reducing their income.
- Blockchain technology can be used to establish contracts between farmers and businesses, connecting these parties.



DESIGN CONCEPT 5

Blockchain system for farmer - business contract

DESIGN OUTLINE

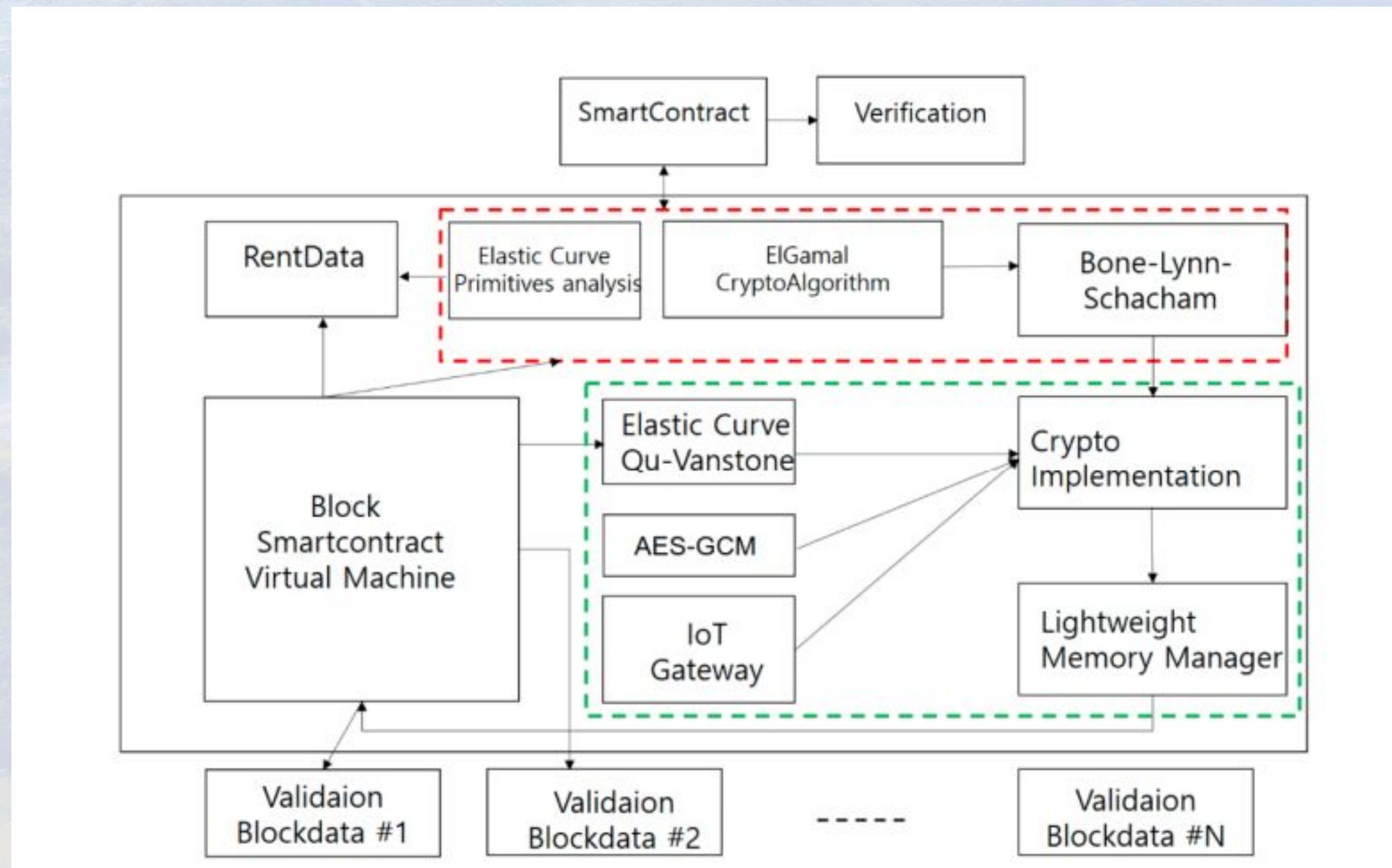
- The system will be ***implemented on the cloud.***
- ***Businesses*** will ***place orders*** on the system. ***Farmers*** will ***get the orders and sign contracts***, which will be put into a blockchain system. Breaching the contract will damage the breacher's reputation.



DESIGN CONCEPT 5

Blockchain system for farmer - business contract

DESIGN OUTLINE





DESIGN CONCEPT 5

Blockchain system for farmer - business contract

DESIGN OUTLINE

- The blockchain system will look like this. The red block provide encryption to protect the information within the system. The green block will ensure that the encryption is working before putting it into blocks. There is also a smart contract component to check if the input data satisfy the requirements for the contracts or not.



DESIGN CONCEPT 5

Blockchain system for farmer - business contract

DESIGN BENEFITS

For **farmers**:

- The private sector will better understand the farmers.
- Help farmers to build their reputation.

For **businesses**:

- Gain access to high quality farmers.
- Reliable material sources even for rare materials.



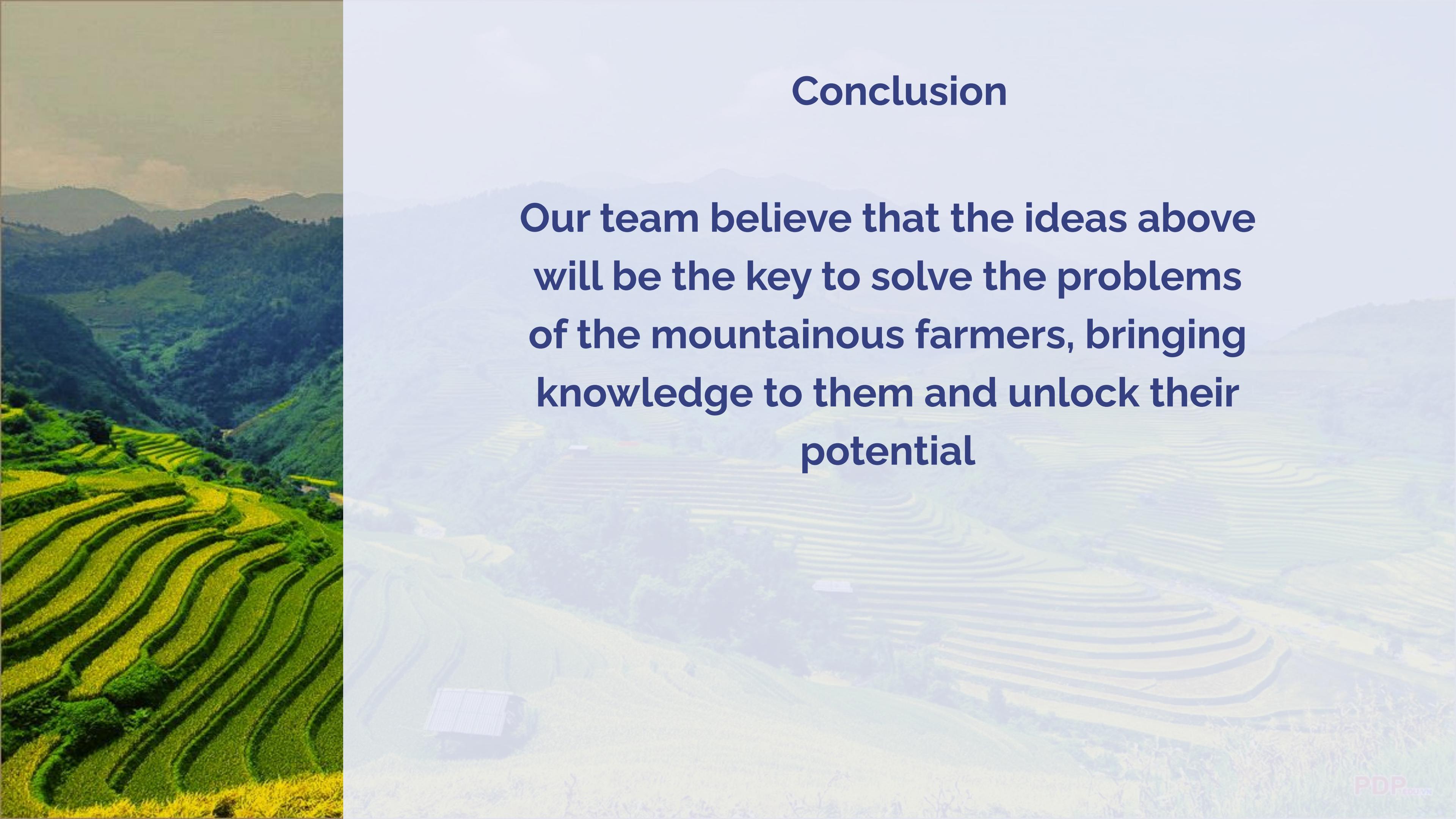


DESIGN CONCEPT 5

Blockchain system for farmer - business contract

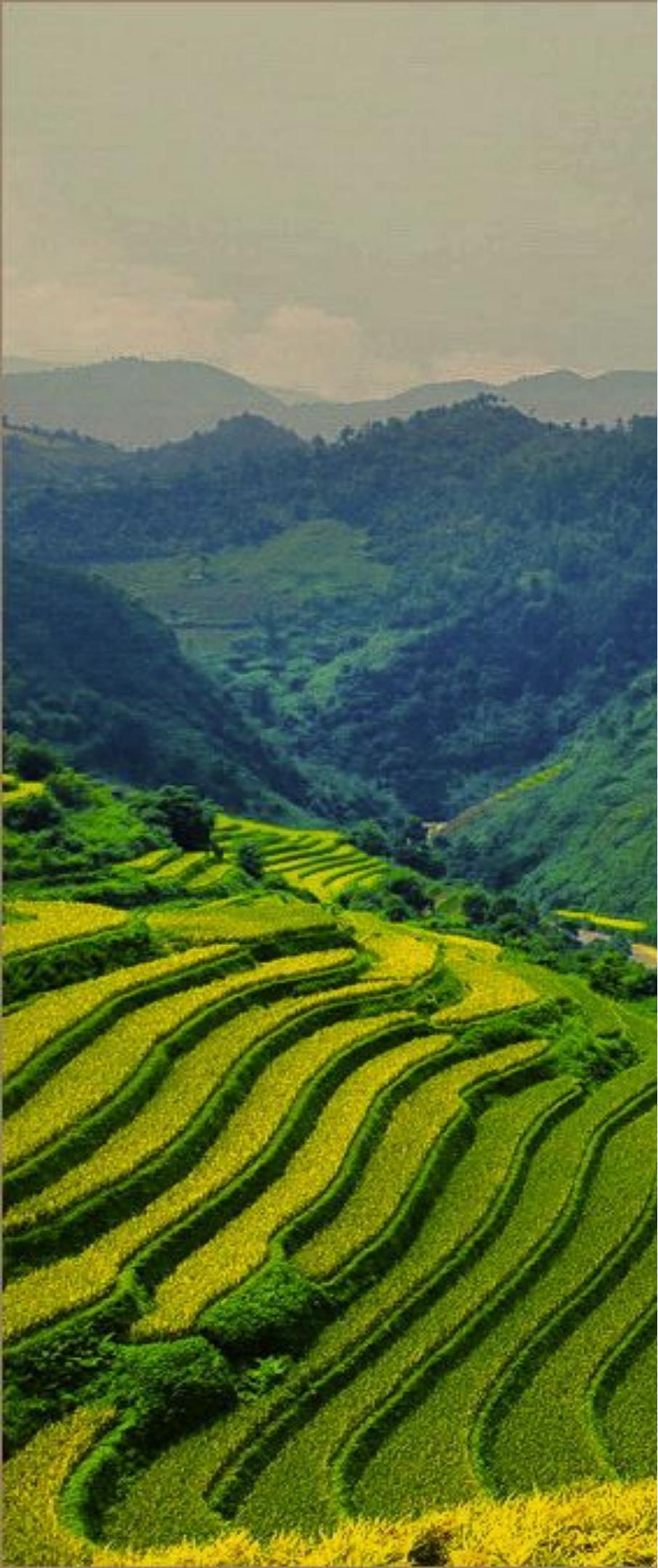
ESTIMATION OF BUDGET

Type	Detail	Monthly costs
Equipment	Cloud Architecture (EC2, ECS and SageMaker)	\$422.42 (623.68 AUD)
Labor	Cloud Architect (x1)	28.900.000 VND (1789.26 AUD)
	Blockchain engineer (x1)	14,900,000 VND (922.92 AUD)
	Manager (x1)	35.000.000 VND (2167.94 AUD)
	Machine learning engineers (x1)	28.900.000 VND (1790 AUD)
	IT security (x1)	21.900.000 VND (1356.51 AUD)
	Office (100m ² , with electricity and Wi-Fi coverage)	117.500.000 VND (7381.54 AUD)
Total		16031.85 AUD (256,957,182 VND)



Conclusion

Our team believe that the ideas above will be the key to solve the problems of the mountainous farmers, bringing knowledge to them and unlock their potential



Thank you!

Please ask us any questions!