Assessing the Feasibility of Contract Farming Models in the Thai Hemp Industry

Abstract

This project assesses the feasibility of a contract farming model between Eastern Spectrum Group and Thai agricultural commodity farmers. To achieve this, the team conducted interviews with farmers, performed a content analysis on the interview data, and investigated the practicality of cultivating industrial hemp under a contract farming model. The validation results revealed that with proper support from the company and a trusting relationship, the contract farming model is a feasible and mutually-beneficial solution to reducing agricultural poverty in Thailand.

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Disclaimer

This report represents the work of four WPI undergraduate students and four Chulalongkorn University students submitted to the faculty as evidence of the completion of the degree requirements. WPI routinely publishes these reports on its website without editorial or peer review.

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Potential Mitigation for Agricultural Poverty Found in Hemp Contract Farming

For decades, Thailand has been a globally significant exporter of agricultural commodities. The Thai farming sector has an instrumental role in Thailand's economic development. Workers in the Thai agricultural sector comprise nearly 30 percent of the Thai workforce and suffer from poverty at a disproportionately higher rate than the general Thai population.[1] Approximately 30 percent of Thai farmers in all provinces live below the poverty line.[2] In some individual provinces, like the Chaiyaphum Province, up to 64 percent of Thai farmers live below the poverty line.[3]

Thailand's dependence on its agricultural sector merits solutions that address poverty reduction among farmers. The Thai government does not have the resources to single-handedly alleviate poverty in the agricultural sector. Studies of farmers in Thailand and neighboring countries in the Southeast Asian region conclude that impoverished farmers need opportunities that increase the potential for profit, a stronger agricultural economy, and social protections.[1, 3, 4] One possible solution to this problem is contract farming.

Contract farming is an agreement between farmers and private companies that guarantees a constant stream of a specific commodity to the company. In this mutually beneficial relationship, the farmer secures the necessary infrastructure, reliable markets, fixed price structures, and educational knowledge from the company; the company secures reliably high-quality raw materials and can bypass common land constraints or resource limitations.[5] This farming model is advantageous for the farmer as it provides support and a reliable income.

Contract farming has an established role in Thai farming, with increasing numbers of Thai companies pursuing contract farming models. Eastern Spectrum Group (ESG) is a Bangkok-based company and one of Thailand's largest manufacturers of hemp-derived cannabidiol (CBD) products.[6] The company is interested in alleviating poverty via contract farming. They currently grow hemp in house but are invested in expanding their business through contract farming. Hemp grown through the company's contract farming agreement would help ESG branch out into hemp supplement products such as peptides. The company wants to scout farmers in declining agricultural sectors (tobacco, sugarcane) and excess commodities (rice, corn, cassava) and propose a long-term contract farming agreement where farmers grow hemp for ESG. The company's focus on farmers of these less economically stable agricultural commodities will aid them in targeting poverty.

ESG's proposition for this model aligns with Thailand's timeline for the deregulation of hemp cultivation. This alignment is purposeful; ESG executives are wary that Thailand's waning cannabis laws may lead to a sudden rise in hemp farming–a move that could potentially send farmers into debt. The company's concern is that Thai farmers will turn to hemp farming as a new, lucrative industry. Compared to other common Thai agricultural commodities, hemp grows more quickly, produces a higher biomass per area, and regenerates the soil it grows in.[7] However, there is a high potential for crop failure, and losses can be further aggravated by market surpluses.[8–13] To avoid the potential losses Thai farmers might face as they enter hemp farming, ESG wants to introduce a hemp contract farming model in Thailand. The company has significant knowledge in growing industrial hemp for commercial use and is equipped to guide Thai farmers as they transition into a new agricultural market.

This project aimed to assess the feasibility of implementing a contract farming agreement between ESG and Thai agricultural commodity farmers. To complete this objective, a joint team of students from Worcester Polytechnic Institute (Worcester, MA, USA) and Chulalongkorn University (Bangkok, Thailand) evaluated the current business environment for Thai farmers, conducted a content analysis of interview data, and attempted to validate the practicality of cultivating industrial hemp under a cooperative farming model. This included interviews with Thai farmers, ESG executives, and an assessment of cooperative farming models and Thai hemp regulations. After the analysis of collected data, the joint team proposed a comprehensive rationale for the validation or rejection of a contract farming model. The team concluded that a contract farming model is appropriate for ESG and included recommendations on best practices for the model in their final deliverable.

The Current State of Farming in Thailand

Agriculture accounts for a critical economic sector in Thailand. The agricultural sector (which typically includes forestry and fisheries) accounted for 8.8 percent of Thailand's GDP in 2020, and employed 30 percent of the country's labor force.[1, 14, 15] The sector encompasses over 127.5 million rai (50.4 million acres) of land and is a predominant producer of globally essential crops including rice, sugarcane, cassava (starch), rubber, and corn.[16]

The agricultural sector commands a significant percentage of the Thai workforce (6.4 million households have a member employed by the agricultural sector) and the economic outlook for Thai farmers is exceedingly poor.[15, 17] As other economic sectors gain traction, younger members of Thailand's workforce have abandoned farming. This career shift is often supported by small-scale farmers (owning less than 10 rai) that send their children to non-village schools with the intention of escaping poverty.[18, 19] Consequently, the Thai farming population is aging.[15]

The aging farming community is posed to present problems for an already struggling sector. Data on the agricultural sector suggests that between 30 to 40 percent of Thai farmers live below the poverty line of 32,000 baht annual income.[2, 15] Poverty is coupled with high rates of debt. The risk of debt is especially high for farmers with limited farming portfolios. Sixty-six percent of farmers practice monocropping of excess commodity crops (rice, sugarcane, cassava, rubber, and corn). This practice makes farmers more susceptible to market risk, especially if they suffer from a poor crop season.[15, 20] Overall, poverty and debt are particularly rampant among smaller farming households.

In the near future, smaller farming households will be forced to bear more than the brunt of poverty and age. Climate change is a consequential, fast-approaching issue that will likely introduce disastrous complications in the Thai agricultural sector.[21, 22] As of 2021, Thailand was ranked ninth among countries most vulnerable to climate change.[23] Climate change is expected to bring unprecedented numbers of natural disasters, including drought, storms, and flooding. Over the last 30 years, Thailand has experienced a natural disaster almost every year.[24] Studies have found that the farmers hit hardest by these natural disasters are also the largest contributors to climate change because of their chemical pesticide use. Chemical pesticides have detrimental effects on the environment and biodiversity. Importantly, they can also harm farmers and consumers of the crop.[24, 25] As the Thai agriculture sector continues to struggle, the common, conventional farming practice of using pesticide cannot be ignored.

Industrial Hemp, a Popular Emerging Crop

In the face of climate change, new farming practices and more resilient and sustainable crops are necessary to combat natural disasters. Industrial hemp (also referred to in this document as hemp), is a hardy, adaptable, and multifunctional crop that might be suitable for this purpose. Hemp (*Cannabis sativa L.*) is a cannabis plant that is grown for a wide array of applications in industrial, consumer, and medicinal products.[26, 27] Industrial hemp is characterized by its high fiber content and low (less than 0.3 percent) tetrahydrocannabinol (THC) concentration.[28, 29] (THC is a psychoactive compound that can be bred in the cannabis genus. Plants with a THC concentration above 0.3 percent are typically referred to as marijuana and are not classified as industrial hemp). Hemp is growing in popularity globally, particularly in medicinal and health-oriented markets. In these markets hemp is renowned for its cannabidiol (CBD) concentration, which is advertised for its many health benefits.[30, 31] The CBD compound is concentrated in the leaves of the hemp plant.[28] The rest of the plant, including the stalks and seeds (referred to as fibers and grain, respectively) can be used for applications such as food products, textiles, sustainable packaging, paper, biofuel, and more (Figure 1).[26, 28]

Hemp can be grown under numerous environmental conditions. The plant is native to Central and West Asia, but is cultivated worldwide in various climates.[32, 33] Hemp is suitable for tropical climates, like Thailand, where cultivation of the crop will improve local biodiversity.[34, 35] It is pest resistant and can aid in reviving damaged or contaminated soil by displacing weeds and absorbing heavy metals.[33, 36] The plant's ability to adapt and thrive in different climates is a sound indicator of the plant's potential to withstand the natural disasters that impact Thai agriculture. After the plant has established roots, it can survive more extreme conditions than other crops. Hemp roots extend two to three meters underground, which allows the plant to draw water from deeper soil levels during a drought and remain stable during a flood.[36, 37, 38] Despite its roots, physical damage and the introduction of pests and bacteria can still occur under extreme weather stresses.[39, 40]

Hemp is a relatively fast-growing crop. Hemp can be harvested two to three times a year, depending on environmental conditions.[29] In larger commercial operations, the plant is typically grown in fields and harvested at the base of the stalk using mechanical harvesting methods (Figure 2).[42] In smaller operations, the plant may be planted in individual planters and sections of the plant harvested manually (Figure 3).[43] Regardless of harvesting method, after hemp is harvested, the plant is completely dried before it is processed. When dried, the plant can be separated into stalks (fiber), leaves (CBD), and seeds (grain) for product-specific processing.[44] In addition to the benefit of a quick growth cycle, the renewable feedstock is advantageous for its durability, high biomass per area, and its ability to regenerate the soil it is grown in.[32, 33]

Thai Regulation on Hemp Production, Import, Export, and Distribution

Despite the increasing acceptance of hemp in consumer markets, the guidelines for growing hemp remain strict internationally. In Thailand, approval of applications for hemp production, import, export, distribution, and possession licenses (Cannabis sativa) began in January 2021. A month earlier, in December of 2020, the Government Gazette of Thailand published "The Ministerial Regulation on Application and License for Production, Importation, Exportation, Selling, or Possession of Hemp," which contained the specific requirements for this significant step in Thailand's ongoing development of a regulatory regime for hemp.

The process for obtaining a license to manufacture, import, or export hemp varies based on the applicant's location. The application can be filed directly to the Thai Food and Drug Administration (FDA) office for manufacturing activities in Bangkok, as well as all import and export licenses. Manufacturers outside of Bangkok should submit the application to their Provincial Public Health Headquarters, which will then be forwarded to a provincial committee and the governor for assessment, and then to the Thai FDA office. The complete review procedure for applications submitted directly to the Thai FDA office is likely to take 2-3 months, and 4-5 months for applications submitted to a provincial health office.[45]

Towards the end of January 2022, the Ministry of Public Health decriminalized both cultivation and possession of hemp and removed cannabis plants from the list of controlled drugs in Category 5 addictive. The changes enter effect 120 days after their publication in the gov-

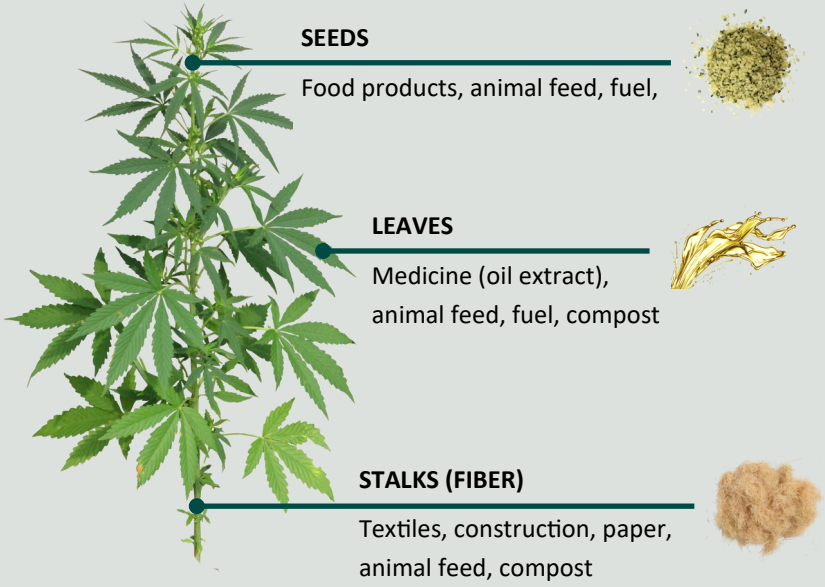

Figure 1. Various applications for industrial hemp based on part of plant. The entirety of the hemp plant can be used for multiple applications. Uses for hemp seeds, leaves, and stalks are shown here.

Figure 2. Hemp grown on a larger-scale farm at University of Kentucky in Kentucky, USA.[72]

Figure 3. Hemp grown on a small-scale farm in individual planters. Image taken from interview.

ernment gazette.[46] Despite the decriminalization, extracting parts of the cannabis plant that contain more than 0.2 percent by weight of THC remains prohibited by the Health Ministry (List of Prohibited Narcotics). For Thai citizens growing cannabis in their own homes, the regulations stipulate that the plant must be used for medical purposes and that random inspections may be conducted.

Eastern Spectrum Group

As the partial decriminalization of hemp cultivation extends across Thailand, multiple Thai CDB companies have launched in the country. One of these companies is Eastern Spectrum Group (ESG). Eastern Spectrum Group is a CBD manufacturer based in Bangkok, Thailand that produces different types of CBD oil from hemp. ESG provides services such as hemp extraction, drying, and harvesting.[6] ESG currently manages 200 rai of farmland in Thailand, allowing them to grow large amounts of hemp for CBD extraction. Having only been established for a little over a year, the company already plans to expand to almost 5,000 rai of farmland over the next three years.[47] They aim to grow 100,000 tons of hemp per year to produce three tonnes of CBD oil.[48] ESG also plans to expand into the hemp-based food products industry by establishing a contract farming model with local Thai farmers. Through this model, the company will commit to providing long-term stability for farmers in a rapidly changing industry.

Contract and Cooperative Farming Models

Across less developed nations, contract farming has been studied as a method for including small-scale farmers in larger and more lucrative agricultural markets. Contract farming differs by individual contract, but it typically outlines an agreement between a farmer and a private company. Private companies, often referred to as "sponsors," agree to provide access to technology, knowledge, and production services in exchange for the farmer's agricultural commodity at a fixed price and quality. This movement of the commodity through multiple stages of a supply chain (that are owned by different stakeholders) is referred to as vertical coordination.[5, 49] The most significant advantage of vertical coordination for small-scale farmers is that it helps mitigate the price variation they frequently encounter when selling their crops.[50, 51] Moreover, the farmers are provided with a skilled support system to maximize crop yield. This structure is similarly advantageous for the sponsor. The sponsor is guaranteed a product of consistent quality and can avoid limits on land and resource availability.[5] These specific advantages of the contract farming system can be difficult for both the farmer and sponsor to acquire individually. For this reason, the Thai government is a prominent supporter of contract farming.

Contract farming is a familiar concept in the Southeast Asian region. Thailand has had years of experience with contract farming in multiple agricultural sectors. Most recently, Thailand made contract farming a part of the country's agricultural development plan. This change stems from government frustration with open agricultural markets and heavy (and costly) public sector involvement in the agricultural industry.[50] The change was enacted in 2017, when the Royal Thai Government Gazette introduced the "Contract Farming Promotion and Development Act." This bill aimed to integrate support from the private sector for farmers (Figure 4). Farmers and sponsors that seek to participate in contract farming must operate with regard to this bill.[52]

Although the Thai government views contract farming as an effective means for poverty reduction, the farming model still has drawbacks. For farmers, the power of an economically stronger private company may result in inequitable contracts (unfair economic distribution and manipulation of contract quotas). It could also compromise farmers if there are complications with produc-

GOVERNMENT
Office of the Permanent Secretary for Agriculture and Co-operatives

Oversees contract farming in Thailand.
Pens guidelines, manages contract violations.
Operates the **Contract Farming Promotion and Development Commission**, which is comprised of government officials, & farming and business representatives.

SPONSOR
"Agricultural Business Owner"

All terms of a contract must be submitted by the sponsor to the government. The contract must be in Thai language. Upon conclusion of the contract the government and farmers must be notified in advance. The sponsor agrees to be monitored under this contract.

SPONSORS + FARMERS
"Contractual Parties"

Agrees to fulfill contract. In the case of a disagreement, the party agrees to sustain the contract and continue agreed production. The party may not actively harm another party by discontinuing production.

Figure 4. The "Contract Farming Promotion and Development Act" simplified for comprehensibility.

tion, possibly leading to debt. For the sponsors, the disadvantages lie in the difficulty of controlling farmers, and the corruption among farmers.[5]

In some instances, a contract farming model may translate into partnerships with existing agricultural cooperatives. Cooperative farming, also known as collaborative farming, refers to a model of farming where farmers share knowledge and resources that address common needs. In contract farming, this type of relationship between farmers is referred to as horizontal coordination.[53] The four most common forms of horizontal coordination can be categorized as informal arrangements, incubator farms, lease agreements, and legal business entities. Informal arrangements provide farmers with communal farming resources, equipment, and knowledge, but do not have legal or written documents that detail the farming model. Incubator farms are temporary farming agreements where farmers share land, farming infrastructure, and farming equipment. This model helps new farmers overcome initial challenges associated with starting up a farm such as access to equipment, land, or capital. Lease agreements are a flexible framework that involve landlord farmers renting plots of land to tenant farmers, similar to how rental apartments work. Legal business arrangements can include the communal resources in the above models, but they are fully documented and can take a significant amount of time, effort, and capital to establish.[54]

Assessing the Feasibility of Establishing a Contract Farming Model

The project's goal was to assess the possibility of establishing a contract farming model between Thai farmers and Eastern Spectrum Group (ESG) to provide resources to the farmers and a steady stream of hemp to ESG. The project addressed the different agricultural industries in Thailand and the feasibility of building a strong relationship between Eastern Spectrum Group and the farmers through a long-term contract. The objectives of this project were to determine the business environment of the primary stakeholders in cooperative contract farming, compile data on Thai farmers' current business practices and opinions on contract farming, develop a value proposition for Thai farmers who fit the criteria for contract farming, and assess the practicality of cultivating hemp with local Thai farmers to create new hemp products with ESG. The objectives and their respective tasks are shown in Figure 5.

1. Determine the business environment of Thai farmers and Eastern Spectrum Group.

In order to determine if a cooperative farming model is feasible for both Thai farmers and Eastern Spectrum Group, it was necessary to gather information about the operating practices of both parties, including financial numbers and qualitative data about crops. The team conducted interviews with Thai farmers from across different agricultural industries and spoke with Preet Marwaha, the Director of Innovation at ESG.

1.1. Assess farmers' investments in agriculture and interest in cooperative contract farming

Thai farmers' willingness to participate in cooperative farming is the cornerstone of the cooperative farming model ESG wants to implement. ESG is particularly interested in recruiting local Thai farmers who are invested in shrinking agricultural sectors (namely, tobacco and sugar cane) and excess commodity sectors (corn and rice). To gauge local farmer interest in cooperative farming models, the team interviewed farmers in these sectors, as well as farmers already invested in industrial hemp farming. Farmers contacted for this interview

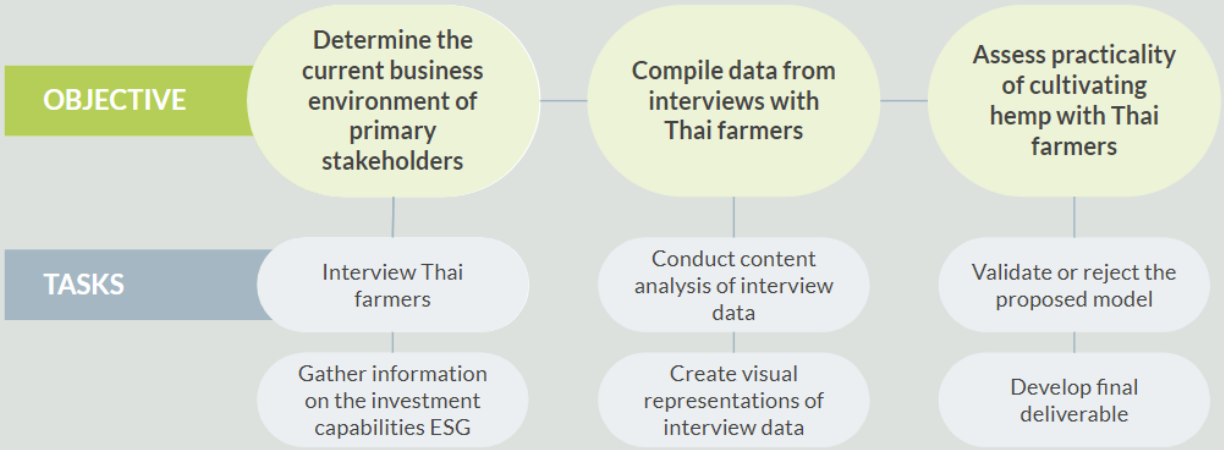

Figure 5. Methodology organization chart detailing tasks necessary to accomplish the objectives.

process were recruited via Facebook groups for hemp farmers (ส่งเสริมการปลูกกัญชง~เชิงพาณิชย์และอุสาหกรรม (Supporting Commercial and Industrial Hemp Cultivation), แชร์ประสบการณ์งานไร่อ้อย (Sharing Sugarcane Cultivation Experience), and กสิชน คนทำไร่อ้อย (Sugarcane Farmers)) and personal and ESG executive connections. The team also contacted farmers through One Tambon One Product (OTOP), a local stimulus program for small businesses selling handcrafted items.[55] The team aimed to interview farmers with ten or more rai (to accommodate the scale at which ESG expects to expand), however, due to the limited number of farmers that responded to interview queries, we decided to also interview farmers who had fewer than 10 rai. Due to the rising number of COVID-19 cases in Thailand, most interviews were conducted virtually on multiple platforms, depending on the farmer's comfort. ZOOM, Facebook, and Line were the primary video-conferencing platforms that were used to conduct interviews. In person interviews were conducted exclusively among tobacco farmers in the Ban Phaeng and Na Nat sub-district, Nakhon Phanom province. Farmers were asked about the crops they grow, operating costs and procedures, struggles they are currently facing, and their opinions on cooperative farming. See section 2 of the Supplementary Materials file for the full list of interview questions used.

Figure 6. The team interviewed tobacco farmers at a farm in Ban Phaeng.

1.2. Determine the total capital ESG can invest into cooperative contract farming

In the cooperative farming model that ESG wanted the team to evaluate, the majority of farmers contracted would be new to farming industrial hemp. The farmers' inexperience with hemp farming would necessitate upfront investment in the resources required for cultivating hemp. The team interviewed Preet Marwaha of ESG to ascertain the specific resources that the farmers would need to begin hemp farming and determine the capital that ESG is willing to invest. Mr. Marwaha was interviewed multiple times at different points in the project timeline. In the interviews, the team collected information on the costs and procedures of cultivating hemp and the expected profit for the farmers. Mr. Marwaha was also asked questions regarding the specific types (size, crop type, locations) of farms ESG was interested in partnering with.

2. Compile data on Thai farmers' current business practices and opinions on contract farming

The team organized data collected from the interviews to establish an overview of the Thai farmers' current business practices, profit margin, and opinions on hemp and cooperative farming. The process produced limited quantitative data on the number of farmers that have the qualifications ESG is interested in for their contract and whether those farmers would be interested in farming hemp under the contract. This quantitative data was compiled from the qualitative interview data.

The team performed a content analysis of the responses from Thai farmers for all interview questions in order to gather quantitative data. Content analysis is a strategy that counts the presence of specific words or concepts within qualitative data in order to determine common themes or connections. To do this, individual "codes", or categories, are developed. Once the codes are established, each piece of data is coded to determine if it has certain content.[56]

The content analysis consisted of 12 questions, mainly with yes or no answers, to count how many farmers fall into certain categories. Each question was assigned a two-letter code to indicate the farmer's response. The first seven questions covered the farmer's current business practices such as their land size or whether they make a higher profit than ESG's predicted value. These questions show whether each farmer meets the qualifications that ESG is looking for, as compared to the expectations of ESG as set out in the aforementioned interviews with Mr. Marwaha. The rest of the content analysis questions covered whether the farmers had a positive or negative opinion of hemp and cooperative farming. These questions determine how many farmers might be interested in ESG's contract to produce hemp.

The content analysis was performed to gain insight into which farmers would be most suitable for ESG's contract farming contract and whether they were interested in switching to farming hemp under ESG's contract. The team chose to visualize the data that would have the greatest impact on the sponsor's plan to implement a cooperative farming model, so the deliverables would be more effective.

3. Assess the practicality of a co-op farming contract between ESG and Thai farmers

Based on all data collected and analyzed, the cooperative farming contract was determined feasible if the benefits of this new venture outweighed the costs and risks. The final deliverable was a suggestion to ESG on how to move forward from the results of this analysis, including specific recommendations the team developed on how ESG can best implement the cooperative farming model.

The team determined how feasible it was for Eastern Spectrum Group to implement using evidence from the content analysis. The decision was backed by reasoning on the costs and benefits to ESG and Thai farmers, taking into account what the farmers' biggest struggles are currently. The total benefits of the new venture had to outweigh the value of the current business model for both the Thai farmers and ESG.

The team also developed recommendations for ESG to ensure the company enters into the venture with the best possible strategy for supporting the farmers. Using qualitative data from interviews on the farmers' biggest concerns, the team outlined how ESG can best implement the cooperative model to be beneficial and profitable for both parties.

Eastern Spectrum Group Plans to Increase Hemp Production

ESG is interested in expanding their CBD product line to include hemp-based food products. In early discussions, Mr. Marwaha, Director of Innovation, explained that ESG will need additional land to cultivate hemp for this purpose. Currently, ESG cultivates hemp on 80 rai (31 acres) of land that is exclusively for CBD extraction. In the next three to four years, the company intends to add 5,000 rai to their portfolio for their hemp product expansion. To achieve this rate of expansion, ESG is interested in partnering with local Thai farmers via contract farming. (Note that in interviews ESG executives consistently used the term "cooperative farming model" but described a practice that aligned with a contract farming model that included vertical and horizontal coordination. We have opted to use the term contract farming in this report because it is the conventional term for the farming model described by ESG executives.) ESG's executives are familiar with contract farming, and they report having a strong desire to support Thai farmers. As a company, they want to participate in contract farming because they believe it should be a suitable support mechanism for struggling farmers.

ESG has already outlined a contract farming model that they are interested in, with a few notable features. The company executives want to contract local Thai farmers to grow hemp for ESG. The company would provide the knowledge, equipment, and infrastructure necessary for growing hemp, and in exchange, the farmers would sell all of their hemp to ESG at a fixed price per rai. This payment agreement deviates from a traditional contract farming model where farmers are paid a fixed price per weight and quality, but ESG executives believe that a model centered around a fixed price per rai of crop has the potential to reduce the volatility that farmers face in the agricultural market. In the first harvests, the company intends to cover the upfront costs for transitioning to hemp farming and then deduct the costs when purchasing hemp from farmers at the end of the harvest season. Fewer upfront costs are a major benefit of the long-term stability a contract farming model can provide. Farmers under ESG's proposed model would be paid about 20,000 baht per rai per cycle, and with the deduction of the upfront costs, they would gain approximately 13,000 baht in net income until the resources provided by ESG were paid off. ESG plans to grow hemp in two cycles per year, with 120 days per grow cycle.

ESG wants to ensure that the farmers they recruit are suitable for a contract farming model and has detailed multiple qualifications for farmers. The company is primarily looking for farmers with two distinct characteristics. First, they are interested in farmers with ten or more rai of land because mechanical harvesting equipment can be used on the land. Mechanical harvesting equipment reduces the amount of labor required by farmers, and the greater area of land is more practical for reaching the company's goal of cultivating 5,000 rai of hemp. Many farmers with larger plots of land (greater than 100 rai) are contracted by larger companies, thus ESG is searching for any farmers with more than ten rai. Second, the company wants to focus on farmers facing poverty in declining agricultural sectors. The company executives detailed interest in the sugarcane and tobacco industries, and in excess commodity industries like rice and corn. These industries were underscored because the farmers are typically subject to volatile market prices, and they have large areas of land that are appropriate for cultivating hemp. A partnership with ESG has the potential to provide these farmers with more stability and profit than they would typically receive in their current industries.

The Market is Volatile for Sugarcane, Tobacco, and Other Agricultural Commodities

In interviews, Mr. Marwaha indicated ESG was interested in partnering with farmers that grow crops such as sugarcane and tobacco because they lack market stability. Because of this, we conducted market research to validate those farmers' suitability for contract farming with ESG. Additionally, we reviewed industries that typically produce excess crops, such as corn and rice, since those farmers would also benefit from ESG's contract farming model.

Sugarcane farming in Thailand

In the global sugar market, Thailand is the second largest net exporter. In terms of job-creation and international trade, Thailand's sugarcane and sugar industries play a significant role in the country's economy.[57] Sugarcane farmers are subject to a volatile and competitive market because of the size of the industry. The COVID-19 pandemic, droughts, and policy change on sugar imports and exports have created a turbulent market for sugarcane. In the last two years, demand for sugarcane has declined, with researchers speculating that the decrease was related to the COVID-19 pandemic.[57, 58] Even if this drop was in part due to the pandemic, Thai farming statistics indicate that since 2017, many Thai sugarcane have transitioned to increasingly profitable agricultural industries, such as corn and cassava. Researchers that studied this shift in the agricultural industry believe that the changeover stemmed from poor harvest yield due to drought, prices below production cost, and low prices for the crop.[59] Importantly, they also highlighted two significant policy changes for sugar. First, a sugar tax was implemented. In 2019, the Thai Excise Department enacted an excise sugar tax on sweetened beverages produced in Thailand.[60] This tax aimed to reduce sugar consumption and promote health awareness. To avoid this tax (which the department plans to increase over the next few years) many beverage manufacturers decreased production and reformulated their products to include artificial sweeteners–thereby bypassing the sugar tax. The beverage manufacturers' avoidance of the sugar tax was influential. In 2018, before the tax was implemented, demand for sugar from these manufacturers declined 15 percent when manufacturers reformulated their products. This type of taxation is growing increasingly common globally, as countries encourage their citizens to make more health conscious choices.[61–64] Second, Thailand ceased to control domestic sugar prices and eliminated sugar export quotas. This change reshaped the sugarcane supply chain and resulted in a decrease in the export price of sugar because the export price was associated with global markets.[58]

Tobacco farming in Thailand

In recent years, the Thai government has been promoting anti-smoking campaigns towards Thai people due to health concerns, economic burden, and environmental degradation.[65] The government has increased the current cigarette tax from 20 to 25 percent for cigarette prices lower than 72 baht per pack. For cigarette prices higher than 72 baht, the tax will be 42 percent. This law was enforced starting in the beginning of October 2021.[66] As the product price increases by government taxation, the demand for the product may decrease. The Tobacco Authority of Thailand (TOAT) is forecasting that cigarette production will reduce from 28 billion to 18 billion baht.[67] TOAT purchases a quantity of tobacco directly from farmers at a fixed price each year. Because of the decline in cigarette production, tobacco farmers are concerned about a possible decrease in their quota and the price of tobacco that the TOAT promises to buy.[68] The decline in the tobacco market is anticipated to upset tobacco farmers. Researchers that study tobacco and tobacco-use policy argue that, with Thailand's new growing regulations, tobacco farming will not be a sustainable livelihood. They suggest that for tobacco farmers to make liveable wages in the future, they will need to transition to growing other crops.[69]

Excess commodity crops

Thailand's agriculture sector comprises over 30 percent of the country's entire labor force.[15] Thailand is currently facing an oversupply crisis for agricultural products such as rice, corn, and cassava. According to the president of the Thai Rice Exporters Association, Mr. Chookiat Ophaswongse, the production of milled rice was predicted to reach 20 million tons in 2022, causing the price to fall and making rice less competitive for exportation.[70] In 2021, the price of rice dropped by 35 percent. The global corn price is predicted to drop by 10 percent every year due lower demand from Asian countries.[71] This prediction was calculated based on various factors, including the price of fertilizer, refrigerated container price, and weather conditions. As a result, corn production is expected to decline by four percent in 2022, due to farmers switching to more profitable crops as compared to the high production cost of corn. As for cassava, although domestic consumption is increasing, demand from China is declining as China has planned to utilize domestic corn for animal feed and ethanol production instead.[64]

Thai Farmers' Views on Contract Farming

The interviews with Thai farmers were essential in gaining insight on the feasibility of the business venture with ESG. The team reached out to a total of 20 farmers. The team sorted interview data by each farmers' primary crop due to the wide range of crops grown. The crop types were split into six main categories. The distribution of primary crop types grown by the interviewees is shown in Figure 6.

A quarter of the interviewees already grew hemp or marijuana. While ESG indicated a greater interest in non-hemp farmers, the handful of interviews with hemp and marijuana farmers still allowed for insight on this particular agricultural sector in Thailand. Over half of the interviewees grew rice, tobacco, or sugarcane, which are all crops that ESG initially specified interest in. Two-thirds of those interviewed farm on more than ten rai. The data from the interviewees with smaller farms were still used in all analysis.

Tobacco and Sugarcane Farmers are Interested in a New Crop

Although the farmers from our interviews were concerned with switching crops since they lack knowledge on hemp, many of them are still interested in growing it. Of the crops grown by farmers interviewed, tobacco is the most promising as an industry to switch farmers from. All four of the tobacco farmers interviewed showed interest in switching to hemp. Further, the team found that financial stability is important to the farmers - including getting paid on a regular basis. One interviewee, K' Supan Goson, specifically mentioned that farmers currently only get paid once a year, and they are forced to grow other crops to keep up with expenses. ESG expects to have two grow cycles per year, doubling how often this farmer would be paid.

All three sugarcane farmers interviewed showed interest in switching crops, and they would greatly benefit from switching to hemp specifically. Overall, cultivating hemp is easier than cultivating sugarcane. Hemp only needs six months to reach full size (compared to a year for sugarcane) and it requires less water. Additionally, harvesting hemp is easier due to the smaller stalks, and it does not need to be replanted.

Five rice farmers were interviewed, but none of them showed interest in growing hemp for different reasons. One farmer referenced a lack of trust in large companies, while another expressed their fear of the hemp industry and changing regulations. Another farmer mentioned problems with their own resources, such as the inability to commit to farming full-time. None commented on financial concerns.

While some reservations are solvable through further discussion with ESG, our findings overall show it is less promising to switch rice farmers to hemp contract farming. Compared to rice farmers, tobacco and sugarcane farmers are more concerned with the switch to growing a new crop. Our lack of knowledge on hemp cultivation was likely detrimental to our interviews, but more information can be provided by ESG in the future to farmers who are interested.

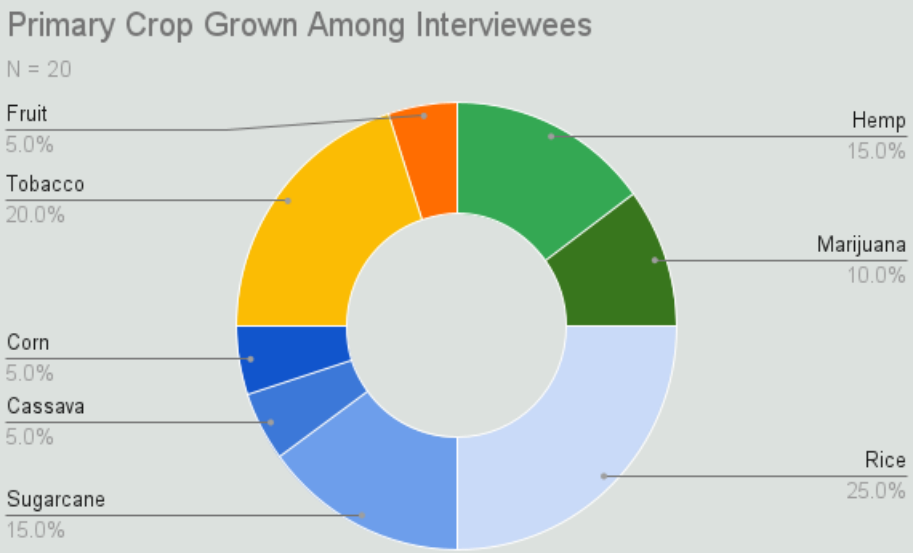

Figure 7. Primary crop grown among interviewees. Cannabis species are displayed in green, excess commodity crops are displayed in blue, and all other crops were assigned random colors.

Evidence from interviews provides several insights into the farmers

The content analysis yielded several useful insights about the farmers that were interviewed. In Figure 6, a conditional distribution of hemp and non-hemp farmers across ten questions is shown (i.e., analysis organized

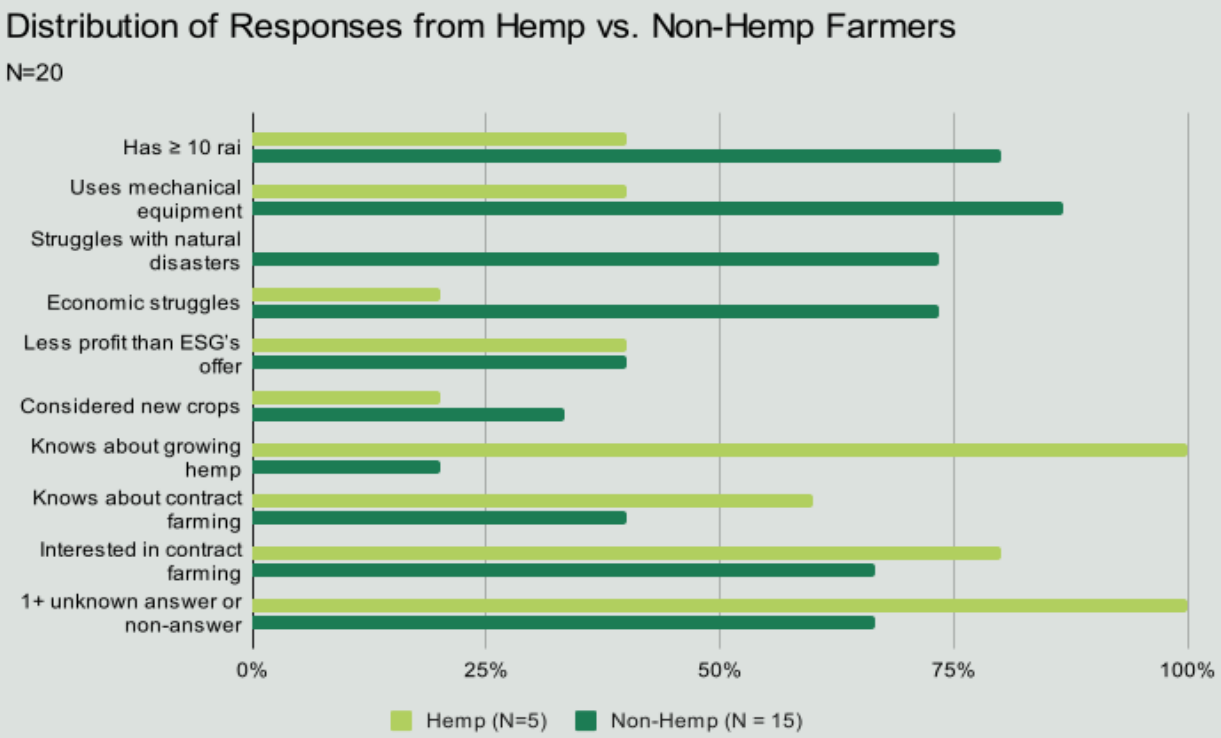

Figure 7. Distribution of responses from hemp and non-hemp farmers for the content analysis questions. Marijuana farmers were categorized as hemp farmers for this analysis.

by the two crop categories). This is a general representation of the positive responses from the hemp and non-hemp farmers.

Figure 7 indicates several general themes. In this data set, the non-hemp farmers tended to have farms greater than 10 rai more frequently than hemp farmers and similarly, more frequently had mechanical equipment to aid in the upkeep of the larger farm. Additionally, more of the non-hemp farmers that were interviewed reported economic struggles than the hemp farmers.

The bottom row represents the presence of one or more unknown answers in a particular interview, meaning a farmer did not give a clear answer to a question or did not answer the question at all. As can be seen in Figure 7, the majority of the interviews did not yield enough information to answer every question for this qualitative analysis. The missing data was accounted for in subsequent analysis and is further considered in the Discussion section.

The Majority of Farmers are Interested in the Contract Farming Model

While attempting to gauge interest in contract farming, the team restricted the analysis to farmers with more than 10 rai (~4 acres) to satisfy the size criterion set by ESG.

As can be seen in Figure 8, both hemp farmers and seven of the twelve non-hemp farmers are interested in the contract model. Of the non-hemp farmers, the ones who were interested currently grow sugarcane or tobacco - which supports ESG's particular interest in these declining agricultural sectors. The five non-hemp farmers who were not interested all grow rice.

The team found that about 73% of non-hemp farmers that were interviewed experienced a negative effect on their crops due to natural disasters such as drought. Switching to growing hemp could alleviate some concerns regarding natural disaster as the hemp plant is more resilient to dramatic condition changes compared to traditional crops.

The team compared farmers' interest in the contract farming model with their struggles regarding natural disasters (e.g., floods, droughts, etc.) and the economy. The data in Figure 9 shows the interest in contract farming given, adversities faced, and is organized into hemp and non-hemp categories. The two questions of the content analysis relating to adversity ask whether the farmer reported negative experiences with natural disaster and whether the farmer was negatively affected by the economy.

As shown in Figure 9, the majority of the non-hemp farmers who were interested in the contract farming

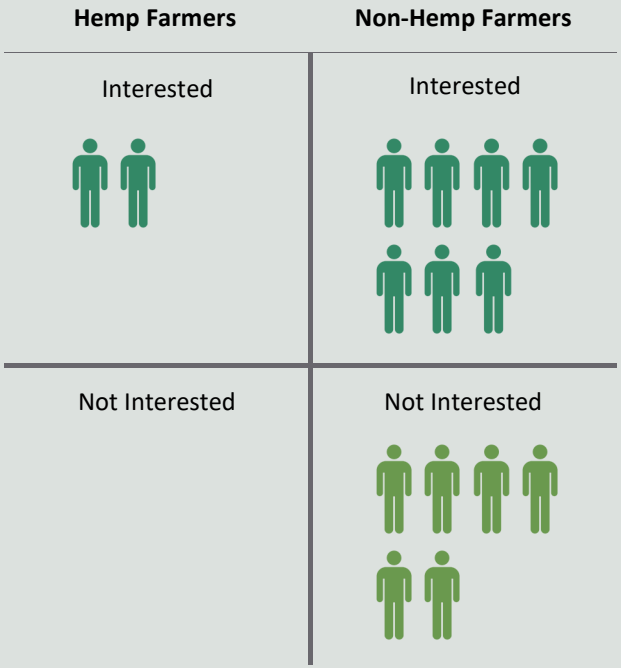

Figure 8. Distribution of interviewed farmers who have ≥ 10 rai and their interest in the model - organized by hemp and non-hemp (N=14).

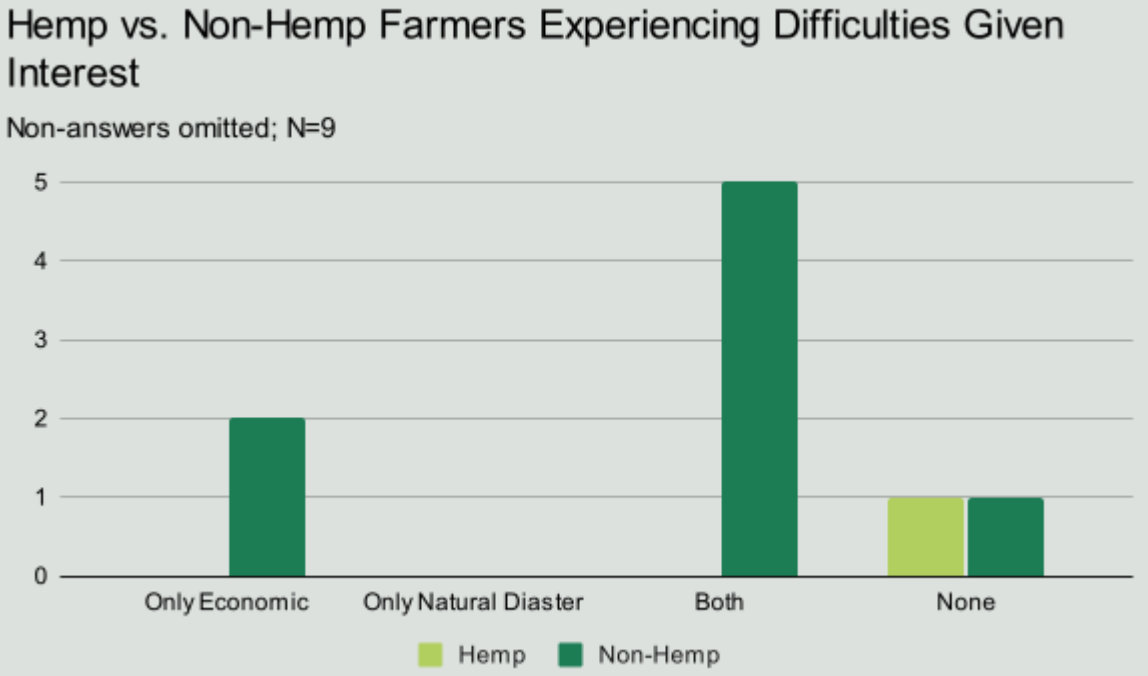

Figure 9. Difficulties that interested farmers have experienced.

model also struggled with either the economy or natural disasters. Five of these non-hemp farmers struggled with both. Of the five hemp farmers that were interviewed, only one specifically answered "No" to being affected negatively by natural disaster - the rest of the hemp farmers did not answer this particular question. Across all interviewed farmers, the economic struggles were most commonly attributed to price fluctuation and production costs. In this particular analysis, non-answers were omitted from the data set because any conclusions made with the missing data would introduce potentially inaccurate assumptions. Due to the sensitive nature of the question, only a handful of the farmers that were interviewed shared details regarding their financial figures. For the proposed contract farming model to maintain feasibility, all parties involved must earn more money than before. With the small data set, the team was able to find that about 86% of farmers with more than 10 rai and who reported net income figures make less than what ESG can offer.

The Proper Handling of Data is Essential to Analysis

The content analysis strategy of organizing and analyzing the data was powerful but not without flaws. In the implementation of content analysis, the team created a binary dataset corresponding to the answers of the various yes-or-no questions. In doing so, inherent bias was introduced to the study because non-answers to the questions were treated as "no's." Drawing conclusions under the assumption that the dataset was complete can lead to erroneous analysis and biased results. The proper handling of missing data was important to making conclusions that were as accurate as possible. The team considered various handling techniques that are common in scientific studies. In distributions such as Figure 9, the data involved was deemed complete such that analysis involving these questions did not need

special treatment. For other questions with particularly incomplete datasets, non-answers were omitted - otherwise known as case deletion.[56]

Helping Farmers Switch Crops Requires Substantial Investment

As the farmers cited the company's support as one of the reasons to enter into the contract, it is important for ESG to continuously provide resources to ensure the farmers can produce the highest quality crop possible. We recommend both educational and economic support by providing knowledge on hemp cultivation and the financial means to begin producing hemp.

As many farmers were most concerned about learning how to grow a new crop, having continuous support throughout the cultivation process is important. One farmer specifically expressed the concern that ESG would assist in starting to grow the plant, but once it began growing, the company would leave the farmer to grow it themselves. Educating farmers on how hemp should be grown to withstand natural disasters is also important, as the threat of climate change becomes more prevalent in our world.

Farmers also need machinery or tools needed to plant, cultivate, and harvest hemp. Of the fourteen farmers interviewed with at least ten rai (four acres), all but one already owned farming machinery. The one farmer without machinery borrowed from the factory they sold tobacco to. Machinery is important to the proposed contract farming model because according to ESG, the amount of hemp grown would be difficult to harvest by hand. ESG also stated the company could coordinate shared use of mechanical harvesters between farmers who have them and those who do not. This is beneficial for ESG because they can focus on supporting farmers through other means, such as security measures or education on hemp cultivation. Education, material, and financial assistance proves to farmers that ESG is committed to the partnership and will make growing hemp more successful.

A trusting relationship between ESG and farmers is necessary

Additionally, to ensure that the farmers understand the full extent of ESG's support, the contract should be fully discussed with farmers before it is signed. It is important that the farmers understand all terms of the contract, including amount paid for crops, so that ESG appears as transparent as possible. Professional representation from the company directly communicating with farmers will prove to farmers ESG's commitment to a partnership that will benefit everyone involved.

Another important aspect of a successful collaboration between ESG and farmers is commitment to building a trusting relationship. One of the interviewees explained that they trust the government more than large companies because companies have not upheld contracts in the past, often paying the farmer less than they promised. Collaboration between the government and the company will help farmers build trust with ESG, due to the Thai government's promotion of hemp farming and their ultimate authority regarding the plant. Finally, one interviewee recommended that the company convince leadership figures such as village headmen to promote the business model, as they already have established relationships with farmers. The team also talked to a village headman who owned three rai (~1.1 acres) of land, but knew of farmers from the village interested in growing hemp that have at least 100 rai (~40 acres) between them. Establishing communication with authority figures such as government or village headmen will also reassure farmers that ESG is a trustworthy company.

With the current sample of interviews conducted, these are suggestions and possible solutions to implement as ESG seeks out their ideal candidates for contract farming. Based on the data, building strong relationships with farmers and providing comprehensive support will produce the most successful and mutually beneficial business model.

A contract farming model has serious risks, including bad relationships and low yields

The interviews with farmers revealed potential risks in enacting a new business model for agriculture. In one interview, we talked to a farmer who had previously contracted other farmers to sell to them. They had stopped this practice for a few different reasons, but the main one was the farmers selling to him were untrustworthy. The farmers working under him would sell the seeds given to them, plant their own, then lie about their yields to sell to competitors. The interviewee mentioned farmers lying about natural disasters occurring, when they actually sold their crop to someone else. However, the experience of this interviewee does not represent all Thai farmers, and other interviewees thought the companies were less trustworthy, not the farmers.

There are also inherent risks of growing crops outdoors, as very wet or very dry weather can both harm crops if

they persist, and natural disasters always pose risks. One of the four sugarcane farmers reported weather negatively affecting their yields, while all four tobacco farmers reported negative effects on their yields due to weather. Since hemp is more resilient than sugarcane or tobacco, it is more likely to survive severe storms during the growing season, meaning farmers are more likely to have consistent yields. Furthermore, ESG should be aware of the region in which the new farms will be located, in the case that a certain area may be prone to flooding or drought. Under ESG's proposed contract, natural disasters are a business risk for ESG, not the farmer, since ESG will still pay the farmer the same amount based on the amount of land, while ESG receives a smaller yield.

While there are major risks to consider when implementing a contract farming model, for possible stakeholders involved, the benefits outweigh the risks. It is ESG's responsibility to minimize the risk to farmers and build a strong relationship that is beneficial to both the company and the farmers.

Conclusion

As a result of this project, Eastern Spectrum Group will be better prepared to address the needs of Thai farmers who are suitable for contract farming and have better business practices when beginning in this new venture. The findings of this project include ESG's plans for a contract farming model and Thai farmers' current attitude towards contract farming based on the limited sample of interviews we conducted.

If successful, the contract farming model will mean that ESG is able to help farmers grow hemp as a new cash crop in Thailand. With the support and proper growing methods supplied from ESG, farmers can expect to have steady incomes on a per rai basis, regardless of the yield and quality from their farms. Long-term contracts from ESG will allow the farmers to become adept at hemp farming, so even when the contract ends they will be able to make a living for themselves off the crop.

There were a few farmers who had already been cultivating hemp or marijuana and made more money than ESG is able to offer. The goal of the cooperative farming model is not to offer the greatest profit of any competitor, but to help create a stable yet lucrative business. ESG is offering many additional benefits outside of the profit per rai, such as the seeds, income security, and expertise. There are farmers in Thailand who would benefit greatly from a new venture with ESG, but those already in the hemp and marijuana industry are not as viable for ESG to pursue.

In summary, contract farming is a stable solution proven to help farmers in poverty. ESG has shown their commitment to farmers by looking to establish this new venture. The company believes that farmers who possess at least ten rai and grow non-hemp crops would benefit the most from this business model. According to interviews with Thai farmers, the majority of farmers who fit ESG's requirements are interested in a contract farming model with ESG.

Lastly, based on concerns raised by the Thai farmers and evidence from case studies, companies that provide financial and material support as well as build strong relationships of trust with the farmers are the most profitable. By putting into practice those values, ESG will be successful in both expanding its production and effectively supporting farmers.

Figure 10. Field trip to tobacco farm in Ban Phaeng.

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