

Project Name: Organic removal of weed

Team Members: Hasib Ashan Nadeem, Prashant Neopane, Chavakorn Srisopha, Paing Hein Htet

Facilitators: Hazwan Razak, Pattamaphon Dumnui

Background information

Agriculture is the livelihood in Thailand, and that is apparent in our design focus area. Baan Hang Wao. Baan Hang Wao is situated in Sisaket province, eastern part of Thailand, with a population of approximately 200. Majority of the village residents is Lao native speakers and able to speak Thai language at different levels of fluency. Rice is the main crop in the community, with some members of the community raising chickens, ducks, cows, buffalos and pigs. Apart from farming, other types of jobs include working in the construction sector and weaving silks.

There's a total acreage of 1,087 rai In Baan Hang Wao, and 103 households. The average land distribution is 10 rai per household. The average amount of harvest per rai is around 500-550 kg but the exact output is uncertain as only a few farmers keep record.

Through the network of IDDS and information sharing, we were able to gather information from the facilitators who had been in the community for quite some time who were researching on the matters. Farmers in the community face challenges similar to those in the Indochina countries. The original problem framing brief we began with was the paddy drying problem, stated as "farmers [in Baan Hang Wao, Sissaket Province, Thailand] have identified drying rice as a challenge because they don't have space to dry it outside and the process is subject to weather." Solutions are required to solve this problem given the willingness of the farmers to try out new ideas.

Gathering Information

Given the background, we started interviewing members of the community. Through open ended and direct questions, we inquired on the main challenges farmers face, starting from sowing the ground to the post harvesting process. Farmers were asked to list the stages of farming and problems associated with each stage. When the problems were stated, the "5 whys" method was used to dig into details. We also used the method OAT – "Observe, Ask, Try" to identify problem that can be acted on.

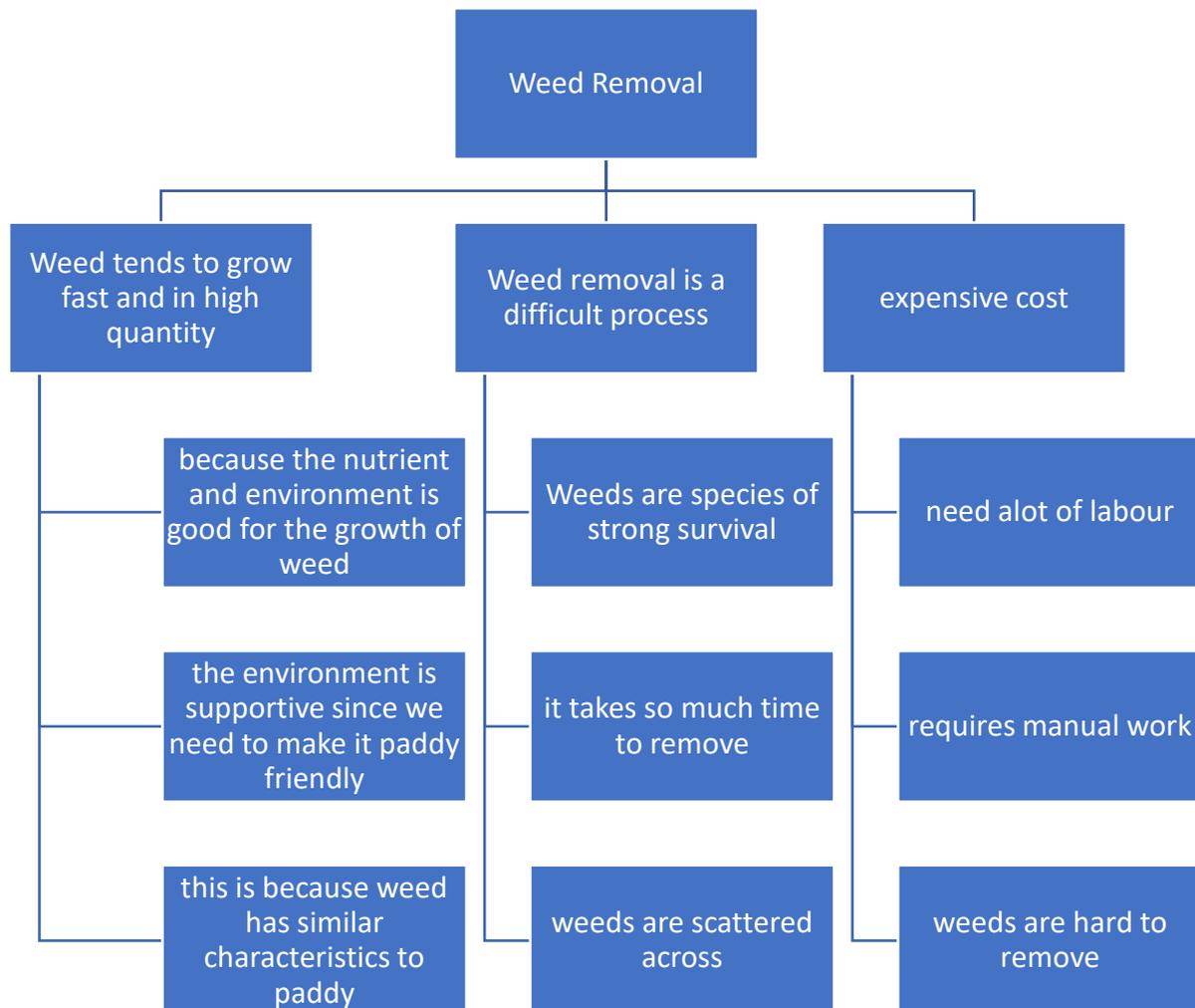
The initial research shows that the challenge to dry paddy is not much of a problem for the farmers as there exist solutions. Out of all the interviews we had, only one respondent answered that paddy drying is a problem, although it is on a minor scale. The paddy drying itself is not a problem. Instead, the labour, indirect cost and time involved is more of a problem. In addition, farmers went on to respond that they already developed solutions to overcome the challenge which include drying the paddy on the road.

This is the case because we arrived when paddy is not harvested. Therefore, we were not able to do direct observations. We started our interviews in the month of July and harvest only happens at the end of rainy season, from September to October. Conducting interviews at a different time in the year could have affected the answers.

Reframing the problem

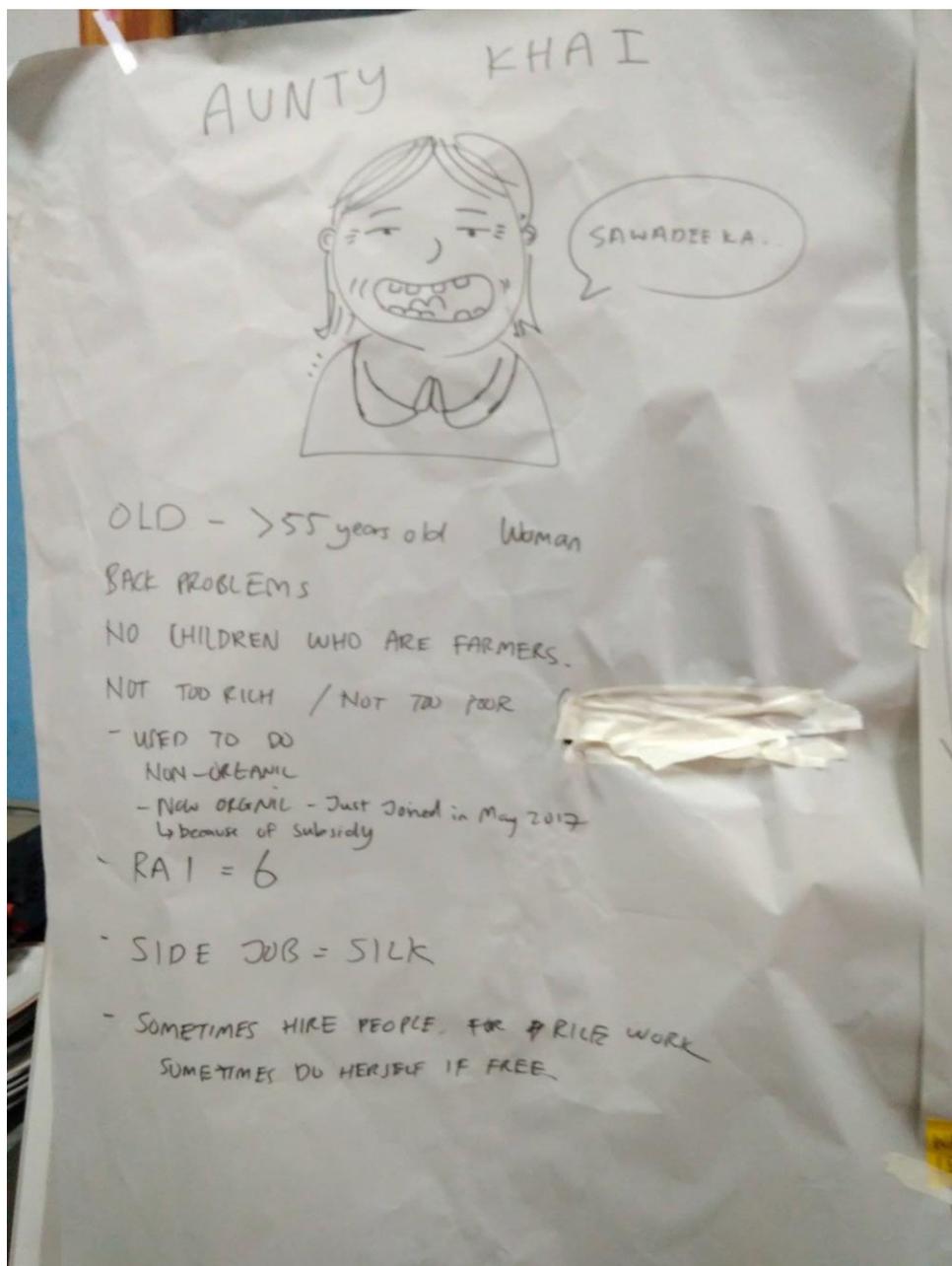
Throughout our interviews, we highlighted the main challenges that villagers faced and they concentrated on three themes– weed, cost of inputs and labour problems. These themes ultimately directed our approach towards the focus on the weed problem. By the consensus of the group, we decided to focus on the weed problem because we believe it has direct relations with the productivity of the rice field. When farmers have the tools needed to be more productive on the farm, more time can be saved to involve in other industries and take on side jobs – like silk weaving -- to generate more income. Prototyping is attainable within the conference time, unlike other problems that could require longer time and deliberation with varying levels of stakeholders.

Below is the problem framing tree that guided our thinking.



Given this problem frame, we came up with the PATH statement – Weed is one of the major problems for rice farmers, especially organic farmers who prefer non-chemical usage. Current weed removal method in Baan Hang Wao is manual and labour intensive, which severely burdens elderly farmers and creates health problems such as back pain. To solve these problems, our team is developing a low cost solution which reduces labour in weed management and help farmers to maximize their yield for better livelihood.

Please refer to the picture below to see the User Persona, which we used to describe and provide the targeted solution for the intended user.



Out of all these we narrowed down to post planting weed removal method that is to use the weed cutter.

Co-creating a solution

In South Asian and South East Asian countries, given the experiences of the team, weed removal tools are readily available in the markets and can be easily bought. However, in the community area, there is only one farmer who owns the tool and he does not use the tool because it is heavy, lack of mobility and certain effort is required to be exerted. It is still cost-saving and time saving for him to hire labour and cut the weed or manually pull out the weed. On a larger scale, we believe that farmers are not using the tools because they have not enjoyed the immediate benefit of removal of tool. It is more of a routine to take off the weed than of an urgent matter.

Herbicides are also readily available for non organic farmers. However, through our respondents, non-organic farmers are less willing to use herbicides for the concern of their health. Later in the course of the process, we also discovered that non-organic farmers are willing to switch to organic farming if there are organic methods to eliminate the weed.

Our ideation session used the methods of meshing, brainstorming, categorizing ideas and focusing on producing as much as ideas without any judgements. In the end, we prioritize and categorize ideas that have potentials.

After framing our problem and initial ideation session, we came up with these ideas which can be seen in the photo – and the ideas finally came down to – motorized spring weed cutter, nylon net with sharp teeth, double blade weed killer, and pumped weed removal tool.

Through the engagement with the community on the showcase day, we received great help from one lady – a local farmer – Auntie Pao. She was originally one of our interviewees and on the day after our team members explained the idea to her, she was enthusiastic about the potential.

Throughout the showcase, Auntie Pao was a “bridge” between our team and the members of the community. She communicated our ideas and advocated for execution of the idea. This has led to the buy-in from the community where most of the attendees are excited in trying out our very first prototype. This incident has shown that farmers are interested in co-creating solutions with us. The underlying reason could be that we are tackling a burning issue faced by many community members. The sentiment to overcome the challenge is strong. Additional reason is that weed problem has been a barrier for non-organic farmers to convert, and our solution served as a great motivation for them to upgrade their farms.

After the showcase, we decided to prototype the double blade weed killer for

Prototype

With the help of IDDS design facilitators, we were able to spend our time in workshop fully equipped to build our prototypes.

Before building the prototype, we brainstormed to list the design specification that would help us in building the frame of the prototype. Below is the table,

Criteria	How to measure	Units
Easy to build	Time	6 hours
Weight	Kilogram	5 kg
Mobility	Steps	2-3 steps taken to execute
Low cost	Cost of making it	Less than 500 baht
Size	Height of the tool	1 meter
Waterproof	Not corrosive by water	plastic
Does not affect rice	No rice is cut in the process	N/A
organic	Does not include chemical components	No chemical use
Reduction of manual work	Difference in time spent on removing weeds with and without the tool	Time difference for removing weeds in the same size of plot

Based on these design specifications, we came up with the prototype.

The objective behind the double blade weed killer was to effectively remove the weed without the need for the user to bend over and can be easily push or pulled in the paddy field while maintaining the weight to be as light as possible. The design is inspired by similar weed removal tools from African countries and Cambodia.

The main components of the tool are the blades. Each blade is attached to a double layer of lightweight wood which are then conjoined by metal connectors. Through the metal connectors, the wooden rod is extended to the metal handle bar, recycled from an old bicycle.

After building the prototype, the tool was taken out into the field to test. Several shortcomings of the design were noticed which were

- i) the tool tends to get stuck in the mud and it's hard to move forward
- ii) the tool is heavier than expected

and we took back the tool to the workshop to redesign it. The changes were to put the PVC as shown in the photo to allow buoyancy of the tool to be able to move forward. The metal connectors are also shortened to reduce weight and the teeth are grinded to be wider and shorter in length to prevent them from clamping against the soil. After the 7th iteration, we achieved the final prototype which could do its job while maintain the design requirements.

Throughout the prototyping, community members are continuously welcomed and are encouraged to provide feedbacks the usability and feasibility of the tool.



Lesson Learned

The community provided positive feedback as they were impressed by the usability of the prototype. The prototype we eventually produced was light-weight due to lack of wheels and easy to be carried around. The only major drawback is the initial force needed to get the weed killer moving (the tool was much easy to push around once it starts moving), which makes it harder to operate for some.

One thing about working in a small town that we did was to respect and include local opinions as much as possible. The local farmers, a.k.a. our users, were the ultimate judges for the effectiveness of the tool, so including them in the process of brainstorming and prototyping can greatly increase our success rate. The same strategy applies in many scenarios when people from outside of the community want to create something of use for a small community like Bang Haan.

This design process has been particularly eye-opening for all our team members because we come from very different backgrounds, and have various level of comfort with expressing ourselves in English. Surprisingly, language barrier did not hinder the effectiveness in communication. By having the same goal and being equally motivated, we can focus more on the process and strive to understand each other better and not having the difficulty in language stand in our way of achieving the goal.

Next Steps

Even though our prototype received positive feedback, we unfortunately don't have a viable next step for mass producing or putting our prototype into wider use, because the manufacturing of our prototype is not scalable. The materials, especially the material for the teeth of the cutter, cannot be locally sourced and requires advanced tools to make.

As mentioned above, there are other products in the market, organic or not, that could achieve the same effect of killing weeds. Many farmers have opted to these cheaper and more accessible products, which makes producing a new product to compete with existing ones a much more difficult task.