Exploring Asset-Based Community-led Development (ABCD) Elements for Determining Farm Technologies in Rural Rice Farming Community – Kelabit Highlands, Sarawak

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ABSTRACT

Malaysia is a net importer of rice, and Sarawak itself contributes approximately 8.2% of total national rice production. Although Malaysia's national policy is targeting to achieve 80% self-sufficient level of rice for national food security agenda, another alternative is to explore some premium quality traditional rice varieties that potentially entering into premium market for the socioeconomic advancement especially for the rural areas. Traditionally, the choice of farm technologies is implemented through government direction in a top-down approach, through decisions, strategies, and diffusion processes driven by the agencies. This study aims to explore the elements of Asset-Based Community-led Development (ABCD) as an alternative to conventional needs-based development within a community of rice farmers based in the Kelabit Highlands – a rural community in the highlands of the East Malaysian state of Sarawak. The study collected interview data from rice farmers in the Kelabit Highlands and also discussed the role of agencies and their efforts to form partnerships, and peer collaborations based on those assets identified and community strength. The study also evaluated the ABCD framework as a means to visualize community-based assets. Clarifying these factors would identify suitable farming technologies that are socially desirable in the Kelabit Highlands and determine a bottom-up method for other rural communities to evaluate and pave a path forward in selecting farming technologies that fit into their landscape.

Keywords: ABCD, bottom-up, farm technologies, rice farming, top-down

INTRODUCTION

The community in the Kelabit Highlands of Sarawak has a tradition and reputation for supplying organic, artisanal rice for the population of Sarawak and has been well received as an export product in other parts of Malaysia. Malaysia is considered net importer of rice, with self-sufficiency level (SSL) of between 60% - 70% for rice in year 2016, and approximately 200,000 farmers actively cultivating rice across country. Despite the sizeable gap in reaching self-sufficiency, the study also showed that there is a greater urgency to sustain the farmer's livelihood than achieving 100% SSL for Malaysia to prevent the industry from collapsing (Omar et al., 2019).

Table 1. Rice Production in Malaysia (Omar et al., 2019)

Year 2016	Population	Production		Consumption		Area Harvested		Rice yield	
	Thousand	Million MT	Average Annual Growth (%)	Million MT	Average Annual Growth (%)	Thousand Ha	Average Annual Growth (%)	MT/Ha	Average Annual Growth (%)
Malaysia	31,187	1.8	1.62	2.7	1.75	700	0.03	2.5	1.60

A prior study discusses the role of climate change affecting the livelihood and profitability of the rice farmers, which necessitates adaption and mitigation of rice farming agriculture practices (Firdaus et al., 2013). Agencies such as the Malaysian Agriculture Research and Development Institution (MARDI) has the agenda to focus on farming technologies in rice farming research to tackle those challenges in Malaysia (Rahim et al., 2018). It has also been mentioned that for Malaysia to move towards a growing, equitable and sustainable rice industry, one of the key points is to empower the farmers by using eco-friendly paddy and rice production, technologies are one of the keys to move forward (Arshad et al., 2021).

By looking at any elements of ABCD approach that exists in the rural rice farming community and possibly the approach that can strengthen the bottom-up or grassroots movement in the choice of faming technologies to complement top-down approach that preferred in this industry by most agencies in current Malaysia rice farming landscape.

This study is guided by the concept of ABCD approach, which highlights the identification of resources in local residents, associations, local institutions, places, exchanges, and stories to determine the elements in a community that can be executed, that required outside assistance or that required outside services. The ABCD approach was used in a wider setting, asking questions relating to enabling health, assuring security, stewarding ecology, shaping local economies, contributing to local food production, raising children and co-creating care (McKnight et al., 2018). However, these elements are specified in the field of rice farming for the purposes of this study.

It is a conventional practice that the agencies, namely government, institutions, often implement need-based community development where it is highlighting what is lack in the community, rather than what is abundant in the community, and the agencies usually has a set of deficits calculations to evaluate a community what they need from the agencies. Often the knowledge transfer of any areas is disseminating via top-down approach by so call "expert knowledge" to the defined distressed communities.

Table 2. Comparison of ABCD Sensitized and Non-sensitized Community (Nel, 2020)

Themes	ABCD sensitized communities	ABCD Non-sensitized communities
Relationships with stakeholders	• Has positive relationships with stakeholders from outside • More power within communities	• Top-down in nature. Fund dependents • Government did not show an interest • Limited cooperation with stakeholders
Networking and partnerships	• Learning partnership, equal basis • Decisions were made democratically • Focus first on internal assets and capabilities to be utilized	• Did not network with external organizations (only with the purpose of obtaining resources and funds) • The leaders of organizations drove the process and responsibilities
Funders	• Driving own developments, determine the rules of the partnership with funders • Invest own assets first, generate own income • From dependent to independent	• Driven by fund received.
Entrepreneurship	• Informal businesses established. • Work together, share resources	• Less sustainable and independent businesses

ABCD approach is often associated with the community development. This framework is to investigate if ABCD approach can potentially an important element in determining the farm technologies in the rural rice farming community.

LITERATURE REVIEW

Traditionally, technology adoption and technology diffusion are implemented with top-down approaches. The decision, strategies, planning of the technology adoption and diffusion processes are driven by related agencies. The top actors introduced the technology, the strategies of how the technology adoption and diffusion should be implemented, which often has questionable success rate for the user groups, largely depends on how the whole process being deployed by the top actors . It is also such technologies are not easily accessible by the user groups largely because of the cost incurred, the scale of the technologies (Eneh, 2010). In another study it is also evident that top-down approaches are restricted from achieving frame alignment among participants for the innovation adaptation to flash flooding for rice farming in Bangladesh (Kamruzzaman et al., 2022).

This study explores the Asset-Based Community Development (ABCD) approach in determining farm technologies in the community. The ABCD approach explores the strength of the community. It focuses on finding the assets in a community on their own individuals, associations, institutions, gifts, skills, capacities, get their ownerships and looking at outsiders' help or assistant, it is a grassroots initiative (McKnight et al., 2018).

A study shows that an ABCD-sensitized community tend to become self-motivated, self-driven, self-organized in the initiatives and projects. The community determined their directions of the community development by emphasizing on their existing local assets. The external actors act as learning partners, co-investors and co-creators of wealth, all actors inside and outside the community are in the equal positions to decide the community development. On the other hand, non ABCD-sensitized communities tend to rely on funds and assistance from institutions, agencies that change the community according to the agenda of the agencies. This shows that it is always not sustainable and thinning out slowly (Nel, 2020). ABCD-sensitized community gets empowered, the mind-set and attitude change in the community to take control and awareness of what assets they have, and the change and transition will be localized to their strength to incremental the changes and development. In the non-ABCD community, problem-based approach, the community is bound by the system, program that designed by the policymakers, institutions that might not be able to fit into the community context (Pretorius et al., 2012).

The ABCD approach is widely accepted by practitioners as a way to develop sustainable communities, compared to the need-based approach. It also indicated that for ABCD approach to function fully in the community, empowerment and development, the trust, social networks, relationship within the community and with the external agencies must be solid in order to build the peer relationships. This might be a weakness in underprivileged, disadvantaged communities that have loose internal and external social networks, that limited assets are evaluated and utilized (Harrison et al, 2019).

Rice farming is still under-researched and the effectiveness of modern farming still a question in the Kelabit Highlands in Sarawak (Omar et al., 2018). The study observes confusion in the community in balancing increasing rural income by adopting new technologies versus retaining old methods for the identity. This study considers the interaction between the actors of possibly bottom-up approach for more accurate farming technologies selections, as there are projects, programs initiated by policymakers that are not often able to be applied into the local practicality and usability, and consume unnecessary resources from the whole system (Omar et al., 2018). Clarifying these factors would identify suitable farming technologies that are socially desirable for upgrading farming technology in the Kelabit Highlands. Choosing the right farming technologies can possibly ensure food security, social health and sustainable livelihood of the rice farming community, especially considering the unpredictable environment with climate change. Diffusion of the right technologies localized into local landscape have been observed to have obstacles in Malaysia. It is one area that can mitigate the transition of this radical change and determine a bottom-up method for other rural communities to evaluate and pave a path forward in selecting farming technologies.

METHODOLOGY

This research used qualitative methods to capture the perspectives and experiences of rice farmers in the Kelabit Highlands. The use of qualitative methods also allows the study to capture a wider scope of ABCD elements in the community that derive further insight into the local nuances. The field research activities were carried out between February 2022 and May 2022. Two methods were used for data collection:
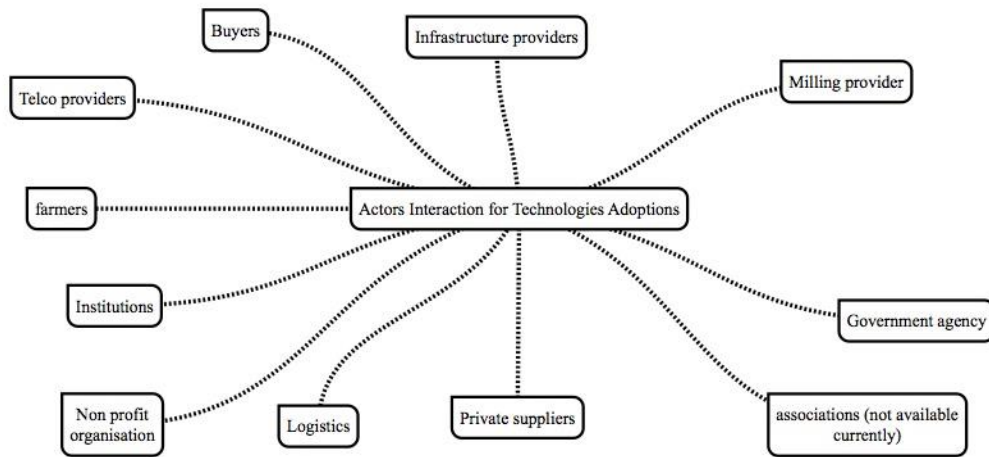
- Participants interview
- Field observations

Participants Interviews

Wide and open information was captured to further investigate the trends of interaction between actors, particularly opens the possibilities of any bigger picture of the whole social dynamic of the farming landscape. Open and partial semi-structured questions guided the interview sessions among the rice farmers. These were conducted with face-to-face interview, one-on-one or one-to-many approaches. Each interview session lasted around 45 minutes to two hours depending on the subjects discussed.

The interviewees were selected based on the connections and ties to the rice farming landscape. This research focused on the farmers' perspectives.

Figure 1. Farming Social Landscape

A few defined codes act as a guide, particularly the interviews were led by the following themes:
- Assets in the rural rice farming community
- Methods of rice planting in the Kelabit Highlands community
- Rice farming technologies
- Interaction with the agencies

The themes and definition of ABCD approach were explained to the interviewees. As a bottom-up approach, these guided the interviewees to think of the assets in the community.

The venues of the interviews were selected based on the interviewees' preferences, depending on their level of comfort. All of the interviews were done in the indoor settings to enable a clear audio recording session. All the interviews were recorded in audio.

Field Observations
Field observations were conducted to observe the farmers' activities and capture their social interactions, which can explain the elements of ABCD within the community. This method was done through casual verbal interactions, farming work interactions, as well as visual observations by the researcher.

This also enabled the study to capture the scenario. Observing activities happening on the ground explain the information from the participants interviews, especially for information that was not mentioned and worth to be explored further in this study.

Data Collections
A total of 10 face-to-face interviews were conducted in the first round among the farmers. A few community leaders or their social network were also asked for their opinions. Audio recordings were collected during all the interviews with consent from the interviewees. Different languages were used during the interviews, namely English, Bahasa Melayu, and Mandarin. All were transcribed and translated into English for further data analysis.

After the first round of interviews, field observations were conducted by the researcher for 6-7 months. The researcher was an active participant in the rice planting process and performed daily activities together with the community and observed their farming routines. Efforts were made to reduce any personal, sensitive opinions, or activities during the field observations to protect the privacy of the interviewees. Field observation data were recorded both in audio and written formats. These were used to complement the information from the interviews and to observe the changes in the period during the research timeline.

Following a reflection on the interview data, follow-up interviews were conducted to recapture and review what has happened during the period; and rethink the changes, the directions of the rice farming in the community itself. This reflection is to understand the activities in the community and making any possible directions of the technology adoption phenomenal.

Data Analysis
Inductive thematic data analysis was used with codes and themes loosely guided by the research objectives and research questions. Codes and themes were detected from the transcribed interview scripts and further grouped to form the basis of the analysis. The guided themes used during the interviews were also used to explore the interview transcripts, as well as observation data to further capture emerging or useful information for the research analysis. Microsoft Word and Microsoft Excel were used to perform the data analysis.

Study Area
Selected rice farming community: -

1.   Kelabit Highlands, Bario, Sarawak, Malaysia (GPS coordinates: 3.7445456079346733, 115.52343933455934)

Figure 2. Location of the Kelabit Highlands (Google maps)
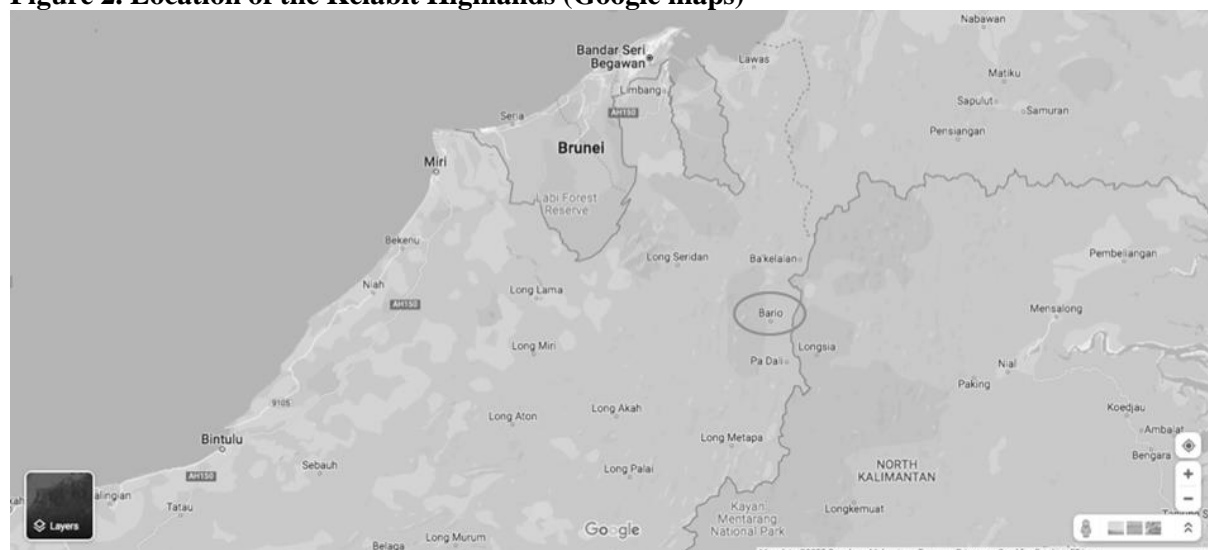
Bario is situated in the northern part of Sarawak, Malaysia. It is a highland landscape with an altitude of above 1000 meters, inhabited by a remote rural traditional rice farming community. The Kelabit Highlands set an ideal case study of both rural and traditional rice farming communities in Malaysia.

The Kelabit Highlands is famous for cultivating *Adan* rice variety that is considered premium in the market due to their unique environment, landscape, farming methods and history. The Kelabit has a long history of transitioning from hill paddy to wet paddy cultivation, a tradition by observing nature. Their own cultivation calendar is based on bird migration, moon calendar, as well as the seasons of the wet and dry (Janowski, 2004).

The Kelabit farmers cultivate rice once a year due to the slow growing paddy variety, which is the six-month variety. Each household has approximately 1 to 1.5 hectare of paddy field for cultivation and considered small-scale farmers. It is a community activity where all the farmers adhere to the agreed farming calendar. *Gotong-royong* activities are still observed in some villages, although some recently have been replaced by paid workers from the nearby Penan settlements or foreign helpers from the bordering villages in Kalimantan, Indonesia. In recent years, a service provider, a joint-venture of local and private company, provided farm services such as ploughing, harvesting, and spraying. They also provide contractors to work on farm infrastructures such as farm roads and irrigations.

Traditionally, the farmers will start clearing the paddy fields in May and they will work in stages throughout the planting months. All the work is done either by hand, bush cutter or ploughing machines. The farmers will soak the paddy seeds at the end of month of June, usually on 26 June or 1 July depending on the community consensus. Then, they cast the sprouted paddy seeds after 3 to 5 days of germinations, and leave in the nursery (*tapak semaian*) for a month until the seedlings grow to 1-2 feet tall. They will then transplant them to the paddy field in August to September. In January to February the following year, it is time for harvesting. After the harvesting, the paddy fields will be left fallow until the next planting season for another round of clearing and planting cycles. The farming calendars are chosen based on the indigenous knowledge passed down from generation to generation. although some farmers prefer to depend on scientific farming calendars.

With the constant changes in environmental, social, and economy activities, this rice farming community faces many challenges such as environment changes, climate change, labor shortage, demand vs supply, traditional farming vs modern farming, and their own food security in general within the community (Omar et al., 2018).

FINDINGS & DISCUSSION

The results of this study were presented based on the classification of the ABCD framework. This included insights from both interviews and observations of community interactions. The results were arranged according to resource view of ABCD, with the observations and discussions centered on artefacts that have been utilized in rice farming as well as the services provided by internal and external agencies. The discussion begins with those identified to be internal followed by those categorized as external.

Internal Assets and Services

The community in the Kelabit Highlands has been working manually on rice fields based on the processes and knowledge that have been passed down from previous generations. This was successful in building the artisan brand of Bario rice that garnered enough yield for export. These practices were the building blocks for the current community of rice farmers and their rich heritage, which have marked the Kelabit Highlands as a tourist destination for those keen to experience the village lifestyle in Sarawak's interior. Below are their narratives:

> 2011…so from 1964 to 2011 it was manual and the whole area was clear and then we even export rice. [interviewee 8]

> Looking at the farms, this is what I saw during my parents' time. They were full time. They were very good in doing the work the way they did. On top of that, they also get help from the Indonesians who come on a regular basis. [interviewee 1]

> Looking at this generation as you see. The elderly generation. The older generation who did the family. The whole Bario was cleared. It is like mechanized and but it was manual from 1964 up. [interviewee 8]

The traditional rice farming method translated to what is popularly known in recent years as organic/natural rice farming has its own following in large markets. Nonetheless, traditional rice farming also became a highlight tourist activity for the Kelabit Highlands.

> Advantage of traditional because we tourists like it yeah, and that that that contribute to the social economy and then it became a social economic. [interviewee 8]

There have been efforts to make the rice products more accessible to larger markets such as Kuala Lumpur or Kuching, the capitals of Malaysia and Sarawak respectively. But these efforts were not scaled up due to the limitations of the traditional methods. Most of the older generation prefer to practise traditional farming. However, that can be the barriers for the community to explore other possibilities of farming technologies and knowledge. Some machines were introduced to the community, yet the farmers choose to continue with the traditional method that is more suitable to their farming landscape.

> We have machine but don't want to use them because if we use the machine also the machine not able to go into the paddy field fully, the machine not able to, not suitable for the paddy field here, if the machine go in also is not fully serviced. [interviewee 4]

> Still the main older generation is still tell them you just stick to the traditional farming which is. So that's why we cannot move. That's why we are still bound by all laws. This is not good. [interviewee 5]

Gender equality has been observed to be a sticking point as the largely patriarchal community is inclined towards male leadership as opposed to an equal distribution of credit or responsibility. Nonetheless, the female workforce contribute a large part of the labour in the field from clearing, planting, field maintenance to harvesting. Thus, the female workforce has more practical skills and knowledge on the ground.

> But then we are telling the truth, the real story. The housewife is. Yeah, it's very simple. The housewife knows because they're practical, particularly the whole household. Even if you. Want simple? You should speak to the housewife. Instead of profession no. Yeah. Yeah, yeah. Do you think this is this is what? This could be true. [interviewee 9]

> There's nobody else there. There's no other woman. He always asked uncle to tell the story, not her. Do you swallow? First period, she's not confident in herself. One thing is, she's not a highly educated, probably that that what holds back her. [interviewee 9]

> Yeah, the confidence to speak up like that, but then. Well, but I guess she had more knowledge on these things because she went on the field. [interviewee 9]

> My mum not highly educated, that holding her back voicing out yet she has ground knowledge. [interviewee 9]

> Yeah, because it's been since our grandparents time our grandmother do the lucky nor my our mother then now ourselves, so it's all women doing the paddy field. [interviewee 9]

> Yeah, because looking at my what my mom did, my parents did. They were already full time doing the work. It's from dawn to dusk, dawn to dusk. [interviewee 9]

> The people who go in into the paddy field is the woman, but then the person would go for the dialogue is man. [interviewee 9]

> Get the farmers gain confident, and get trust from them, they will speak the truth. Cultural thing that don't trust woman. [interviewee 9]

Besides the women, there were new digital savvy young generation that were ready to be involved in the farming activities. This could bring a change to the current farming landscape. Nonetheless, a lot of them have migrated to the urban areas to find work and study. The farming community was hopeful that the younger generation would be enticed to return to farming activities if they can see the deployment of new technologies. They can also provide leadership through the exposure that they have gained from their studies or experienced in more technological advanced settings.

> Second, these are a new kind of leadership. Visual guide leaders. They sync with everybody with the community. The whole thing to do something. Do something for climate change. Now you know and then also impacting the younger generation because they are the digital duration [generation]. [interviewee 3]

> Yeah, if the young people who have access to the internet, they can get many ideas, and come back to Bario. [interviewee 9]

> I mean, if only we have young people, young farmers. Then they can easily adapt to what is going on. I mean they can be taught how to use the machine. [interviewee 9]

> If there is opportunities, she [daughter] wants to learn the machines, must learn. [interviewee 4]

> Not teaching me how to use the machine. If teach, of course I will learn. [interviewee 4]

> My daughter interested, even though is difficult, she really interested, even if next time she has to do traditional way, she still interested, another daughter not so interested. [interviewee 4]

The farmers realized that they can present their ideas and agendas to the relevant agencies. In situations where they lobbied for support to bring in certain machinery, the community observed the lack of any real follow through, as well as the lack of appreciation for grassroots challenges that are unique to the Kelabit Highlands.

> In the community have to do the proposal would have to write the thing. Have to give the proposal to the government. Government will consider. It's not them who do. The proposal for us for it to come, it has to come from us to give to them, then they will decide. [interviewee 3]

> There are many requests have been denied in in this many, many years. That they denied because of not in the government agenda. They don't want to consider. I think that's what it said failed me last time. [interviewee 5]

> There must be a reason why in the past they do that but never communicate, no use keep having dialogue. [interviewee 9]

> Thus, our so called authority ignore the people's knowledge of what they have learned. That's why I said always said. We have to combine all methods and the new method. I mean you have the truth indeed. [interviewee 5]

> We farmer community can bring up what we want, but the agency still depend on their masterplan. [interviewee 5]

> The agencies don't really listen to the farmers. The local told them, they don't listen. [interviewee 5]

The government should sit down and listen to the community, now they come in with a plan. [interviewee 6]

Yeah, they always think about technology and then all these engineering, yes. See, you have to. You need to look at who are on the ground, who is on the ground in the field. And who is who is going to do the work right? So you have to capture for that those people. Yes, bring machinery, yeah, They don't understand the family. [interviewee 9]

No doubt the like people who came in there. They're more familiar with the machinery. Is because it? Our engineers done. Theory wise, they understand yes. But you're not there, they're familiar with the. Their engineers, but then to use the thing we have to find around more practical person and then if you look for people like who's that actually they all, I don't know what's the background. Probably the background is just mechanical. Then maybe they have experience with. The technician or this long. Technical part of it. But no, but they don't know our, like the soil, I mean why our grandparents have been practicing like this since those days? There must be a reason. [interviewee 9]

There were voices from the rice farming community that, to progress effectively, farmers should be independent to move forward rather than following government agendas. However, this is also contended by some who feel that there is room for equal partnership with the local government.

The farmers have to be independent. If you want to do something, you have to go through government agenda. [interviewee 5]

Trying to self-sustain from government so that we don't ask for money all the time, else always loss. [interviewee 5]

It is good to work in peer level, hand in hand, instead of you must listen to me and follow me, or pulling down. [interviewee 6]

External Assets and Services

The interviewees that were approached for this study generally agreed that imported technologies would be beneficial, citing examples from Indonesia, Japan and other case studies. In particular, interviewees discussed the benefits of light weight and affordable technologies that were deployed in Indonesia that they knew of. In this case, the interviewees discussed the benefits of using machines that were not high maintenance and were suitable for the land types that were specific to the Kelabit Highlands, which would not be commonly found in other parts of Malaysia.

To me, Japan is a very high level that. I can say we have a huge gap. Long to go to that level. So, the closest to us is Indonesia, they have a kind of small machine that I think is cheaper compared to the big machine that they use. [interviewee 7]

There is technology out there that is not expensive but not promoted in Malaysia like India, Africa – diplomatic problem. [interviewee 1]

Somehow, maybe we need good leaders with a lot of exposure. Then personally familiar. I would like to see Malaysia actually buy. Maybe looking go visit Japan to just inspire me to do. And maybe China, Myanmar today. [interviewee 1]

Some did mention that there were service providers and government agencies that were active in searching for suitable technologies to be introduced to local farmers. However, there has been instances where such technologies were either not suitable or unpractical for the situation in the Kelabit Highlands.

Current machine not fit into landscape and not user friendly, machine now need to learn and need license. [interviewee 9]

When comes to design, not clear, the design not fit into farmers' landscape. [interviewee 2]

Same design trying to fit into all landscape. [interviewee 2]

That is one thing we have to look at. Sometimes the thing that the programmer right, but it's not workable in this place. [interviewee 5]

Not everybody can do that, but right now to move forward we have to find something that can that can fit, everyone can pick up. I mean everyone can use other user friendly or even like you know, like we use the hand phone. So anybody can use it. Even a person who doesn't know how to read or sometimes how to use the hand phone. Something like that the application. Maybe the kind of research they have to they have to do that. [interviewee 9]

Directions over every year during the traditional. All these like machineries because we just don't have the workers. For me, I can't move. Too much. And I have. Land abundantly. Actually to. So far I just cannot find anyone to help me on a regular basis. [interviewee 1]

No one is like during that time, no one is. Getting workers and paying workers. Totally without doing. Being involved in the work themselves. So, getting workers to work is just to supplement. Their own effort in the formula. So now it's more like we depend on them to do from a design that's a different. [interviewee 1]

But sometimes you need people who like who are practical. They have more knowledge compared to a person who is just on the book and looking out the window. Right? Observer, yeah, probably that is why she love. [interviewee 9]

If we can do it, why not other agency? Why, why not other institution? Why not the? Why not those are NGOs listen instead of coming in to give the mandate to give the manifesto?. [interviewee 6]

Example of handphone, people cannot read still can use handphone. [interviewee 9]

If there are ways that are easier, of course we want, is not that we don't want, you ask all the students, if they have technology, like don't have and still get us to do traditional. [interviewee 4]

Let's say with the mechanisation, did we solve our rice import bill? Did we consume local rice? No, we are buying subsidised like me. [interviewee 8]

Service providers and agencies have been actively involved in the local community but struggle with lack of support or human resource to properly service the community.

It is that they don't give us opportunities to use, like all the machines not functioning. [interviewee 4]

Capture people in the field instead of designing machine in the office, the agency don't understand the family. [interviewee 9]

The way I see is they don't have enough workers. So they can give us proper reliable service. I had to wait two months later. For them to fulfil one request. By the time the two months passed. A lot could have been. [interviewee 1]

I think this is the main problem, even if. OK. Some of us bought his machine, I mean this most. So he got one. But you cannot use it because she didn't. Know how to use it, how to operate. [interviewee 9]

Agencies don't have engineers department but engineers don't know plant paddy. [interviewee 2]

Service provider playing a big part and sometimes that is the broken link of all. [interviewee 2]

The departments not integrated seamlessly. [interviewee 2]

The thing in use, but some things like you know some things you have some they can at that there are some machines you have to go for, cause gun training and then you have to get a license. Like that not everybody can we? [interviewee 9]

They have to do a research if the plan failed then they have to find out why plan failed and then I guess the thing they brought in. It's not user friendly and. That's why it cannot last. It cannot be a long term plan. [interviewee 2]

Some machines are too expensive, it is not possible to buy your own, get a specialist to do for you, it is not possible to just buy one individually and just spray a bit. [interviewee 2]

In the future, farmers here will engage service provider, not possible to buy machine. [interviewee 2]

Our limited knowledge on technology and costly. [interviewee 1]

Discussion

Based on the data collected, it shows that the community realized their internal assets briefly, particularly for their traditional farming knowledge, skills, history, and their livelihoods centred around rice farming. These assets often do not give enough attention to the technology adoptions program tailored by other stakeholders, which causes the low success rate in the implementations of the programs.

The farming community are also loosely bound to their farming groups based on locations, villages, family, and relatives. These can potentially establish stronger capacity in terms of labour supply and resources. It also provides a strong voice in the interaction with outside stakeholders in breaking the barrier to find suitable solutions fitting their own farming landscape. Human capital assets in the community such as the digital savvy youth groups and women groups were often been overlooked by the authorities during the dialog and planning. These two groups represent the digital generation and traditional groups that would be valuable in driving positive change in the rice farming landscape. This raises the question if the process of asset building is diminished in the community due to the passive suppression of the female workforce in decision making processes. This also contributes to the lack of representation of females in engagement exercises with government or industry players leading to a disconnect between the reality at grassroots level and the decision making at leadership level.

On the subject of the development of artefacts, the farmers alluded to instances in the past where the government was pushing for certain machineries that did not adapt well to the environment. However, there are challenges in maintaining the machinery particularly due to the remote location of the Kelabit Highlands and the lack of skilled mechanics in the community that may not be fully aware of how to manage the new machinery.

In that sense, the range of services and the rapport was not built effectively with the farming community. In cases where the services were required, the lack of resources and challenges with maintenance meant that the reliability of service providers were frequently called into question. In some cases, only a select

few were capable to operate the machinery. This meant that farmers had to revert to their tried and tested methods as these services were not readily available.

Nonetheless, there is a growing shift towards this direction in other parts of the country as there is an acceptance that for rapid adaptation of new technologies, service providers would need to play a major role to spread the cost of the technologies available in the market, and bridge the knowledge gap or access to the knowledge which hampers technology diffusion. As the farming community lacks the financial muscle to purchase these machineries on their own or the technical knowhow to learn how to operate one, the only clear solution is through service providers.

While looking at the choices of farm technologies to the farmers, with the farm model landscape changing by introducing service providers, it is obvious that the service providers are the ones that pick up the technologies instead of the farmers. Farmers then become landowners that collect the profit shares from the service provider that run their farms. This questions whether the technology adoption program is still valid in the conventional method that target the farmers.

To drive for the sustainable choice of farming technologies in a more impactful manner, the study suggests a practical audit of asset mapping internally and awareness development within the community with the ABCD framework for focusing on their assets and table out solid proposals, agendas, based on their assets and demand for equal partnership to drive the cycle of technologies adoption, diffusion and integration accurately to the assets, landscape that the community owns. It is also worth for the agencies to play a supporting role in the community to work towards ABCD assets mapping, draft the technologies selection and adoption program based on ABCD framework by handling the ownership to the community.

CONCLUSION

From this case study, by mapping the local assets of Kelabit Highlands rice farming community using ABCD approach, there is potential to encourage the forming of partnerships with the agencies or outside funders with equal basis by focusing internal assets and capabilities first then what is needed, support and help from outside. The study recommends the use of the ABCD approach to map these assets in the community, the requirements of the technologies, with the peer support from the relevant agencies, subsequently leads to successful technology selection and adoption in the community. This study proposes that the promotion of sustainable Malaysian rice production relies on energizing existing rice farmers, through stakeholder engagement and encouraging bottom-up technology adoption, diffusion and integration in the policies.

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REFERENCES

Arshad, F. M., Noh, K. M., & Alias, E. F. (2021, Feb). Paddy and Rice Sector Policy Roadmap: Towards Equity and Sustainability. *Policy Ideas No 71*.

Eneh, O. C. (2010). Technology transfer, adoption and integration: A review. *Journal of Applied Sciences(Faisalabad)*, *10*(16), 1814-1819.

Firdaus, R. R., Latiff, I. A., & Borkotoky, P. (2013). The impact of climate change towards Malaysian paddy farmers. *Journal of Development and Agricultural Economics*, *5*(2), 57-66.

Harrison, R., Blickem, C., Lamb, J., Kirk, S., & Vassilev, I. (2019). Asset-based community development: narratives, practice, and conditions of possibility—a qualitative study with community practitioners. *Sage Open*, *9*(1), 2158244018823081.

Janowski, M. (2004). The wet and the dry: the development of rice growing in the Kelabit Highlands, Sarawak. In *Smallholders and Stockbreeders* (pp. 139-162). Brill.

Kamruzzaman, M., Anne Daniell, K., Chowdhury, A., & Crimp, S. (2022). Facilitating learning for innovation in a climate-stressed context: insights from flash flood-affected rice farming in Bangladesh. *The Journal of Agricultural Education and Extension*, 1-25

McKnight, J. L., & Russell, C. (2018). The four essential elements of an asset-based community development process. *What Is Distinctive about Asset-Based Community Process*, *15*.

Nel, H. (2020). Stakeholder engagement: asset-based community-led development (ABCD) versus the traditional needs-based approach to community development. *Social Work*, *56*(3), 264-278.

Omar, S. C., Jasmin, A. F., & Tumin, S. A. (2018, Oct). Monograph Paddy Smallholders in Bario: Working Paper. Khazanah Research Institute. Kuala Lumpur.

Omar, S. C., Shaharudin, A., & Tumin, S. A. (2019). The status of the paddy and rice industry in Malaysia. Khazanah Research Institute. Kuala Lumpur.

Pretorius, E., & Nel, H. (2012). Reflections on the problem-based approach and the asset-based approach to community development. *The Social Work Practitioner-Researcher/Die Maatskaplikewerk Navorser-Praktisyn*, *24*(2), 266-87.

Rahim, H., Abdul Wahab, M. A. M., Mat Amin, M. Z., Harun, A., & Haimid, M. T. (2018). Perception and acceptance of farmers on precision farming technology in selected granary area. *Economic and Technology Management Review*, *13*.