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Working Paper 2/18

Monograph of Paddy Smallholders in Bario

Working Paper



This paper is the second of a series on agriculture smallholders focusing on some Malaysian farmers who have managed to triumph in the face of various challenges.

Khazanah Research Institute

Working paper 2/18 15 October 2018

Monograph of Paddy Smallholders in Bario: Working Paper

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EXECUTIVE SUMMARY

This paper is the second of a series of working papers on Malaysian smallholders. It aims to understand the cultivation of premium specialty rice in Bario, Sarawak. Following are key takeaways:

SECTION 2 – Industry Performance



- Malaysia produced **1.76m MT** of rice in 2016, **8.2%** is from Sarawak.
- Agriculture contributed ~8.0% to the national GDP. This share increases to **13.5%** for Sarawak's GDP in 2016.
- Potential of the premium rice sector for Sarawak:
    i. >300 unique varieties of rice in Sarawak. (e.g Bario rice, Bajong rice & Biris rice)
    ii. Thought to have more superior/unique qualities in taste, texture, and fragrance

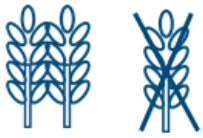
SECTION 3 – Paddy in Bario





- Bario is an **isolated village** close to the Kalimantan border at **3.5km above sea level** and surrounded by Kelabit villages. The population size ranges between **200 - 1000 people**.
- The Kelabit's success in paddy cultivation is due to **Bario's unique geography** – a flat area with muddy soil and constant supply of fresh water from seven streams.
- The **unique taste** and **rarity** of the *Adan* rice provides an opportunity for the locals cultivate *Adan* rice as a **premium speciality rice**.

SECTION 4 – Cultivation Challenges



Lack of research - Without scientific knowledge about the uniqueness of *Adan* rice and **formalised knowledge** on traditional cultivation methods, modern farming techniques cannot be effectively adapted to preserve Bario rice's **authenticity**.

SECTION 5 – Smallholder: Madam Dayang Nalin



- Cultivates *Adan* paddy on **1.21 Ha** with an average yield of **2MT/Ha**, sold at **RM20/kg** to pre-booked customers.
- Premium rice cultivation is considered as her **most successful business** endeavour.

SECTION 6 – Private Sector: Bario Ceria Sdn. Bhd.



- **Est. in 2012** to develop Bario rice cultivation across the **whole supply chain** via **contract farming.**
- Joint venture between **Rurum Kelabit Sarawak** (RKS) and **Ceria Alliance Sdn. Bhd** (CA).
- Leverage on the agricultural experiences of CA and for RKS to ensure the interests of the Kelabit people.

ACKNOWLEDGEMENTS

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This work also benefitted greatly by utilising open source icons made by the talented designers from www.flaticon.com for the various infographics included in this monograph[1].

[1] Icons used are created by Roundicons, Smashicons, Freepik and Vector Market.

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1. BACKGROUND

This paper is the second of a series of working papers on agriculture smallholders which focuses on the experiences of Malaysian smallholders.

Why smallholders?

We decided to focus on Malaysian smallholders[2], given their important role in the agriculture sector as farmers of commodity crops, livestock and food crops. In the agro-food sub-sector, there were at least 500,000 farmers in 2013[3].

Nevertheless, as detailed in the Malaysia Productivity Blueprint[4], the productivity of farmers in the agro-food sector is plagued by issues such as:

a) Insufficient focus on value-adding activities and disconnections along the value chain;

b) Multiple small producers with low levels of productivity;

c) Issues with quality and standards across the subsector; and

d) Low adoption of technology and modern farming practices.

It is not claimed that the learnings from a few smallholder stories will be able to generate policy recommendations or address all the issues affecting the country's smallholders. However, the lessons from this series will hopefully be inspiring and insightful to existing farmers, future agropreneurs as well as the general public.

Objective and Paper Outline

This paper attempts to understand the success and challenges of producing specialty rice in Bario, Sarawak. It is structured as follows:

Section 2 – INDUSTRY PERFORMANCE

Reviews paddy industry's performance using available official government data and international data.

Section 3 – PADDY IN BARIO

An introduction to Bario and paddy cultivation among the Kelabits. Box Article 1 *explains the Adan variety, the variety of the Bario rice.*

Section 4 –CULTIVATION CHALLENGES

Elaborates the challenges faced by paddy smallholders in Bario. Box Article 2 *introduces Geographical Indication as a powerful tool to market Bario rice and an example of its application in Japan.*

Section 5 – SMALLHOLDER: DAYANG NALIN

An interview with Madam Dayang Nalin, a paddy smallholder in Bario.

Section 6 – PRIVATE SECTOR: BARIO CERIA SDN. BHD.

Site visit to Bario Ceria's paddy fields and rice mill to better understand the supply chain of Bario rice.

Section 7 – CONCLUDING REMARKS

[2] There is no worldwide consensus on the specific definition of smallholders (synonyms: subsistence, family farming and low-technology farming) as it varies considerably between countries. However, the most commonly accepted definition as farms having a land area of less than 2 Ha (Based on (Nagayets, 2005 #59),Thapa, et al. (2011) and Lowder, et al. (2016))

[3] DOS (n.d.-b)

[4] EPU (2017)

2. INDUSTRY PERFORMANCE

The contribution of agricultural gross domestic product (GDP) to total GDP amounted to 8.7% in 2016. Of this, the palm oil industry was the biggest contributor to the agricultural GDP at 40.2%, while paddy contributed 2.3%, with the value of RM2.4b[5]. Despite the marginal economic contribution, rice is an important crop to study, given its status as a staple food for many Malaysian households.

This section briefly discusses the Malaysian paddy and rice industry data to provide an overview of recent trends in the crop, as well as some paddy statistics from Sarawak.

2.1. Trade and World Prices

Globally, it was estimated that 497.9 million metric tonnes (m MT) of rice were produced and roughly the same amount of rice were consumed in 2016 (with consumption outstripping production by 30 thousand MT of rice)[6]. Moreover, rice is particularly seen as a Southeast Asian staple. In 2016, this region[7] contributed towards 35.5% of the world's rice exports, with Thailand and Vietnam comprising 88% of this value. Despite the high exportation of rice recorded by this region, not all Southeast Asian countries are exporters of rice.

For example, Malaysia has always been a net importer of rice (Figure 1). In 2016, Malaysia recorded a –USD357.2m trade balance of rice[8]. In fact, this importing trend is likely to persist. The UN Food and Agriculture Organisation (FAO) has forecasted higher rice imports for Malaysia in 2018 at 950 thousand (k) MT, compared to the current 822k MT. By 2025, the amount is expected to increase to 1,276.8k MT[9].

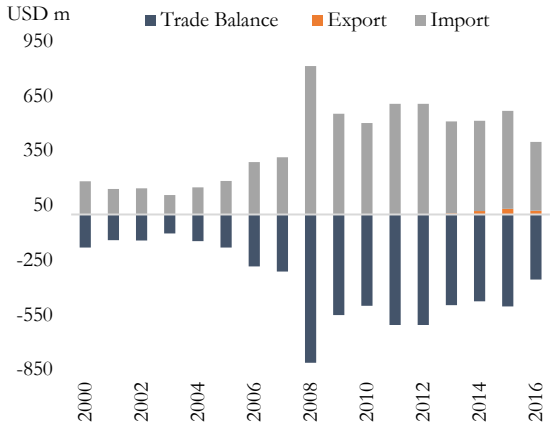
In terms of domestic paddy production, Malaysia recorded 1.76m MT in 2016, which is a modest increase from 1.36m MT in 1993 (Figure 2). Within the same time period, Sarawak produced at an average of 8.2% (including specialty rice) of the total domestic rice production.

Whilst domestic production has been increasing moderately, consumption has been increasing at a faster pace (Figure 2). Noting that consumption outstrips production in Malaysia, imported rice plays a vital role in closing the gap. However, the dependence on imports at the back of limited domestic resources and production capacity naturally lead to concerns related to food security and the nation's ability to be self-sufficient in its rice production.

Unsurprisingly, policies have thus always tended to focus on increasing total production of paddy in bulk for cheap local rice with less focus on premium, specialty rice products. However, the latter seems to hold some potential towards reviving the industry, which could help to improve the farmers' income and rural development. Due to this, this segment of rice production is given specific attention in this report.

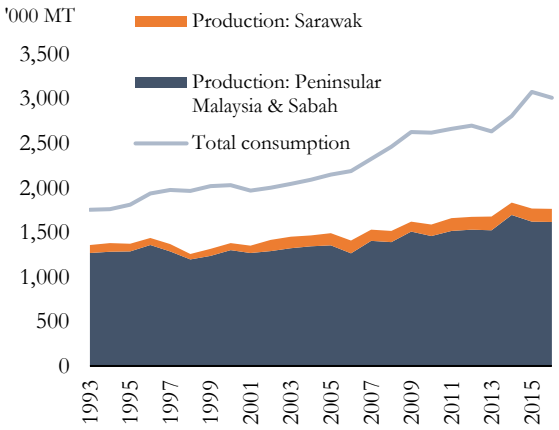
[5] CEIC Database (n.d.)
[6] OECD-FAO (n.d.). For clarification, consumption can outstrip production because consumption of rice can be sourced from previous stocks as well as current production.
[7] The Southeast Asia region includes: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Singapore, Thailand, the Philippines and Vietnam.
[8] UN Comtrade (n.d.)
[9] UN FAO (2017), CEIC Database (n.d.), OECD-FAO (n.d.)

Figure 1: Export, import and trade balance in rice (USD m), 2000–2016



Source:
Data from UN Comtrade (n.d.)
Chart by Khazanah Research Institute

Figure 2: Production and consumption of rice (metric tonnes), 1993–2016



Source:
Data from CEIC Database (n.d.), OECD Stats (n.d.)
Chart by Khazanah Research Institute

2.2. Sarawak Statistics: Production and Consumption

While agriculture contributed around 8.0% to total national GDP, this share increases to 13.5% for Sarawak's GDP in 2016, emphasising its importance to the state's economy. As noted earlier, Sarawak produced an average of 8.2% of the total national rice production over the span of the last two decades. In terms of the agricultural landscape in Sarawak, the percentage of paddy area is 9.1%, which is the third highest after palm oil (70.9%) and rubber (10.7%) in 2013.[10]

Sarawak produced 250,611 MT of paddy in 2017[11]. This figure can be broken down further, as seen in (Figure 3), which illustrates Sarawak's paddy production by district – the darker shades represent a higher production value. Bario is situated in the Miri division, bordering Kalimantan. Out of the 11 districts in Sarawak, Miri is only the fifth highest in terms of paddy production, with Samarahan having the largest production share (20.2%) and more than doubled the production of Miri (8.1%) (see Table 1).

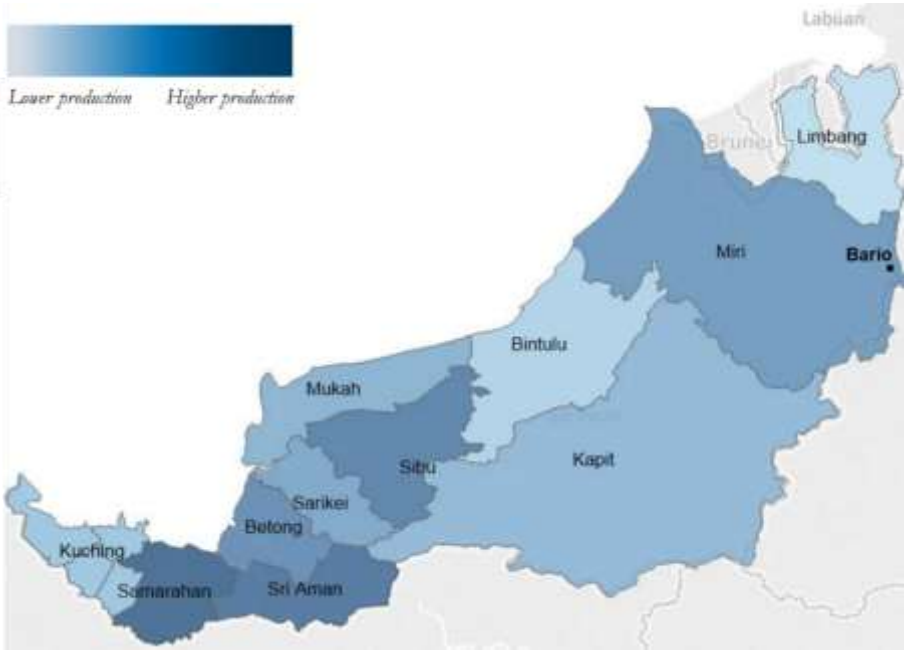
[10] DOA Sarawak (2013)
[11] DOA Sarawak (2017)

Table 1: Paddy production by district in Sarawak, 2017

Division	Production
Samarahan*	50,671
Sri Aman	41,625
Sibu	35,655
Betong	29,594
Miri	20,300
Sarikei	19,185
Mukah	13,790
Kapit	12,470
Kuching	10,463
Bintulu	9,789
Limbang	7,069
Total: Sarawak	250,611
Total: Malaysia**	1,765,700

Source:
Data from the Department of Agriculture Sarawak (2017). Obtained by request.
**The Samarahan division is combined with Serian.*
***To the best of our knowledge, data for the whole of Malaysia for 2017 is not publicly available. Data used here is for the year 2016, obtained from Department of Statistics Malaysia.*

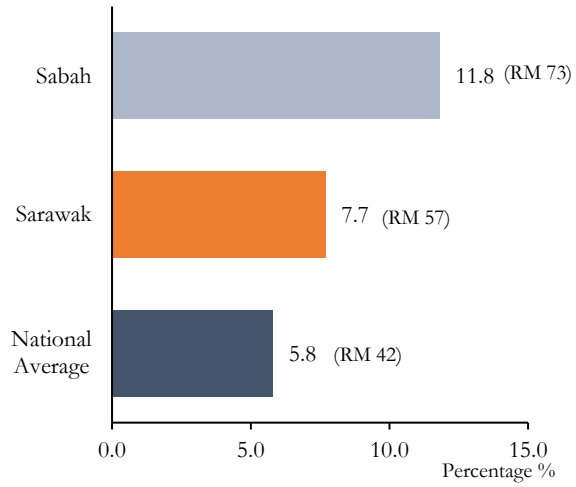
Figure 3: Map of Sarawak colour-coded according to production, 2017



Source:
Data from Department of Agriculture Sarawak, 2017
Chart by Khazanah Research Institute

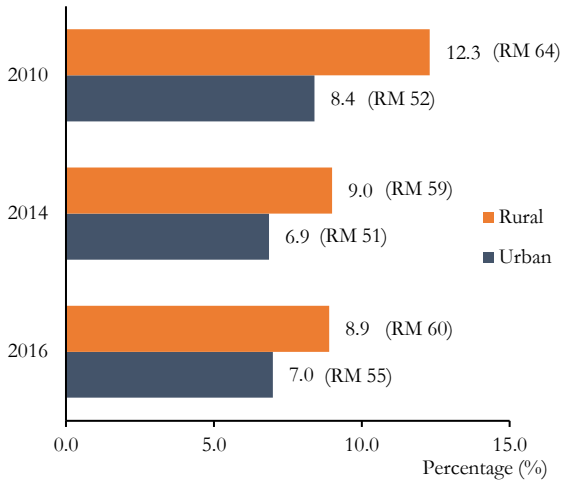
Not only is agriculture important in terms of economic contribution in Sarawak, the population's expenditure on rice as a share of total food and beverage (F&B) spending is also significantly higher compared to the national average (Figure 4). Sabah has the highest share at 11.8%, whilst Sarawak has the second highest share with 7.7%. It is also noteworthy that in the past years, the rural population of Sarawak spent more of their income on rice, relative to urban households (Figure 5).

Figure 4: Average share of expenditure on rice of total food and beverage (F&B) spending by selected states, per household, 2016 (%)



Source:
Data from DOSM (2017)
Chart by Khazanah Research Institute

Figure 5: Average share of expenditure on rice of F&B spending by strata, per household, various years (%)



Source:
Data from DOSM (2014, (2015, (2017)
Chart by Khazanah Research Institute

Towards Premium Rice

Albeit the national focus is on producing sufficient rice for the population, there is also an unexplored potential in the premium rice market. In more rural states such as Sabah and Sarawak, the rice producers are typically users of traditional varieties, which are thought to have more superior qualities in terms of taste, texture, and fragrance[12]. Furthermore, with more than 300 unique varieties of rice, Sarawak has a large potential in the specialty rice sector[13]. Some examples include Bario rice, Bajong rice, Biris rice and Borneo fragrant rice.

As such, the Bario rice is an interesting example of a Malaysian rice entering the premium market. This will be covered further in the next few sections.

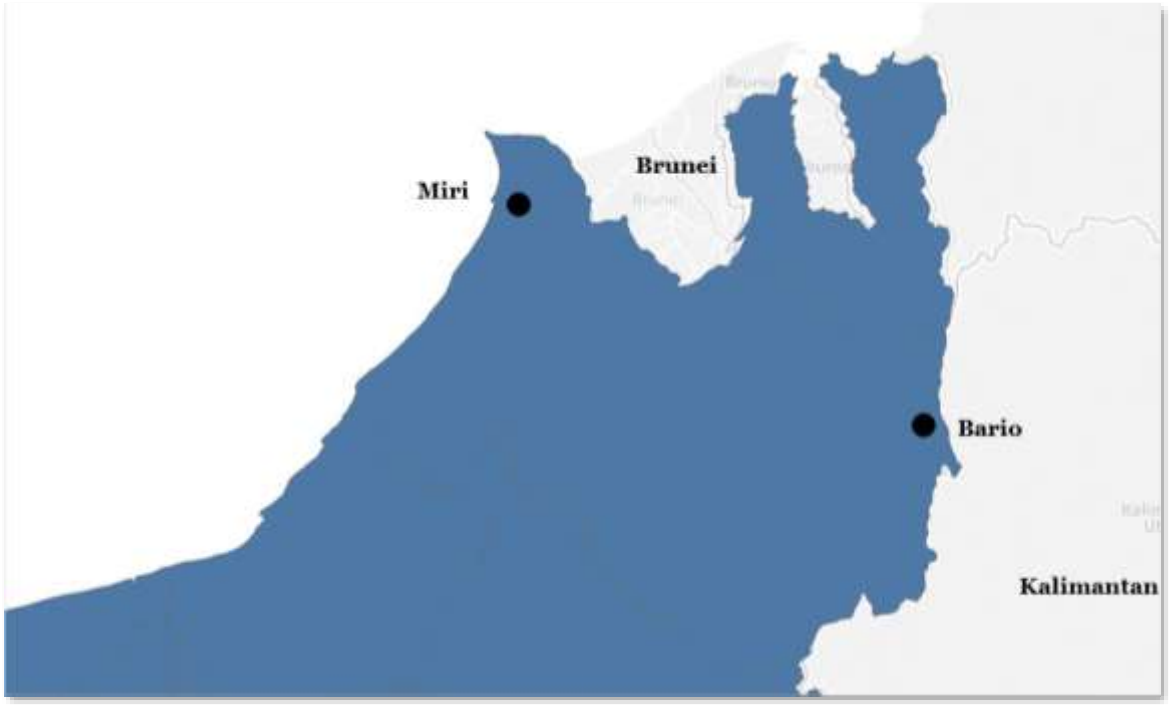
[12] Ministry of Agriculture (1995)
[13] DOA Sarawak (n.d.)

3. BARIO AND PADDY FARMING

3.1 Bario, the Kelabits and the *Adan* variety

Bario, or known among its indigenous population (the Kelabit people) as Bario *Asal*, is an isolated village about 178km inland from Miri, coming close to the Sarawak-Kalimantan border (Figure 6). It is a small flat area at about 3,500m above sea level surrounded by hills and mountains and is the central town for the surrounding 13-16 Kelabit villages[14]. Due to its isolated nature, Bario is only accessible by a small twin-otter Malaysia Airlines plane or a 14-hour four-wheel drive through the tropical jungles on dirt tracks[15]. There are no tarred roads in Bario and solar-generated electricity was recently installed in 2016[16]. At any given time, the population size in Bario is around 200, although during festive seasons, this can increase to more than 1,000 people[17].

Figure 6: Location of Bario in Sarawak



Subsistence paddy cultivation has always been part of the Kelabit community for many generations. In fact, the community primarily identify themselves as rice growers[18]. Beyond its role as the primary source of nourishment, rice is also an important element of social cohesion and symbol of status[19].

[14]Sarawak Tourism
[15] Ibid.
[16] Sarawak Energy
[17] Based on KRI interview with locals
[18] Janowski (2004)
[19] Ibid.

The paddy planted in this highland region is a unique cultivar known locally as the *Adan* rice (Photo 1).



Photo 1: Bario paddy

It is planted in Bario and in the surrounding areas, including villages in Kalimantan, Indonesia. Bario rice generally refers to a type of rice (Adan rice) that is planted in the area. One of the factors for the Kelabit tribes' success in paddy cultivation is due to Bario's unique geography – a flat open area with muddy/water-logged soil and consistent supply of fresh water from seven streams and rivers, originating from the surrounding hilly mountain areas.



Photo 2: A typical sight in Bario: paddy plots surrounded by hills and mountains



Photo 3: Another typical sight in Bario: untarred roads in between paddy fields

The unique taste and rarity of the *Adan* rice, coupled with the geographical suitability of Bario, provides an opportunity for the communities in Bario to cultivate *Adan* rice for commercial purposes. The rice can be sold outside of Bario as a premium grade speciality rice and potentially fetch lucrative prices. This activity can help increase the income of rural farmers in Bario and help develop the town itself.

Currently, there are about eight genetically distinct Bario rice cultivars[20] but interview with the locals revealed four different types: 1) fine-grain white; 2) fine-grain yellow; 3) red rice; and 4) black rice. The issue of plant purity and what actually makes a paddy plant an *Adan* is complex, but it is an important matter to understand. This is because it affects the long-term cultivation of this speciality rice, which is elaborated further in Box Article 1[21] [22].

[20] CAB Direct (n.d.)
[21] It is observed that the local Kelabit community have informal knowledge of their paddy and while laboratory research has been conducted, the Scientific knowledge have yet to reach and benefit the local community and Bario Ceria.
[22] Based on site observations and interviews by Khazanah Research Institute

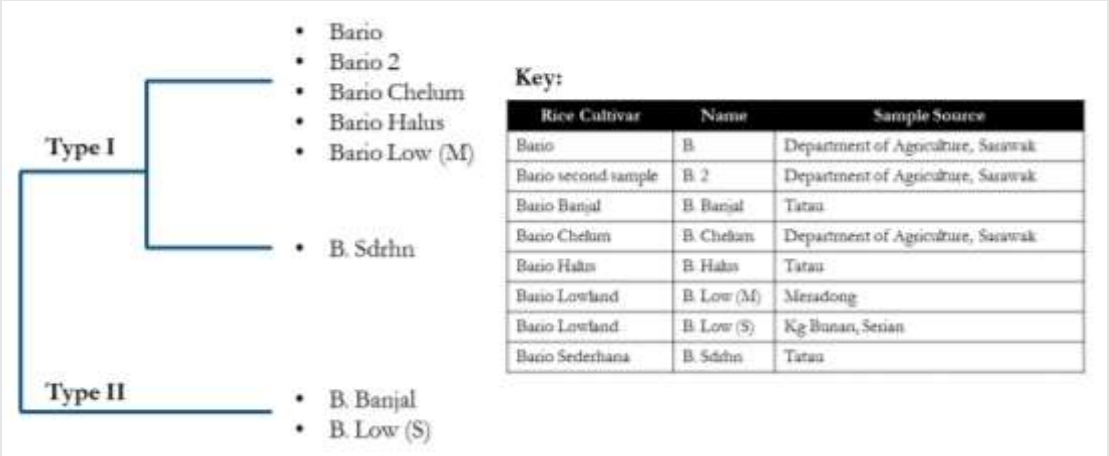
BOX ARTICLE 1: Understanding the Genetics of Bario Rice

Plant variety is essentially the different types of plants from the same species that can be found in nature. On the other hand, a cultivar is a certain type of plants from the same species or even the same variety, that has been cultivated for its specific properties. *Adan* is a loose term for several cultivars of paddy plant with distinct features that are grown around the Kelabit highlands over many generations. One of the earliest genetic studies conducted to better understand the diversity of *Adan* cultivars is in 2009. Here, the researchers discovered that the eight cultivars sampled from around the region can be differentiated into two distinct types. The study showed that samples of paddy plants from what is believed to be the same 'cultivar' but from different areas are actually genetically different (Figure 7). This suggests that the traditional categorisation of the *Adan* cultivars is informal and over the years, have led to some confusion.

For the long-term marketability of the Bario rice as a **specialty rice**, it is essential for the *Adan* cultivars to be: a) differentiated; b) formally recognised; and c) reproduced carefully such that the seeds do not have purity issues.

In the most fundamental concept of genetics, the physical outcome of an organism is the result of a complex interaction between genetics and the environment. As such, for *Adan* rice to retain its specialty feature, the Bario rice stakeholders must not only understand its genetic makeup and the purity of its seeds but also to understand the environmental conditions and cultivation practices that is responsible for the *Adan* rice's unique qualities.

Figure 7: The Genetic Similarity of Eight Cultivars of Bario Rice



Rice Cultivar	Name	Sample Source
Bario	B.	Department of Agriculture, Sarawak
Bario second sample	B. 2	Department of Agriculture, Sarawak
Bario Banjal	B. Banjal	Tatau
Bario Chelum	B. Chelum	Department of Agriculture, Sarawak
Bario Halus	B. Halus	Tatau
Bario Lowland	B. Low (M)	Meradong
Bario Lowland	B. Low (S)	Kg Bunan, Serian
Bario Sederhana	B. Sdhn	Tatau

Illustration by KRI. Adapted from Wong et. al. Bienabe et al.)[23]

[23] Wong et al (2009)

4. CULTIVATION CHALLENGES: RURAL SMALLHOLDERS IN BARIO

In the previous publication of this monograph series, the challenges of planting cocoa were explored through the lenses of Mr Koh Ah Kau, an inspiring, innovative and passionate cocoa farmer in Raub, Pahang[24]. This second report explores the challenges of cultivating paddy in Bario, Sarawak based on interviews with a smallholder and an agriculture developer company.

This section will elaborate four key challenges of paddy cultivation in Bario, which are:

- Farming method: the trade-off between traditional and modern farming methods;
- Geographic Indicators, Intellectual Property and R&D: the limited formalisation of the Bario rice's identity;
- Supply chain: development and improvement of linkages; and
- Labour shortage: the ageing of local farmers in Bario

4.1. Farming method: the trade-off between traditional and modern farming methods

Traditional farming methods rely on the use of traditional seed varieties and cultivation methods in small and scattered areas. The practice has led to fragmented and potentially uneconomical cultivation of paddy. As a result, yield and income for rural farmers tend to be lower. To increase income, farmers are often encouraged to use modern farming techniques to increase their productivity. These techniques include the use of high-yielding seeds, machines, chemical fertilisers or herbicides and designated infrastructures.

"… intensive tillage, monoculture, irrigation, application of inorganic fertilizer, chemical pest control, genetic manipulation of domesticated plants […] —form the backbone of modern industrial agriculture."

Adapted from Gliessman[25]

In Bario, traditional cultivation of paddy depended on rainfall patterns, the use of buffaloes for tillage and manuring, as well as manual labour for transplanting and harvesting[26]. While this may suffice for subsistence farming, these practices may require adjustments if the rice is to be exported and sold outside Bario as a specialty product. The reliance on weather and animals introduce risks to the consistency of quantity and quality of rice production. While paddy production has generated additional income over the years[27], most households in Bario earn less than RM500 per month, and the mean monthly household income was RM597[28]. This level is one-third of the mean income for Sarawak and even less than the national average for rural households[29].

To address the low income of rural households in Bario, modern farming methods in paddy cultivation can be a powerful strategy. However, these modern techniques are not without criticisms. In other countries, the absence of environmental sustainability considerations in

[24] Khazanah Research Institute (2017)
[25] Gliessman (2014)
[26] Jiwan (2015)
[27] Janowski (2004)
[28] Income reported for the year 1999, from e-Bario (n.d.)
[29] In 1999, the nominal monthly gross income for Sarawak is RM1,667 and the nominal monthly gross income for rural areas in Malaysia is RM1,719. CEIC (n.d.)

modern agriculture has led to the degradation of land, incidence of pest resistance, biodiversity erosion, and water pollution[30].

Similarly, in Bario, farmers are faced with the challenge of finding the right balance between productivity improvements as introduced by modern agriculture, and the management of its unintended consequences, which affects long-term development of the Kelabit community.

4.2 Geographic Indicators, Intellectual Property and R&D

Bario rice is highly demanded and known for its soft texture, unique taste and pleasant aroma. The rice could be marketed as a nutritious specialty rice product as it is rich in protein and thiamine, and low in fat[31]. The distinctiveness of Bario rice is potentially the result both the genetic composition of the rice variety (the *Adan* variety) and environmental circumstances. More specifically, environmental circumstances could be due to distinct mineral contents in the soil or the water in Bario, the highland temperature, the specific traditional farming practices, or a combination of these factors (See Box Article 1).

As a niche rice product, the preservation of the unique taste of the Bario rice is an important consideration, since it affects demand for the rice. Although it is equipped with certification such as Geographical Indication Wangi)[32] [33], the value of the Bario rice is related to more than just the location of its origin, but the genetics and ecosystem that produces the distinct characteristics (See Box Article 2). Recently, villagers shared concerns about the possible effects of modern farming methods on the taste of the Bario rice. This, however, remain speculations and it is important to investigate this matter further.

Scientific inquires related to the genetic composition of the Bario rice variety is very recent[34]. There has not been any investigation on the role of different ecosystem factors in determining why the rice develops its unique taste and texture. Moreover, local knowhow regarding the cultivation methods of *Adan* variety is embedded informally among local farmers and has not been institutionalised or combined with scientific methods.

KEY TAKEAWAYS The **lack of research** into this specialty rice can potentially limit its long-term marketability as a niche product. Without scientific knowledge about what makes the *Adan* rice special and **formalised knowledge** on traditional cultivation methods, modern farming techniques cannot be effectively adapted to preserve Bario rice's authenticity.

[30] UN FAO (2011)
[31] Nicholas, et al. (2014)
[32] The Star (2009)
[33] "Bario Rice" is registered with a Geographical Indication (GI no: GI08-00001) in 2008. The certification was applied by Sarawak Information Technology and Resources Council (SITRC), under their capacity as a government state agency. Source: MyIPO (n.d.)
[34] Wong, et al. (2009) and Lee, et al. (2011)

Linkages refer to the network and connections between the different segments of food production. It includes physical infrastructures, connectivity between different players in the agriculture supply chain, as well as integration to the broader market[35].

To go beyond subsistence farming, infrastructures such as well-built farm roads and irrigation systems are essential to ensure consistent and reliable supply of input and subsequently, the farm output. Infrastructures are typically public goods[36] in nature, and often under-invested. The cost of building infrastructure is also higher for rural and geographically-challenging areas, such as Bario, as its remoteness hikes up the cost of transporting raw materials to build the infrastructures.

Moreover, the development of private and commercial agribusiness in a rural area like Bario is hindered by exorbitant fixed costs and limited production scale. Transactional costs between different players in the paddy production segment is high – inputs are infrequently transported into Bario because of limited flights and challenging land journeys[37], while distribution to consumers incur similar large transport costs. There are also communication challenges due to the unreliability of telephone signals and internet connection in Bario, leading to limited information flows from producers to potential rice buyers.

Therefore, the paddy and rice supply chain in Bario should be developed and improved. Smallholders can benefit from having a local milling facility or coordinating among themselves to bulk-buying of inputs and selling grains to downstream buyers. Unfortunately, often the development of these linkages and supply chain demands human capital, are expensive for most smallholders, and is a risky business venture for private companies.

4.3 Demographic: The ageing of farmers in Bario

Demographic shift and the ageing of farmers in agriculture is a concerning issue, with several important consequences to the rural economy. Older farmers are physically limited to perform labour-intensive tasks in farming, leading to lower agriculture output and the problem is exacerbated if farmers rely on traditional farming methods. Moreover, any introduction of new methods or machinery use to increase productivity could be inhibited because older farmers lack the necessary skills and/or interest to implement them[38].

"Only old people work in Bario. Sixty-percent of its people, mostly young, go to bigger cities to work."

Mr Thomas Hii

In Bario, the issue of an ageing population was observable – the town comprised of mainly older farmers, often retired individuals who worked elsewhere in their younger days, and children. Most young individuals migrated out of Bario to urban cities such as Miri, to continue their education and/or for better employment opportunities[39].

[35] Kazanah Research Institute, (forthcoming)
[36] Public good refers to goods that are non-excludable and non-rivalry.
[37] From Miri, Bario is accessible via an hour journey with a twin-otter flight or a fourteen-hour journey with a four-wheel-drive vehicle on roads of subpar conditions.
[38] FAO (2017)
[39] Marcus Raja (2015)

The combination of older farmers and few young, productive farmers have led to the under-cultivation of paddy fields. Although the shortages of labour can be solved by employing foreign labour, it imposes high cost to farmers are often short-term with little motivation to invest in human capital development. Essentially, the ageing of farmers and continued shortage of labour is threatening the long-term sustainability of paddy cultivation in Bario.

BOX ARTICLE 2: Geographical Indications and its application

Geographical indications refer to products with specific qualities or reputation associated with their geographical origin[40]. These geographical origins can be at the national, regional or even at the local level. The distinctive features of these products may be due to its climate, local-knowhow and traditions[41]. As such, GIs commonly have the name of the place of origin of the good, for example, Florida's natural orange juice, Tuscany olives and Darjeeling tea. In this case, Bario rice.

GIs are considered to be a type of intellectual property. Intellectual property, defined loosely by the World Intellectual Property Organization (WIPO), refers to the "creations of the mind: inventions, literacy, and artistic works and symbols, names, images and designs used in commerce"[42]. Intellectual property rights allow creators to claim their work as their own and to prevent others from free-riding and profiting from their ideas. According to the Intellectual Property Corporation of Malaysia (MyIPO), a registered GI is given 10 years of protection from the date of filing and is renewable for every 10 years. This would mean that for at least 10 years, Bario rice producers have the right to prevent others from producing this rice elsewhere and labelling it as Bario rice. However, farmers must ensure that there is an exclusive and a unique characteristic, as well as a high standard of quality for the product to receive a GI certificate[43].

The role of GI is particularly important for rural areas, where these products are more commonly grown. Thus, GI is an important tool to support sustainable development of the rural community, while preserving the local culture. Through entering niche markets and extracting premiums from selling products with GI status, smallholders in rural areas can enjoy an improvement in their living conditions because they earn higher incomes[44]. In most cases, GI-identified products have a positive effect on price[45]. For the case of Bario rice, as seen in Table 2, this specialty product's premium is as much as RM15.70 per kilogram, over the local Super Special Tempatan (SST) rice.

[40] The TRIPS agreement defines GIs as "indications which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin" (Article 22:1)
[41] UN FAO (2018)
[42] WIPO (n.d.)
[43] MyIPO (n.d.-b)
[44] Bienabe, et al. (2009)
[45] In UN FAO (2018), the authors find that in 9 cases of GI products, the premium on average could range between 20 to 50 percent. For the case of specialty coffee beans, Teuber (2007) find that the coffees with GI had significantly higher retail prices.

Table 2: Price comparisons of different types of rice in the Malaysian market, 2018

Type of rice	Price per kg
Bario White Rice	RM18.30
Bario Brown Rice	RM18.30
Dragon AAA Thai Fragrant Rice	RM 7.99
Jati Super Special Tempatan (SST 5%) Rice	RM 2.60
Jasmine Original Sun Brown Rice	RM 4.65
Kohinoor Faiza Basmati Rice	RM12.90

Source: BMS Organics, Tesco price search as of 8 June 2018

Challenges: Up-scaling Production

However, because Bario rice is a unique product grown in a designated area, it would seem difficult to expand the production of Bario rice to a bigger scale beyond the Bario area due to spatial constraints. On the contrary, increasing the pressure on local resources may lead to an overexploitation, which could risk the quality of the Bario rice and the preservation of the GI status in the long run[46]. Thus, there is a trade-off between the economic benefits of focusing on GI products versus the preservation of natural resources that makes these products unique to begin with.

Challenges: Fake Products

The Geographical Indications Act 2000 (Act 602) was introduced to protect geographically unique products within Malaysia. Currently, the Act does not cover penalties or fine for the erroneous use of GI products in Malaysia. There are claims that non-genuine or mixed Bario rice is being sold in Malaysia as Bario Rice. If this is true, this could prove problematic for the Kelabit farmers and their Bario rice industry.

Example: Yubari King in Japan[47,48]

GIs have been applied in many countries, with different methods of implementation and success levels. This section looks into how GI is applied in Japan, particularly for one of the nation's most premium fruit – the Yubari King, a cantaloupe known for its soft and juicy flesh, sweet taste, and rich aroma.

The fruit was created in 1961 from a hybrid between two cantaloupe cultivars, after multiple cultivation testing by the Yubari Melon Association, which was established in 1960 by 17 volunteers. A gift box containing two Yubari Kings will cost about RM200 (¥6,150)[49]. The fruit is also auctioned and can fetch high bidding prices, up to RM100,000 (¥3,000,000)[50]. In comparison, fruits can cost about RM60 per kilogram in Japan[51]. The Yubari King can fetch a much higher price due to its premium quality and because it is often demanded as a gift item and not just as a food item[52].

This fruit is produced by farmers of JA Yubari, a Japanese Agricultural Cooperative. The Yubari King is cultivated in greenhouses in the city of Yubari, Hokkaido and its seeds have never left the city. The premium quality of the fruit is not only the result of the uniqueness of its variety and Yubari's environment, but also the local knowledge of Yubari farmers, which has been developed over many years. This knowledge includes cultivation and farming techniques to correctly control surrounding temperature, humidity and soil moisture, such that the cantaloupes produced achieve the taste, texture and aroma that the Yubari Kings are known for.

The success of Yubari King transformed the city. Yubari was founded in 1943 as a coal mining town and declined economically after the mines were closed in 1980s. Between 1965 and 1975, Yubari became a production centre for Hokkaido as planting, cultivating, sorting and shipment activities by Yubari's cooperatives for the cantaloupe was very active. Nationwide delivery of the Yubari King started in 1979 and the strict cultivation standards have been maintained over the years.

The Yubari King is one of the 62 agricultural and food products with a GI certification in Japan. The certification was implemented under the Geographical Indication Wangi) Act, which came into force in June 2015. Japan's Ministry of Agriculture, Forestry and Fisheries Ministry of Agriculture Forestry and Fisheries Japan) stated that the Act intends to protect the interest of producers and contribute to the development of the agriculture industry, in recognition of the potential value of many regional products in Japan.

The implementation of GI in Japan does not merely involve a registration process. Rather, it emphasises the inclusion of farmers, who organise themselves into a cooperative and initiate the GI certification application themselves. The specification of the product (standards of origin, method and quality) is the result of discussion between farmers in that area. Moreover, farmers are involved in establishing a guideline to control the quality of their agricultural product. After registration, farmer groups are also directly involved in ensuring the guideline is followed to control the quality of the product after registration. There are also mechanisms placed to prevent illicit use of GI labels and punishment for its misappropriation.

[46] UN FAO (2018)
[47] Based on Ministry of Agriculture Forestry and Fisheries Japan (n.d.-b)
[48] Based on Ministry of Agriculture Forestry and Fisheries Japan (n.d.-a)
[49] Kansai Matsusin (n.d.) and approximated using exchange rate of RM1.00= ¥27.29
[50] Independent; (2017) and approximated using exchange rate of RM1.00= ¥27.29
51 Based on the cost of oranges, apples and banana from Numbeo and the average cost of fruits is approximated using exchange rate of RM1.00= ¥27.29
[52] Kansai Matsusin (n.d.)

Figure 8: GI application processes in Japan

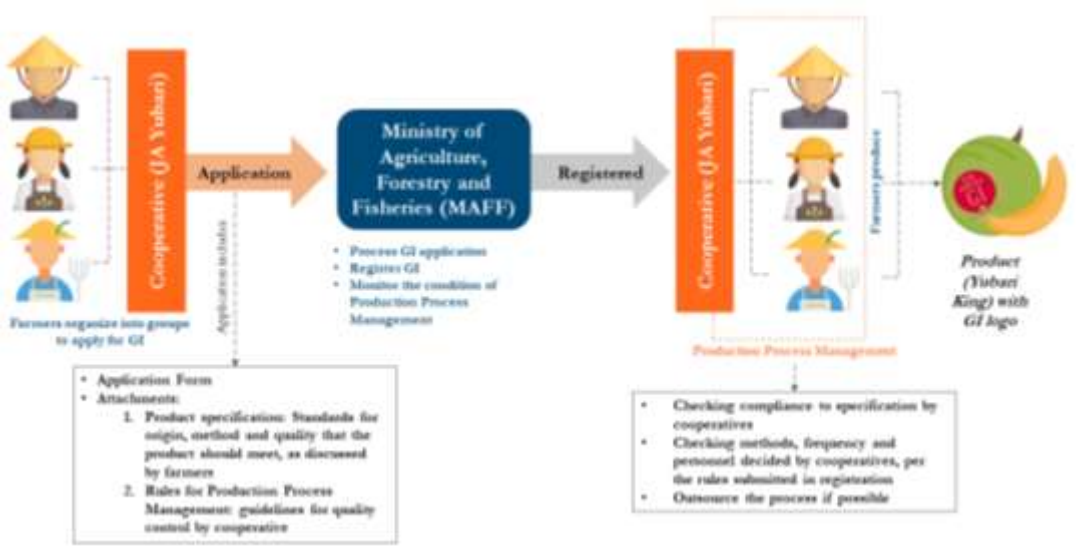


Illustration by KRI. Adapted from the Ministry of Agriculture, Forestry and Fisheries of Japan[53]

The production of premium fruits in Yubari revived the city's economy. More broadly, GI certification supports the development of agricultural products in Japan because it manages to differentiate these products in the market such that they can be sold at premium prices. Farmers are also protected from potential "fake" products and maintain their reputation as producers of specialised regional goods, while consumers are protected because the authenticity and satisfaction from consuming these products are ensured.

[53]Ministry of Agriculture Forestry and Fisheries Japan (n.d.-a)

5. SMALLHOLDER: MADAM DAYANG NALIN



Photo 4: Madam Dayang Nalin, a smallholder in Bario, Sarawak

5.1 Background

Madam Dayang Nalin is a smallholder paddy farmer in Bario who cultivates paddy on 1.21 Ha of land at Block 2B, Bario. She was born in Kampung Kuba'an and currently lives in Kampung Arur Dalan. Her parents were farmers and Madam Dayang herself has cultivated paddy for more than 10 years. Aside from paddy, Madam Dayang also farms pineapple (4 acres) and recently, coffee (6 acres, with 160 coffee trees).

Madam Dayang's farming activities began on a part-time basis. Prior to farming, she has worked at the Bario airport for 4 years and only pursued farming full-time in September 2017. Her income is very diversified. In addition to farming, she also operates a thriving homestay business in Bario as well as a pineapple jam business under *Projek Komuniti Azam Kerja* initiated by Sarawak's Department of Labour.

5.2 Paddy cultivation and premium rice market

During the time of interview, Madam Dayang has planted three different varieties of paddy; fine-grain white, fine-grain yellow and red rice. She individually plants paddy seedlings on her land plot, which is the traditional method of planting paddy in Bario. Harvested paddy is also dried manually under sunlight, following the traditional method. She mentioned that her decision to use traditional drying method is because of the lower production cost incurred, in comparison to using machines to dry the harvested paddy. Indeed, as a smallholder, Madam Dayang is always on the lookout for ways to reduce her production costs.



Photo 5: Madam Dayang's paddy field



Photo 6: Traditional way of drying seeds

However, Madam Dayang is not averse to the use of machinery and technology in her cultivation, especially for labour-intensive tasks. For instance, she rents machinery services for ploughing and levelling of her land from Bario Ceria, an agricultural service provider in Bario. She also hires two to three workers at times to help her on the field.

Madam Dayang estimated her harvest this season to be slightly more than her usual average of 2 metric tonnes. We were also told that the rice is sold at RM20 per kg, with no price differentiation between the different rice varieties. However, it is believed that the red and black varieties could attain a much higher price due to their higher nutritional value.



Photo 7: Grains of harvested seeds

The rice from her farm is sold privately through a booking system. Buyers knows of her rice cultivation through their own social network. In the past, she has couriered up to 75 kg of rice to Kuala Lumpur for her customers. This marketing method is interesting because Madam Dayang is personally connected with her customers, who trust the quality of her rice production and are willing to pay premium prices and delivery costs to ensure the authenticity of the rice that they consume.

A challenge that Madam Dayang faces is the mismatch between supply and demand for her rice. This season, Madam Dayang mentioned that she underestimated her cultivation, resulting in overbooked orders. As such, she had to limit her products to only a few kilograms per buyer. Furthermore, as mentioned earlier, she has (and still experimenting with) a number of different agricultural commodities so that her sources of income are diversified. Nevertheless, the premium rice industry can be considered as one of Madam Dayang's successful business endeavours.

6. PRIVATE SECTOR: BARIO CERIA

Following the story of Madam Dayang Nalin, this section elaborates on how a public-private initiative, Bario Ceria Sdn Bhd, attempts to develop the cultivation and branding of specialty rice in Bario, Sarawak.

6.1 Developing paddy and the rural economy: Community and the private sector

Public-private partnerships (PPP) has been highly encouraged by various global development agendas and particularly in agriculture. The concept refers to different forms of relationships between the public sector and private firms. It prioritises public and social causes, in addition to the cost and benefit considerations of private investments.

In Bario, a modified type of joint venture was initiated as part of National Key Economic Area (NKEA) paddy development project, which will be discussed in the next section. While joint ventures typically involve public and private sector co-ownership of a business, the collaboration in Bario involves a Kelabit society to represent the development needs of the Kelabit community in Bario, and an established agribusiness company.

In theory, the private company can transfer knowledge of modern farming practices, assist in farm management, provide input and farm services to rural farmers. Meanwhile, community representatives in the company ensure that the interests of the local community are prioritised.

The company can be involved in the building of linkages such as farm roads and irrigation system, supported by the funds from the government. Moreover, government backing in the partnership reduces private investments' risks and initiate a long-term outlook in establishing agribusinesses in rural areas.

However, PPP cannot solve every challenge of rural agriculture. Private firms might not be equipped to address issues such as the lack of R&D into understanding rice varieties and the ecosystems needed for its cultivation. This is because firms may have limited scientific expertise, resources and expected profitability from such endeavours. Private firms are also ill-equipped to provide for public goods that are not directly related to their business operations, such as the provision of inter-city roads and communication infrastructures. Henceforth, even with PPP initiatives, investment from the public sector is still required to fully develop the rural economy in Bario.

A successful joint venture requires a considerable time to develop a sustainable long-term relationship between the community and the private sector. It needs continuous dialogues, cooperation and the willingness between both parties to share the risks of agribusinesses and the complexity of developing the rural economy. It must be noted that joint ventures are not perfect solutions, as conflict of interests and transparency issues can still occur[54]. Nonetheless, this model of collaborative development strategy is still valuable to enhance the wellbeing of rural smallholders, but it requires honest discussions, consistent monitoring and transparency from all parties involved.

[54] ADB (2008)

6.2 Introduction to the Bario Ceria Initiative



Photo 8: Mr Thomas Hii, Managing Director of Bario Ceria with freshly milled Bario rice

Bario Ceria Sdn. Bhd. (BC) was established in 2012 as part of the National Key Economic Area (NKEA) Bario Rice Industry Development Project initiative under the Entry Point Project (EPP) 11. The company is a joint venture between Rurum Kelabit Sarawak and Ceria Alliance Sdn. Bhd., each owning 44% and 56% shares in BC, respectively. The aim of the joint venture was to leverage on the agricultural experiences of Ceria Alliance to help develop Bario rice cultivation and for Rurum Kelabit Sarawak to ensure that the interests of the Kelabit people are prioritised. A total sum of RM17m was given to BC as part of the Phase I of the project, over a period of two years. In this agreement, BC is expected to develop Bario specialty rice spanning the whole supply chain (Figure 9).

Upstream of the supply chain, the company help source input, builds infrastructures such as farm roads and irrigation systems, as well as provide machinery services. At the farm segment, BC provide extension programmes and farm management. Midstream, a rice mill was built in Bario to process paddy purchased from the farmer, into rice. Downstream, BC conducts product marketing to expand the consumer base for this specialty rice (Figure 9).

Figure 9: Rice NKEA Project and Bario Ceria

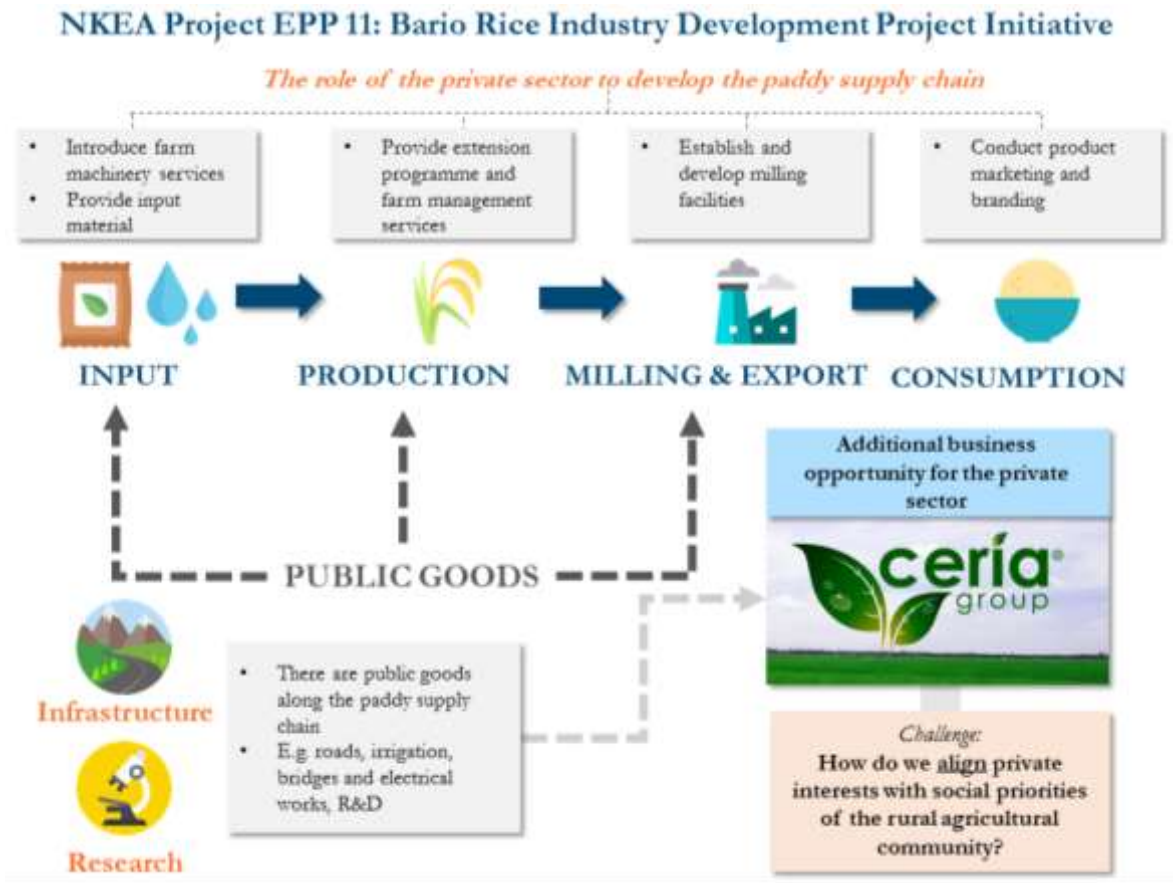


Illustration by KRI

6.3 Contract Farming

For Phase I of the Bario EPP 11 project, a total land area of around 200 Ha in Bario is allocated for paddy cultivation. The area is divided into 12 blocks with an estimated total of 178 smallholders and an average paddy yield of around 2.5 MT/Ha[55].

Farmers within this stipulated area have a choice of cultivating paddy via option 1 or 2 (**Figure 10**). For option 1, a farmer has a contractual agreement with BC for a given season. In this season, BC will fully manage his/her land with a division of 70:30 (BC: farmer) of the final profit made. For option 2, a farmer cultivates the land himself and utilise BC's services as and when needed. Madam Dayang, introduced in the previous section, is one of the smallholders in Bario who opts for option 2 when KRI visited and interviewed farmers in this area. According to Madam Dayang, she choses between either option depending on her

55 Based on information shared by Mr Thomas Hii in an interview with KRI

BC also plays the role of an extension service provider, having its trained managers to provide advice and oversee paddy cultivation in Bario. As the contract is renewed for each planting season, a farmer may interchange between options 1 and 2, depending on his resources and ability. Option 1 addresses issue of ageing farmers in Bario, as many younger Kelabit landowners are working elsewhere but still intend to generate income from cultivating paddy.

BC aims to help with land cultivation only temporarily, until the return of the landowners to Bario. Mr Hii also shared that the company hopes more farmers choose option 2 than option 1 as farmers become more skilled. Moreover, this option meant that the cultivation of the Bario rice will remain to be an essential activity for the Kelabits and lucrative enough to support their livelihoods, given the integration of this product into the specialty rice market.

Figure 10: The two options available for smallholders for paddy farming in Bario



Illustration and photo by KRI

6.4 Downstream processes: milling & marketing

Once harvested, the grains are transported to a nearby BC milling factory and sold for downstream processing. Once packaged, BC is responsible for product marketing, branding and the export of packed Bario rice to Peninsular Malaysia and to other countries (Figure 11). However, BC is not the only seller of Bario rice. Bario farmers can sell the rice directly to consumers, or to other rice companies and market it as Bario rice[56] as long as it meets the GI product requirements.

[56] Examples include the Jati (Source: (Wangi, n.d. #56) and Lohas Premium Bario Rice (Source: (LOHAS, n.d. #57)

Figure 11: An illustration of the milling process to produce Bario rice

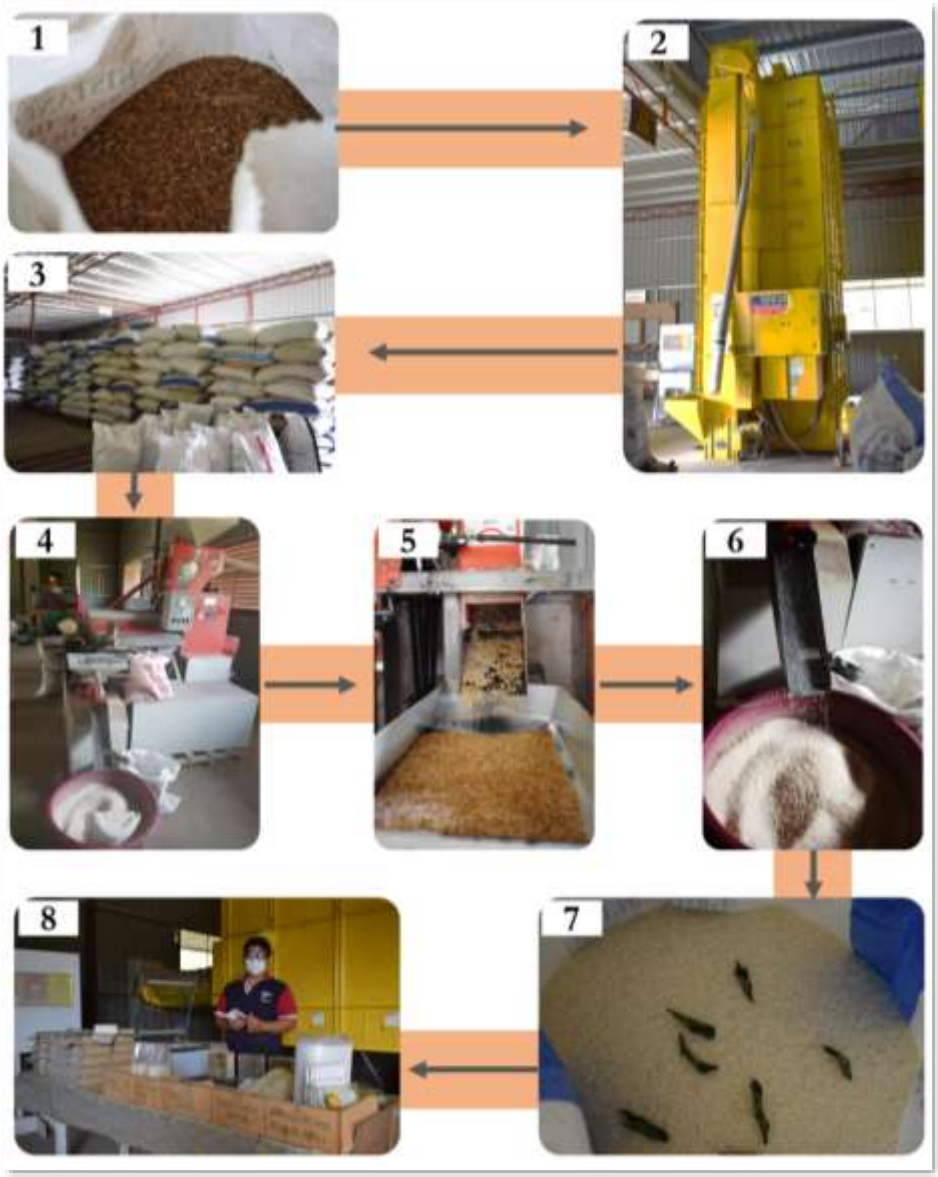


Illustration and photos by KRI

Key

1. **Paddy Delivery**. The purchase and weighing of harvested paddy grains bought from farmers at RM3.60/kg (compared to RM1.20/kg in the Peninsula).
2. **Drying**. Paddy grains dried using a dryer to achieve 14-15% moisture content. The dryer was bought from Thailand and costs around RM140,000.
3. **Hardening**. Dried paddy is stored for one to two weeks to allow it to harden to prevent rice breakage in the next step.
4. **Milling – Dehusking**. Paddy Paddy is milled using a small sized milling machine bought from Thailand costing around RM40,000**.**
5. **Milling – Polishing**. First polishing produces brown rice.
6. **Milling –Polishing**. Second repeat of rice polishing produces white rice.
7. **Storage**. Polished rice is stored in large bags with Kaffir Lime Leaves to prevent the emergence of insects.
8. **Packaging**. Some Bario rice is packaged here and sold locally at RM13.00/kg, while the rest is transported out of Bario in rice sacks and sold elsewhere at RM17.50/kg.

7. CONCLUDING REMARKS

This working paper sheds light on the difficulties faced by smallholders in paddy farming in the rural, isolated area of Bario. To overcome some of these issues, Bario Ceria has assisted with the basic infrastructural development needs of the village, such as building roads and setting up proper irrigation systems. Bario Ceria also assist farmers by renting out their heavy machinery services, such as for ploughing and harvesting, so that the need for manual labour is reduced. At the very end of the supply chain, Bario Ceria also help with the marketing of Bario rice.

Smallholders, such as Madam Dayang Nalin, combines independent management of farms and marketing of products with the machinery services provided by Bario Ceria. Her challenge as a smallholder includes the mismatch of supply and demand for her rice and Madam Dayang Nalin continues to diversify her income base via multiple entrepreneurial endeavors.

KEY TAKEAWAYS The **uniqueness** of the *Adan* rice variety in Bario is still **under-researched**, limiting the effective adoption of modern agriculture. Additionally, the introduction of modern commercial farming presents an **identity crisis** for rural smallholders as there is a conflict between increasing rural income by adopting productivity-inducing cultivation methods or retaining old methods to be able to sell it as pesticide and fertiliser-free rice product but with very low yield and poor product consistency.

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