

Promoting Youth Engagement and Employment in Bio-Circular-Green (BCG) Agriculture and Food Systems for Food Security: An Action Research on the Rice Value Chain in Brunei Darussalam

Brunei Youth's Awareness, Perceptions and Interests in Agriculture and Agrifood Final Report

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Acronyms

BKCF	Brunei Darussalam–Indonesia–Malaysia–Philippines (BIMP)- East ASEAN Growth Area (EAGA)-Republic-of-Korea- Cooperation-Fund
CSPS	Centre for Strategic and Policy Studies
GGGI	Global Green Growth Institute
IBTE	Institute of Brunei Technical Education
ILO	International Labour Organisation
PPB	<i>Pusat Pembangunan Belia</i> (Youth Development Centre)

Background

To inform the development of a responsive policy and implementation framework for the project funded by GGGI-BKCF, in which CSPS¹ are the project implementors, ‘Promoting Youth Engagement and Employment in Bio-Circular-Green (BCG) Agriculture and Food Systems for Food Security: An Action Research on the Rice Value Chain in Brunei Darussalam’ a survey of youths was conducted from 22 August 2024 to 6 September 2024. The survey of youths assesses the awareness, perceptions and interests of Bruneian youth in agriculture and agri-food (henceforth known as the ‘Youth Survey’). In addition, the Youth Survey allows CSPS to identify the gaps, challenges and opportunities in terms of modern smart farming options.

Methodology

This section reports the methodology of the Youth Survey, including the questionnaire design, sampling and data collection methods.

A specific measurement tool was designed in the form of a questionnaire to address the following themes:

- i. Demographic and Socio-economic profile
 - Age, gender, religion, ethnicity, household size, marital status, education, employment status.
 - Family members’ agriculture practices
- ii. Awareness of Agriculture Information, Careers and Practices
 - Sources of agriculture information
 - Sources of agriculture careers information
- iii. Perceptions of Agriculture, Agribusiness and Smart Farming
 - Current conditions of agriculture work and smart farming in Brunei
 - Employment and career opportunities in the agriculture industry
 - Contribution of the agriculture industry to Brunei’s economy and society
 - Future of farming in Brunei
 - Monetary challenges in agribusiness and smart farming
 - Social acceptance and perceptions of agriculturalists and farmers
- iv. Interests in Agriculture, Agribusiness and Smart Farming
 - Interests in agricultural skills, training, education, careers and technologies in smart farming

¹ Centre for Strategic and Policy Studies (CSPS), Brunei Darussalam.

The current report presents the analysis of the Youth Survey. This survey has a total non-random sample of 343 youths aged 18 to 39 years. Although the national definition of youth is 18 to 35 years, the minor increase in the age range for the Youth Survey was intended to target young Bruneians who are likely interested to be employable in the agriculture and rice industry.

A purposive sampling design, a non-probability sampling technique in which units are selected because they have characteristics required for the sample, was deemed appropriate due to the homogeneity of Brunei citizens.

The following youth groups were selected:

- i. 90 respondents (26%) from *Pusat Pembangunan Belia* (PPB or Youth Development Centre), to capture the out-of-school and out-of-work youth. PPB runs various skills courses for the community and youth².
- ii. 97 respondents (28%) from the Institute of Brunei Technical Education (IBTE), to capture youth likely from middle or higher monthly household incomes, and higher education levels. IBTE is a post-secondary institution providing non-degree vocational technical education.
- iii. 156 respondents (45%) from online.

A criterion of random sampling was applied to the institutions selected, PPB and IBTE, wherein the institutions were asked to randomly select students who were of equal share of males and females. This is to get as diverse a sample as possible within the institutions. The distribution by gender is proportionate where 52% of respondents are female, and 48% are male³. The majority, 66.8%, of respondents are within the 18-24 age group.

Two modes of data collection were conducted:

1. Self-administered online survey. The online survey became live on 22 August 2024 and the closing date to complete the online questionnaire was 6 September 2024.
2. Administering a group survey to the selected institutions (PPB and IBTE).

² Youth Development Program (one year) to conduct 'marketable' and recognized skills training for youth, self-development programs and job placement programs. Community Program (less than six months) to run various courses on a short-term basis for 'upskilling' and 'reskilling'.

³ Amongst Brunei Citizens and Permanent Residents (PR), 50% are male and 50% are female, (DEPS, 2023)

Target Groups, Gaps and Opportunities Identified:

The target groups, gaps and opportunities were identified by the scores of the indices, survey analyses, and major background variables.

TABLE 1: Target Groups, Gaps and Opportunities

Target Groups	Gaps and Opportunities
Youth from very high-income households (more than B\$6,000 per month)	➤ A significant proportion (40%) are not interested in pursuing a career in agriculture due to smart farming innovations. ➤ Significantly negative personal and social outlook of agriculture in Brunei. ➤ A higher proportion (58%) think that agriculturalists and farmers are <u>not</u> highly respected by Brunei society. ➤ More than a third (38%) agree that their friends and family will look down on them if they work in agriculture. ➤ Less engagement in agriculture activities, i.e., a higher proportion does <u>not</u> have a family member who leases (96%) or privately owns land (84%) for agriculture or farming purposes, compared to other income groups. ➤ A higher proportion (87%) agree that Brunei lacks professional and licensed agriculture opportunities. ➤ A higher proportion (79%) agree that there is <u>no quick return of money</u> in agriculture.
Youth from middle-income households (B\$2001-6000 per month)	➤ A higher proportion of middle-income households utilise privately owned land for agriculture or farming purposes.
Youth from lower-income households (B\$2000 and below per month)	➤ Less sources of information on agriculture and agriculture careers. ➤ More low-income households lease land from Government for agriculture purposes. ➤ A significant proportion (32%) strongly agree that agriculturalists and farmers are highly respected by Brunei society. ➤ A higher proportion (52%) think that <u>there is a quick return of money</u> in agriculture.
Youth with Degree level or higher	➤ A high proportion (40%) are not interested in pursuing a course and career in agriculture.

Target Groups	Gaps and Opportunities
	➤ Significantly negative perception of agriculture development in Brunei. ➤ A higher proportion (92%) agree that Brunei lacks professional and licensed agriculture opportunities. ➤ A higher proportion (66%) agree that there is <u>no quick return of money</u> in agriculture. ➤ A small but significant proportion (25%) think that it is <u>not costly to start an agriculture career</u>.
Youths with a Secondary level education and lower	➤ Youth with a secondary level education have a more positive perception of agriculture (Agriculture Outlook Index Score of 53.2). ➤ A significant proportion of secondary (29%) and primary (50%) education level youths think that it is <u>not costly to start an agriculture career</u>.
Men	➤ Men have less sources of information on agriculture compared to women, and a significantly higher proportion of men (16.6%) are not aware of any types of agriculture careers compared to women (5%). ➤ More than a third (36%) agree that no woman will want a farmer as her husband. ➤ A significant proportion of men (39%) agree that their friends and family will look down on them if they work in agriculture. ➤ A small proportion (14%) would rather stay unemployed than be a farmer.
Women	➤ The majority of youth (89%) think that the agricultural industry is not exclusively for males. However, a small proportion of men (16%), 25–34-year-olds (17%), youth from household monthly income of more than B\$6,000 (15%) feel that working in the agriculture industry is <u>only for men</u>. ➤ Women have a more positive perception of agriculture (Agriculture Outlook Index Score of 53.6, compared to men's score of 48).
Youths between the ages of 18-24	➤ Higher proportion of youths between the ages of 18-24 (41%) are not interested in pursuing a course and career in agriculture.

Target Groups	Gaps and Opportunities
	➤ More than a third (35%) agree that their friends and family will look down on them if they work in agriculture.
Youth from IBTE	➤ Amongst youth who studied in the field of Agriculture, a majority (57%) require basic agriculture skills as their first priority skill to start an agriculture career.
Youth from PPB	➤ Less sources of information on agriculture and agriculture careers. ➤ Reduced access to internet and devices, as indicated by the lower proportion of PPB youth using Social Media/Networking sites for agriculture information and agriculture career information.

Key Findings by Domain and Indices

Key Findings in the Agriculture Practices Domain:

- Most respondents (47%) are not exposed to any agricultural practices within their family members (Figure 1 in ANNEX).
- A higher proportion of youths are more exposed to the farming of fruits and vegetables (Home-based farming (fruits and vegetables) at 37.9%, Fruits at 27.7%, Vegetables at 18.95%), rather than rice (12.8%).
- A higher proportion of low-income (<B\$2000 at 9.4%) and low-middle income (B\$2001-4000 at 9.2%) households lease land for agriculture or farming purposes, when compared to upper-middle (B\$4001-6000 at 4.7%) and very high income (Over B\$6000 at 3.8%) households.
- More lower income households leasing land could be attributed to the lack of financial resources and/or a greater inclination or necessity to engage in agricultural activities to generate additional income.
- A higher proportion of respondents belonging to low-middle income households (B\$2001-4000 at 32.7%) and upper-middle income households (B\$4001-6000 at 32.8%) have a land privately owned by a family member for agricultural or farming purposes, compared to other household income groups.
- Majority of very high-income households (monthly household income of over B\$6000) do not lease or own land to be used for agricultural or farming purposes.

Key Findings in the Interests in Agriculture, Agribusiness and Smart Farming Domain:

- A majority of youths (64%) strongly agree that they want to be farmer rather than be unemployed. A small proportion of youths with a diploma (18%), and men (14%) would rather stay unemployed than be a farmer.
- Majority of respondents (97%) prefer a non-agriculture related job as their number one (1) choice⁴. For example, Business Manager, Lawyer, Police, Doctor, IT Manager, Finance, Graphic Designer, Army Officer, etc.
- In categorising the open-ended answers into types of jobs, majority of respondents (52%) preferred a Professional type of job⁵ as their first choice. For example, Lawyer, Teacher, Doctor, Civil Servant, Finance, Administrative Officer etc.
- Amongst respondents who selected an Agriculture related job as their first priority, the majority (52%) preferred Professional types of jobs, such as Lab technician, Agricultural Teacher, Agriculture Researcher, Aqua-culturist, Food scientist etc.
- Majority of respondents expect a total monthly income between B\$1001-\$2000 (27%) and B\$501-\$1000 (26%).
- The majority of youths feel that the minimum acceptable monthly income is B\$501-\$1000 (45%).
- A majority of youths (92%) are excited about the potential of smart farming technologies.
- A majority of youths (91%) feels that smart farming makes agriculture more attractive to young people.
- Although a majority of youths (66%) are interested in pursuing a career in agriculture due to smart farming innovations, a significant proportion of youths in a household income of B\$6001 and above (40%) are not interested, compared to other income groups.
- Although a majority of youths (63%) are interested to pursue a course and career in agriculture, a significant proportion of youths (37%) are not interested in pursuing a course and career in agriculture. This was highest amongst youth with secondary education (38%) a degree level and above (40%), and those with a postgraduate diploma (50%).

⁴ In listing the top 3 jobs preferred in order of priority, the respondent's open-ended answers were categorised in two groups: Agriculture related jobs and Non-agriculture related jobs

⁵ The respondent's open-ended answers were also categorised into the Major ILO Groups of jobs (Professionals, Technicians and Associates, Service and Sales Workers, Elementary Occupations etc).

- A higher proportion of youths between the ages of 18-24 (41%) are not interested in pursuing a course and career in agriculture, compared to 25-34 year olds (32%), and 35-39 year olds (24%).
- Youths ranked the top 3 skills needed to start a career in agriculture, which are:
 - i. Basic agriculture skills (60% selected as their first priority skill)
 - ii. Business skills (46.7% selected as their second priority skill)
 - iii. Smart farming skills (e.g. IT training, Drone training, etc.) (57.1% selected as their third priority skill)
- More youths who are in the following fields of study need capacity building in basic agriculture skills as their first priority skill required to start a career in agriculture:
 - i. Humanities and Arts (85%)
 - ii. Science (70%)
 - iii. Health and Welfare (66.7%)
 - iv. Social Sciences, Business and Law (66.2%).
- Amongst youth who are currently studying in the field of Agriculture, a majority (57%) require basic agriculture skills as the first priority skill required to start an agriculture career.
- In terms of youth's personal view on smart farming (Figure 2 in ANNEX), majority of youths feel:
 - i. Smart farming technologies are too expensive for small scale farmers (58% strongly agree);
 - ii. There should be more training programs for youth on smart farming technologies (57% strongly agree);
 - iii. Excited about the potential of smart farming technologies (50% strongly agree); and
 - iv. Smart farming is essential for the future of agriculture (49% strongly agree).

Agriculture Outlook Index

The Agriculture Outlook Index assesses youth personal and social perceptions of agriculture in Brunei. Table 2 (ANNEX) illustrates the personal and social views on agriculture items used to calculate the scores in the index. The higher the score the more positive the youth's outlook, the lower the score the more negative the youth's outlook.

Amongst the target groups, youths with a household income of B\$6,001 and above have a significantly negative social and personal outlook of agriculture in Brunei, with a mean score 43.2 out of 100, significantly below the overall sample mean score at 5% level of significance (Table 3 in ANNEX).

Key findings from the Agriculture Outlook Index:

- Top six (6) sentiments from the Agriculture Outlook Index are:
 1. Employment in the agriculture industry is not for old people only (92% agree)
 2. It is better to be a farmer than stay unemployed (91% agree)
 3. Agricultural work is physically demanding (90% agree)
 4. Working in agriculture is an acceptable way of earning a living (90% agree)
 5. The agriculture industry provides a good employment opportunity for young people (89% agree)
 6. Working in the agriculture industry is not only for men (89% agree).
- An overwhelming majority of youths (82%) agree that there is a lack of career progression in agriculture. This is especially so for youth with a degree level and above (87%), men (85%), and youth with a monthly household income of B\$6001 and above (94%).
- Majority of youths (79%), a higher proportion of youths with a degree level and above (92%), and youths with a monthly household income of B\$6001 and above (87%), agree that Brunei lacks professional and licenced agriculture opportunities.
- An overwhelming majority of youth (90%) agree that Agriculture work is physically demanding.
- Although a majority of youth (86%) feel that there is future for farming in Brunei, a higher proportion of men (14%), youth with degree level and higher (19%), youth between the ages of 25-34 (20%) feel that there is no future for farming in Brunei
- Although a majority of youth (68%) state that their family and friends will not look down on them if they work in agriculture, there are differences within demographic groups. A higher proportion of men (39%), youths with a monthly household income of B\$6001 and above (38%), and youths aged 18-24 (35%) agree that their friends and family will look down on them if they work in agriculture.
- Although a majority of youths (92%) state that employment in agriculture is not for old people only, a higher proportion of men (14%) and youth with diploma level education (18%) agree that employment in agriculture industry is for old people only.
- A significant proportion of men (36%) agree that no woman will want a farmer as her husband.
- More than a third (34%) of youth feel that agriculturists and farmers are not highly respected and valued by the Brunei society, this is higher amongst youth with a household monthly income of B\$6,001 and above (58%), and 35-39-year-olds (44% strongly disagree).
- A majority of youths (89%) think that working in the agriculture industry is not only for men. This sentiment is more strongly felt by 35-39 year olds (56% strongly agree).

However, a small proportion of men (16%), 25-34-year-olds (17%), youth with a household monthly income of more than B\$6,000 (15%) feel that working in the agriculture industry is only for men.

- Slightly more than half of youth (56%) agree that there is no quick return of money in agriculture in Brunei. This is higher amongst youth with a monthly household income above B\$6000 (79%), and youths with a degree level and above (66%).
- However, a significant proportion of youth (43%) think that there is a quick return of money in agriculture. This is higher amongst youth with secondary (49%) and primary (50%) level education, and youth with a monthly household income of B\$2000 and below (52%).
- Although a majority of youths (73%) agree that it is too costly to start an agriculture business in Brunei, a significant proportion of youths with a degree (25%), diploma (28%), secondary (29%), primary (50%) level education disagree.

Agriculture Development Perception Index

The Agriculture Development Perception Index assesses youth perceptions of Brunei's agricultural and agribusiness industry development. The higher the score, the more positive the perception, the lower the score the more negative the perception.

Overall, youths with a degree level or higher have a significantly negative perception of Brunei's agriculture development, with a mean score 37.4 out of 100, significantly below the overall sample mean score at 5% level of significance (Table 4 in ANNEX).

Key findings from the Agriculture Development Perception Index:

- The youth view the main reasons for the lack of agriculture and agribusiness development in Brunei as:
 1. Lack of financial resources (46% strongly agree);
 2. Lack of the right network (39% strongly agree);
 3. Lack of agriculture/agribusiness experience (36% strongly agree); and
 4. Lack of agriculture/agribusiness information (36% strongly agree).
- In terms of youth's personal views on agriculture's contribution towards national development (Figure 4 in ANNEX), majority of youths feel:
 1. Local agriculture farming is important in supplying food to Brunei (67% strongly agree)
 2. Agriculture contributes to the development of Brunei's economy (54% strongly agree)

- A significant proportion of youths (34%) feel that Brunei's agriculture industry cannot compete in the global market (Figure 4 in ANNEX).

Key findings in the Awareness of Agriculture Information and Careers domain:

- Top three (3) sources of information on agriculture for youth in Brunei are:
 - i. Social Networking/Media sites such as Facebook or Instagram (68.2%)
 - ii. TV News (53.9%)
 - iii. Stories shared by people they may know (50.7%)
- Top three (3) sources of information on agriculture careers for youth in Brunei are:
 - i. Social Networking/Media sites such as Facebook or Instagram (58.6%)
 - ii. Stories shared by people they know information (34.4%)
 - iii. TV News (28.3%)
- Top four (4) agriculture careers known by youth in Brunei:
 1. Farmers (81.3%)
 2. Fishery (59.2%)
 3. Food Scientists (53.9 %)
 4. Agricultural business managers (46.4%)
- Youth are less aware of agriculture careers which require specialised skills. The least known agriculture careers are:
 1. Forestry (14%)
 2. Finance Director (21%)
 3. Agronomist (21%)
 4. Grain Classifier (23%)
- A majority of respondents (more than two thirds or 68.2%) have found information about agriculture on Social Networking/Media sites such as Facebook or Instagram.
- A significantly higher proportion of men (16.6%) are not aware of any types of agriculture careers compared to women (5%).
- Youth from PPB having fewer sources for agriculture information may be due to less access to mobile/laptop/computer devices or the internet, as their main source of agriculture information is TV news (51.1%). A significantly lower proportion of PPB respondents (48.9%) utilise Social Networking/Media sites as a source of agriculture information compared to IBTE (73.2%) and Online (76.2%) respondents.
- A significantly higher proportion of PPB respondents (27.8%) are not aware of any types of agriculture careers, compared to IBTE (4.1%), and Online (4.5%) respondents.

- Overwhelming majority of youths (89%) view current agriculture work in Brunei as outdated, with manual labour involved⁶.

⁶ Youths were asked how they saw the conditions of agriculture work in Brunei, majority selected a picture of rice farmers using manual labour tools and outdated methods.

ANNEX

Figure 1: Family Member Involvement in Agriculture Practices by % of Respondents

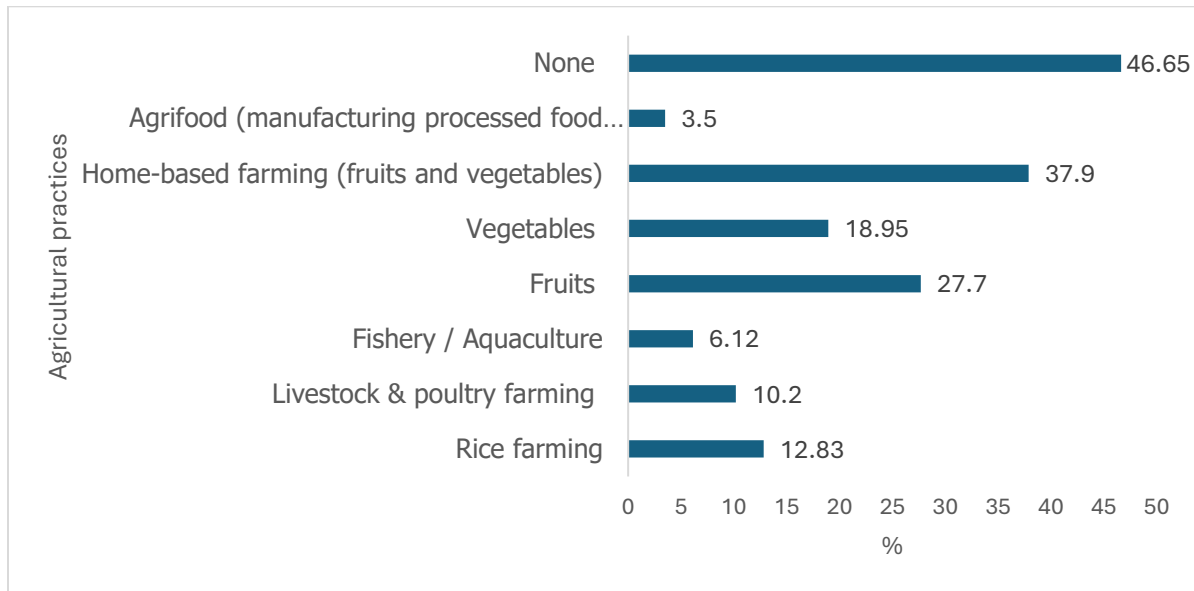


Figure 2: Personal Views on Smart Farming by Frequency

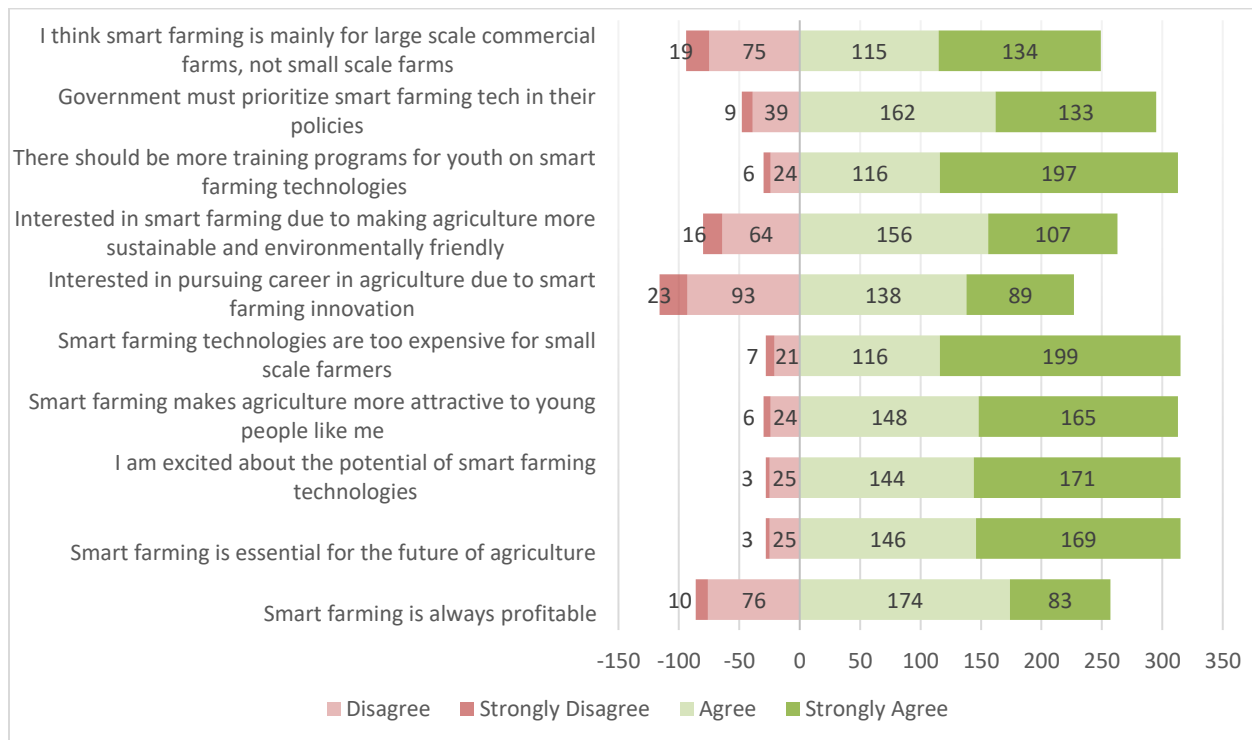


Table 2: Youth's Personal and Social Views on Agriculture Items

		Strongly disagree	Disagree	Agree	Strongly agree	Cronbach's α^7
Agriculture Outlook Index Items						
1	The agriculture industry provides a good employment opportunity for young people	1.5	9.9	52.8	35.9	0.7
2	There is a lack of career progression in Brunei's agriculture industry (<i>reversed</i>)	2.3	15.5	46.9	35.3	0.7
3	Professional and licensed career agricultural opportunities are lacking in Brunei (<i>reversed</i>)	1.5	19.2	41.7	37.6	0.7
4	It is better to stay unemployed than be a farmer (<i>reversed</i>)	64.4	26.2	6.1	3.2	0.7
5	There is no future for farming in Brunei (<i>reversed</i>)	52.5	33.2	10.8	3.5	0.7
6	It is too costly to start an agricultural business in Brunei (<i>reversed</i>)	3.8	23.6	52.2	20.4	0.7
7	There is no quick return of money in agriculture in Brunei (<i>reversed</i>)	11.4	31.8	46.1	10.8	0.7
8	Agriculturists and farmers are highly respected and valued by the Brunei society	6.1	28.3	42.6	23.0	0.7
9	Working in the agriculture industry is only for men (<i>reversed</i>)	47.2	41.7	7.0	4.1	0.7
10	My family and friends will look down on me if I work in agriculture (<i>reversed</i>)	31.2	37.0	26.2	5.5	0.7
11	Employment in the agriculture industry is for old people only (<i>reversed</i>)	58.9	32.9	5.5	2.6	0.7
12	No woman will want a farmer as her husband (<i>reversed</i>)	39.1	39.1	14.6	7.3	0.7
13	Agricultural work is physically demanding (<i>reversed</i>)	2.0	7.6	44.6	45.8	0.7
14	I am interested in pursuing a course and a career in agriculture	9.3	27.7	35.0	28.0	0.7
15	Working in agriculture is an acceptable way of earning a living	2.0	7.9	42.9	47.2	0.7

⁷ Overall Cronbach alpha is acceptable at 0.7287

Table 3: Youth's Agriculture Outlook Index Score by Demographic Groups

Demographic groups		Agriculture Outlook Index Score
Gender		
1	Female	53.6
2	Male	48.0
Education level		
3	Primary	42.9
4	Secondary	53.2
5	Diploma	49.2
6	Degree and above	47.9
Monthly household income		
7	Less than BND2,000	53.0
8	BND2,001 – BND4,000	51.1
9	BND4,001 – BND6,000	52.9
10	BND6,001 and above	43.2 (-) ⁸
District		
11	Belait	52.7
12	Brunei-Muara	50.1
13	Temburong	54.5
14	Tutong	53.3
Mode of response		
15	IBTE	54.0
16	Online General	48.7
17	PPB	51.4
Family own or lease land for agriculture/farming purposes		
18	No	49.4
19	Yes, the land is leased by the government	55.8
20	Yes, the land is privately owned by a family member	53.0
Rural/Urban		
21	Rural	51.1
22	Urban	50.1
23	Missing (.)	53.7
Overall		
24	Total	50.9

⁸ The '(-)' sign indicates that the mean score of the sub-domain is significantly below the overall sample mean score at 5% level of significance.

Figure 3: Reasons for Lack of Agriculture and Agribusiness Development by Frequency

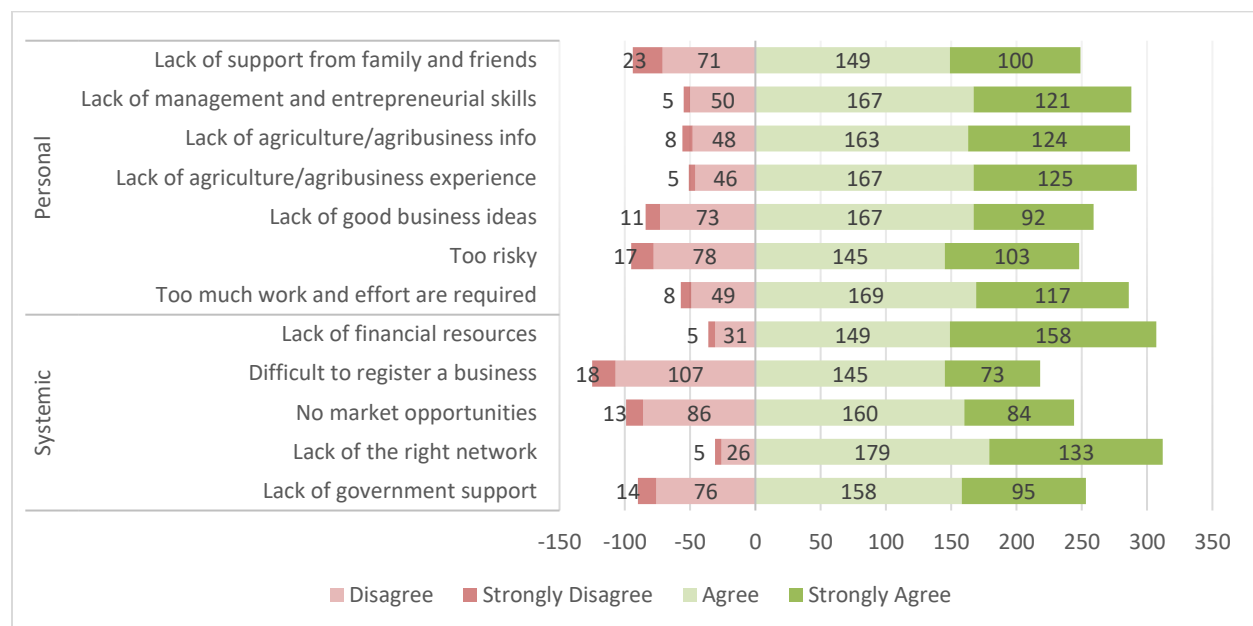


Table 4: Youth's Agriculture Development Perception Index Score by Demographic Groups

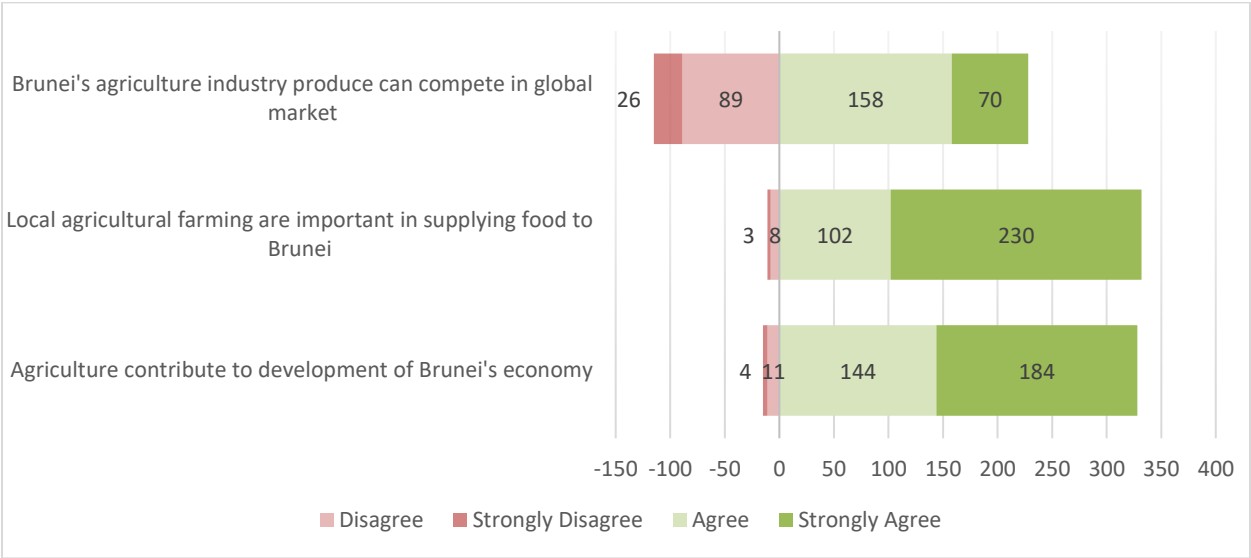
Demographic Groups		Agri Development Index Score
Gender		
1	Female	42.2
2	Male	43.0
Education level		
3	Primary	38.5
4	Secondary	45.9
5	Diploma	40.2
6	Degree and above	37.4 (-) ⁹
Monthly household income		
7	Less than BND2,000	45.6
8	BND2,001 – BND4,000	42.1
9	BND4,001 – BND6,000	40.6

⁹ The '(-)' sign indicates that the mean score of the sub-domain is significantly below the overall sample mean score at 5% level of significance.

Demographic Groups		Agri Development Index Score
10	BND6,001 and above	38.4
District		
11	Belait	41.2
12	Brunei-Muara	41.9
13	Temburong	44.2
14	Tutong	47.0
Mode of response		
15	IBTE	45.1
16	Online General	38.7 (-) ¹⁰
17	PPB	46.5
Ownership of land		
18	No	41.9
19	Yes, the land is leased by the government	43.8
20	Yes, the land is privately owned by a family member	43.8
Urban/Rural		
21	Rural	43.5
22	Urban	41.3
23	Missing (.)	45.8

¹⁰ The '(-)' sign indicates that the mean score of the sub-domain is significantly below the overall sample mean score at 5% level of significance.

Figure 4: Personal Views on Agriculture Contribution Towards National Development by Frequency



VALUE CHAIN ANALYSIS OF THE BRUNEI DARUSSALAM RICE INDUSTRY FINAL REPORT

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VALUE CHAIN ANALYSIS OF THE BRUNEI DARUSSALAM RICE INDUSTRY

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ABBREVIATIONS USED

ASEAN	Association of Southeast Asian Nations
AITI	Authority for Info-Communications Technology Industry of Brunei Darussalam
AWD	Alternate Wet and Dry
BCG	Bio-Circular-Green
BDRIR	Brunei Darussalam Rice Industry Roadmap
BIMP -EAGA	Brunei, Indonesia, Malaysia, Philippines – East Asia Growth Area
BKCF	BIMP-EAGA Republic of Korea Cooperation Fund
BND	Brunei Dollar
BRIA	Better Rice Initiatives Asia
CD	Community Development
CO	Community Organizing
CSR	Corporate Social Responsibility
CSPS	Centre for Strategic and Policy Studies
CRA	Costs and Returns Analysis
DEPS	Department of Economic Planning and Statistics
DOAA	Department of Agriculture and Agrifood
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FTE	Full Time Equivalent
GAP	Good Agricultural Practices
GGGI	Global Green Growth Institute
KII	Key Informant Interview
KOICA	Korea International Cooperation Agency
IRRI	International Rice Research Institute
MOFE	Ministry of Finance and Economy
MPRT	Ministry of Primary Resources and Tourism
MRQ76	An Inbred Rice Variety from Malaysia
RPC	Rice Processing Complex
SCM	Supply Chain Management
SEMBADA188	A Hybrid Rice Variety from Indonesia
SWOT	Strength-Weaknesses-Opportunities-Threats
VCA	Value Chain Analysis
VC	Value Chain
WB	World Bank
WITS	World Integrated Trade Solutions
WRC	Wasan Ricemill Company
WTP	Willingness To Pay

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VALUE CHAIN ANALYSIS OF THE BRUNEI DARUSSALAM RICE INDUSTRY

Section 1. Introduction

Background and Objectives

1. A value chain is defined as “a set of enterprises linked by transactions between actors from primary production to sales of the final product to consumers” (BRIA, n.d.) Value is determined by the buyer’s willingness to pay for the product. Transactions between actors served as vital link for successful product transformation. As value is created at each segment of the transaction, the process gives rise to an interconnected chain of actors. The conduct of a detailed study to understand how value is created from input provision to final transmission as a product or service ready for consumption happening in an environment where enablers and other support services are present, is collectively called a Value Chain Analysis (VCA).
2. The VCA for the Brunei Rice Industry was prepared as an input to the Situation Analysis for the proposed Brunei Darussalam Rice Industry Roadmap (BRIR) 2026 - 2035. It is one of the expected Outcomes of the ‘Promoting Youth Engagement and Employment in Bio-Circular-Green (BCG) Agriculture and Food Systems for Food Security: An Action Research on the Rice Value Chain in Brunei Darussalam’ funded from a grant of the Global Green Growth Institute (GGGI) - BIMP-EAGA Republic of Korea Cooperation Fund (BKCF). In general, the conduct of the VCA aims to contribute significantly to the development of the BRIR map by providing substantial answers to the question “Where Are We” in the Brunei Rice Industry. Specific objectives of the report are as follows:
 - Analyze the nature and structure of the Brunei Darussalam Rice Industry;
 - Map out the Brunei Darussalam rice value chain by identifying the segments processes, actors, functions, standards and enabling environment starting from input provision to product consumption;
 - Identify issues and constraints affecting paddy rice production, aggregation, processing, and distribution of milled rice and the internal strengths and external opportunities available to address these concerns; and
 - In relation to the formulation of the BRIR, provide recommendations on upgrading the Brunei rice value chain.

Methodology and Approach

Data Collection

3. The conduct of a VCA requires the collection of information through the triangulation of various sources, with each source validating the others. For the Brunei Darussalam rice industry VCA, information gathering was started through desk review of existing literature. This is to establish what is available and determine information gaps. To fill in the gaps, Key Informants Interviews (KIIs) and Focus Group Discussions (FGDs) using guide questions and open-ended questionnaires as well as a Farmer Survey thru Survey Questionnaire were conducted during organized interview sessions and workshops. Observational field work was done to follow a product's transformation from input provision to production, on to transformation and distribution until it reaches the final customer.
4. The VCA draw information mainly from primary and secondary sources as follows: (1) Previously completed rice and rice-related supply chain studies conducted by Brunei-based academic researchers; (2) Data from official publications of the Brunei Darussalam Government agencies mainly the Department of Agriculture and Agri-food of the Ministry of Primary Resources and Tourism (DOAA – MPRT) and the Department of Economic Planning and Statistics of the Ministry of Finance and Economy (DEPS-MOFE) and other government agencies involved in the rice industry; (3) Rice VCA related chapter contributions in books and research articles in journals; (4) Official and working documents from government organizations, government corporations, and other agencies with functions related to the rice industry to include the Economic Blueprint for Brunei Darussalam, primary industry plans and similar literature; (5) Results from a survey of randomly selected rice farmers using a questionnaire and (6) Other papers, presentations, and conference proceedings available to us. To fill in the information gap, we relied on information provided by Key Informants we were able to talk online and face-to-face during a short visit to Brunei in June 2024. We supplemented the information gathered from primary and secondary with our industry experience.

Data Analysis and Presentation of Results

5. Collected information validated through triangulation of at least three information sources were then analyzed and organized to form the Brunei Rice Industry VCA Report. The results are in the form of descriptive text, figures and tables. Except for production, consumption and international trade trends, the CRAs and estimates of employment generated, the report is mainly qualitative in nature.

Section 2. Nature and Structure of the Brunei Darussalam Rice Industry

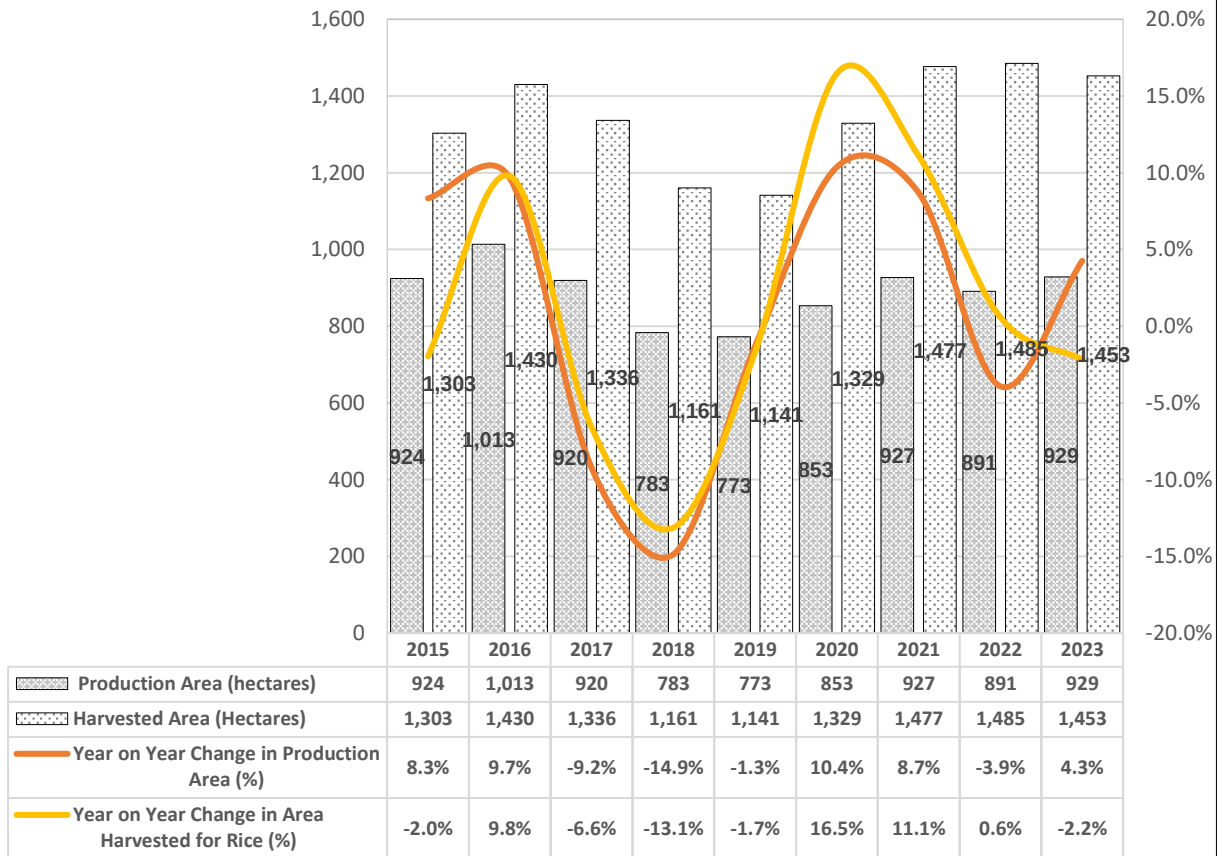
Product Description, Production and Consumption Trends

6. Rice, (*Oryza sativa*), is a semi-aquatic grass plant belonging to the family Poaceae, which produces an edible starchy cereal grain. Milled rice serves as the staple food of approximately one half of the world's population, including almost all people of South, East and South-east Asia. About 95 percent of the world's rice harvest is for human consumption.
7. Compared with its co-ASEAN member countries, the Brunei Darussalam rice industry is at a **micro-scale**. The country's total physical area for rice at **929 hectares** as of 2023 is the approximate size of one rice growing village in Indonesia, Philippines, Thailand, Vietnam or Cambodia. During 2023, the Brunei Darussalam produced **3,727 metric tons** of paddy rice grown from **1,453 hectares** of agricultural lands classified as irrigated and rainfed. In **2021**, the DOAA-MPRT recorded that the country produced **4,115 tons** of paddy, its highest in all of its rice growing years. Shown in Figures 1 and 2 is the growth trend of Brunei Darussalam rice production areas and the resulting produce¹¹. The graph shows that while production has been increasing mainly due to better yields from irrigated areas in the Brunei-Muara Districts, the **area grown for rice was not increasing**. This is mainly due to non-expansion of the country's **limited irrigation infrastructure**¹² resulting to farmers **shifting** to other **less water hungry** but **higher** priced crops. In addition, there may be **limits** of expanding farm lands for rice cultivation. Moreover, with the **un-attractiveness of rice farming** as source of income – a job characterized as 3D - difficult, dirty, dangerous but low returns, Brunei is witnessing a **decreasing** number of **rice farmers** through the years. A potential over-estimation of the milled rice equivalent from local paddy production was observed. Based on interviews and surveys with rice farmers and value chain actors, and direct observation of Brunei paddy farms, a 45% milling recovery rate is used as an estimate to accommodate for a margin of error in Figure 2.

¹¹ To estimate the Milled Rice equivalent of local paddy rice production, a 65 percent Milling Recovery is used in published statistics. This figure may be an overestimate due to the low quality of paddy rice being delivered by farmers. Via interviews with value chain actors and survey of Brunei rice farmers, it has been identified that the paddy rice may not have been thoroughly cleaned with impurities including immature grains. Direct observation of paddy farms in Brunei also showed there is a high prevalence of weedy rice. Coupled with the mentioned longer time frame of storage prior to milling, a 45% milling recovery rate is used in Figure 2 as an estimate.

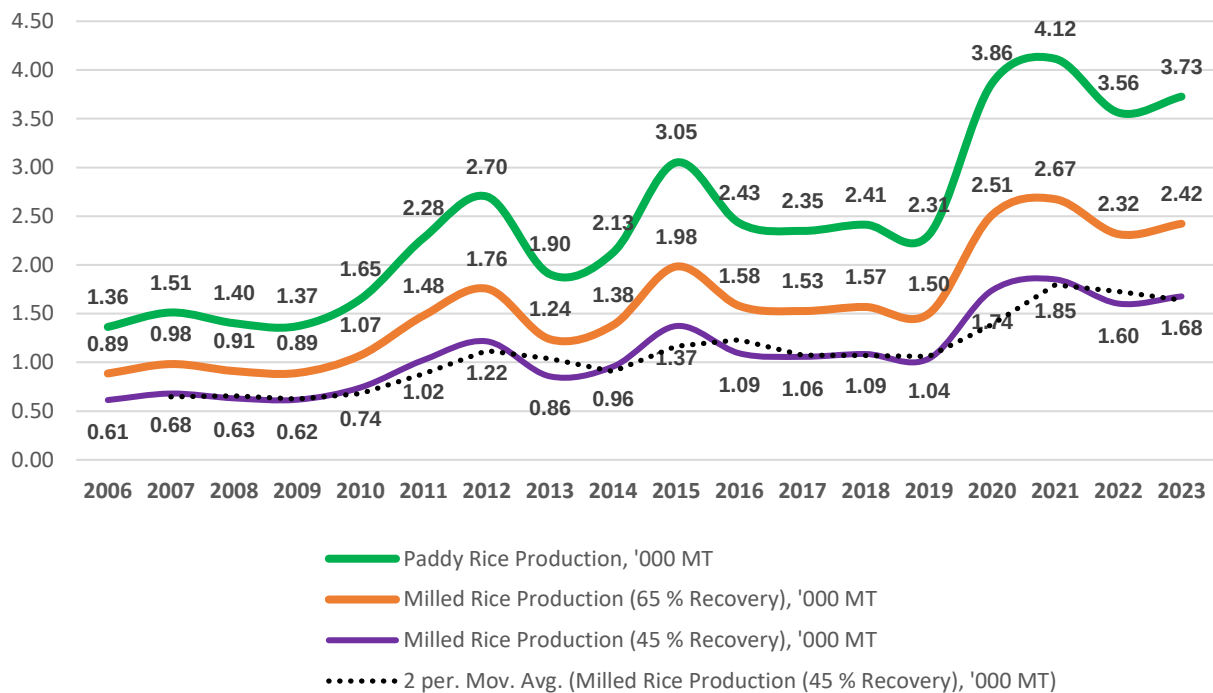
¹² This was observed through the survey of rice farmers, and publications featuring surveys of rice farmers.

Fig. 1. Production and Harvested Area for Rice, Brunei Darussalam, 2015 to 2023



Source of Data: Brunei Darussalam Agriculture and Agrifood Statistics, 2015 to 2023.

Fig. 2. Paddy and Milled Rice Production at 65% (Published estimates) and 45% (Observed estimates) Recovery, Brunei Darussalam, 2006-2023



Source of Data: Published estimates through Brunei Darussalam Agriculture and Agrifood Statistics, 2015 to 2023, Observed estimates through interview and surveys, 2024.

8. To be available for consumption, rice has to go through a sequence of production processes starting from breeding and varietal selection, commercial seed production, seedling establishment, land preparation, transplanting or direct seeding, water and nutrient management, pests and diseases management, and harvesting as paddy rice. After harvest, paddy is dried, milled, packed and distributed to consumers. Summarized in Figure 3 are the products and by-products of paddy rice.

9. The DOAA-MPRT reported that on average, a Brunei citizen and resident whether permanent or temporary, consumed an average of **66.04 kgs** per person in 2023 equivalent to **181 grams of milled rice daily**. With a current population of **450,500** the country's total annual consumption would amount to **29.75 thousand MT**. Presented in Figure 4 is the historical trend of local rice production and importation from 2006 to 2023. During the 17-year period, the Brunei Darussalam has an average annual deficit of **32.2 thousand tons** of milled rice filled through importation. On the other hand, local production averaged at **1.69 thousand tons** resulting into an average rice self- sufficiency of **5.3 percent** over a 17- year period.

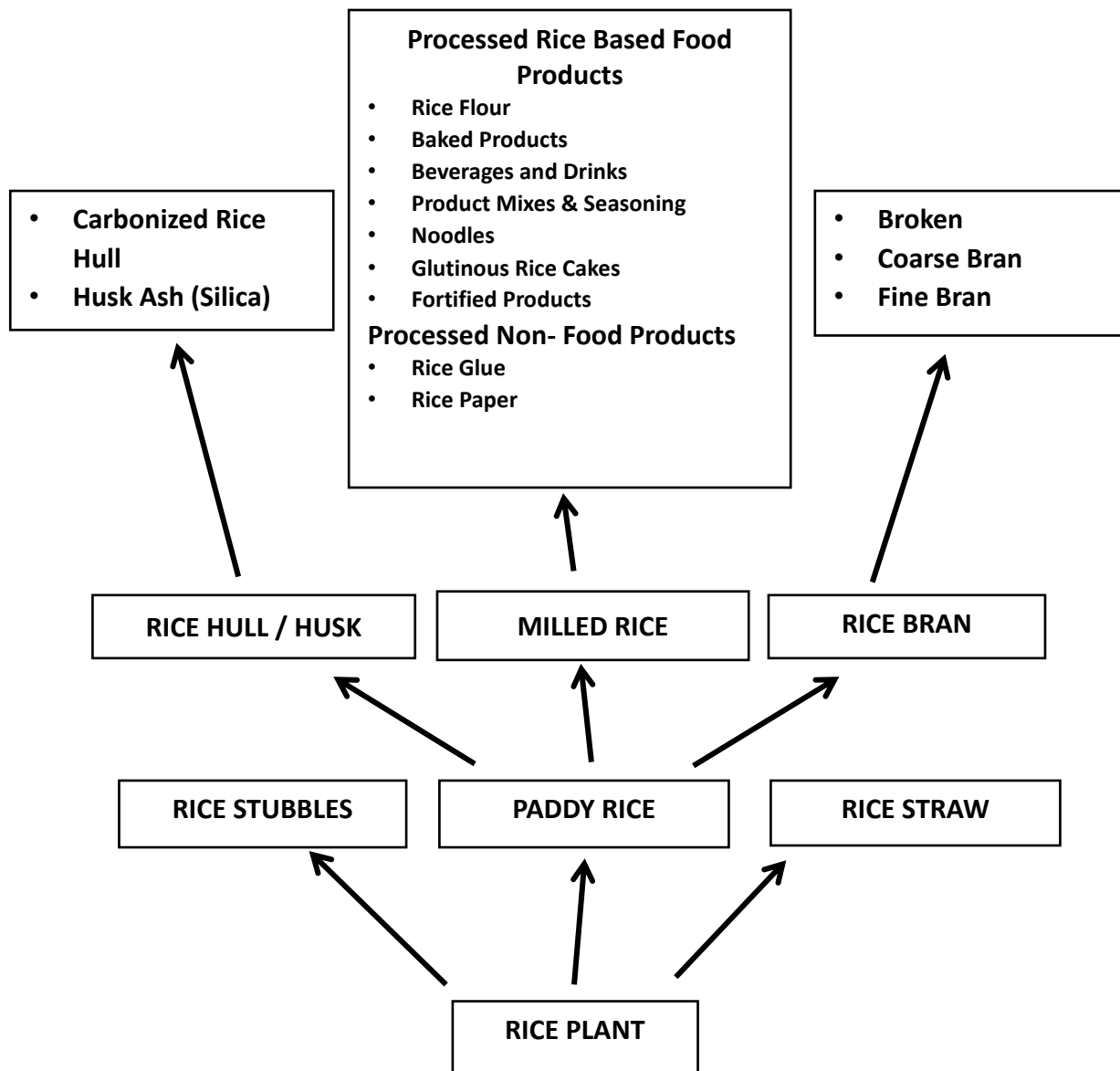
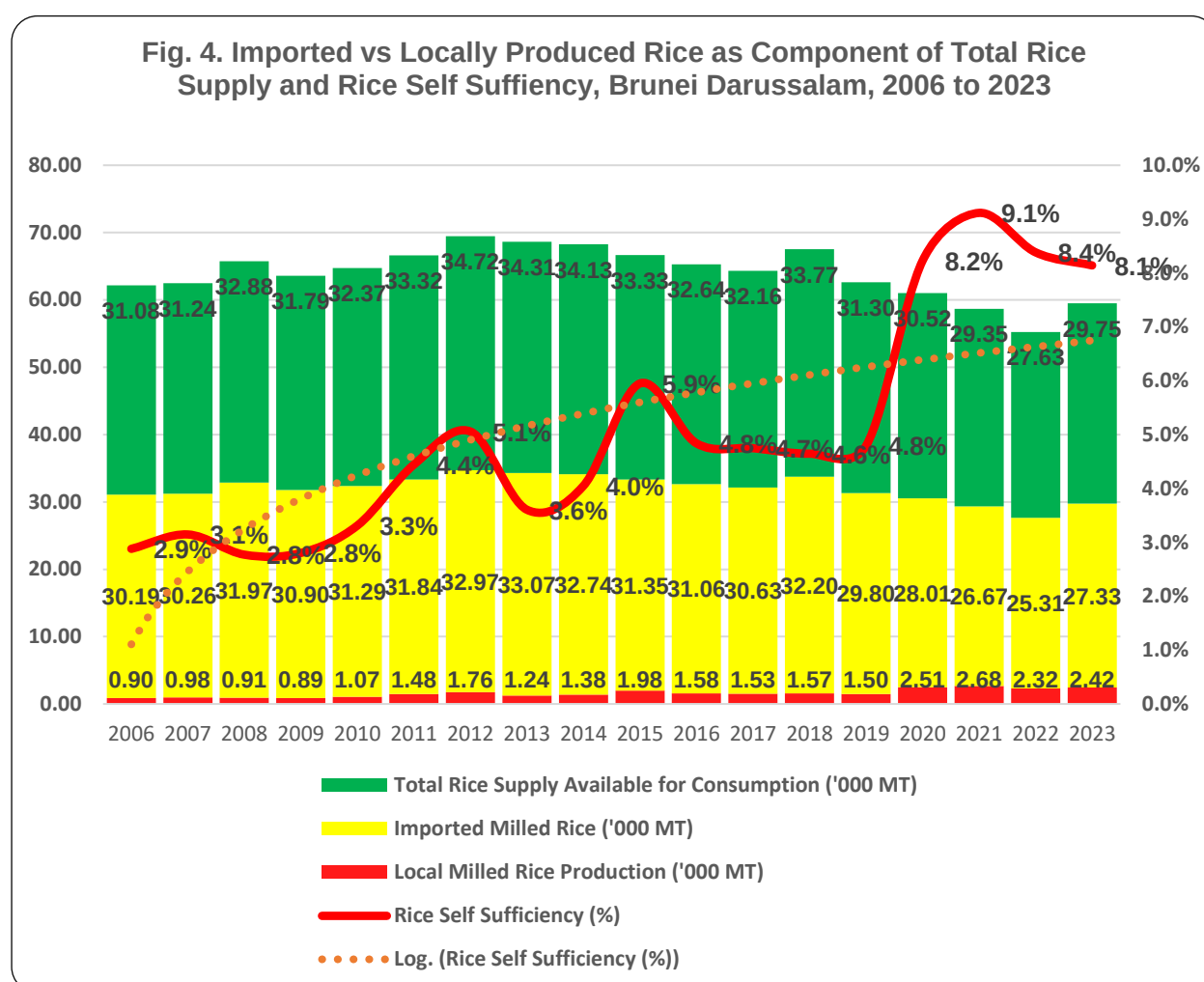


Fig. 3. Products and By-Products of Paddy Rice



Source: Paddy rice production from various issues of the DOAA-MPRT published Brunei Darussalam Agriculture and Agrifood Statistics

Milled Rice Quality Requirements of Market Intermediaries and Consumer Preferences for Rice in Brunei Darussalam

10. For global rice market intermediaries, the top-quality requirement is the grain's physical characteristics, with long grained varieties being the topped choice. This is in response to the observation at the retail level that customers choose the rice grain they buy according to the shape, length and color¹³. In addition to physical appearance, eating quality, specific variety, and purity are also important.

11. According to a 2008 Willingness to Pay (WTP) study¹⁴ conducted for the Bruneian rice market, consumers are willing to pay as much as B\$2.00 per kg of rice of their

¹³ Various studies on Willingness to Pay (WTP) for rice has identified color – pure white, as one of the factors affecting the choice of consumers on the kind of rice to be bought and the price they are willing to pay for the rice of their choice.

¹⁴ Galawat F. and Yabe M. 2010. *Assessing Consumer's Preference for Local Rice in Brunei: An Application of Choice Model*. Journal of the International Society of Southeast Asian Agricultural Sciences (ISSAAS). Vol. 16, No.2:104 -115

preferred quality. The bid price is **67 percent higher** than the government subsidized price of imported Thai fragrant rice at B\$1.20. Urban consumers prefer rice that are **white, purple, long, non-glutinous, aromatic** and **organically produced** with firm preference for white, long, and **organic** rice. On the other hand, rural consumers preference are **white, glutinous, sweet** and **organic** – with strong preference for an organic, sweet and white rice.

12. To successfully wean Brunei consumers - majority of which are children and youth representing the country's future domestic market, away from the more preferred imported rice and patronize local produce, there is an urgent need for Brunei rice farmers to shift to the cultivation of varieties with the preferred attributes of **white, long-grain, semi-aromatic**, and **organically grown rice**. However, the Sembada 188 hybrid and MRQ76 inbred varieties, produced locally by Brunei farmers, carry some but not all these attributes.
13. As to packaging, we observed during our visits to supermarkets during June 2024 that the subsidized imported Thai and Cambodian as well as the locally produced Sembada 188 and MRQ76 rice are sold in 10 kgs bags. Other specialty imported Indica rice from Australia, Japonica from Japan and South Korea and Basmati from India and Pakistan are sold in 5 kgs, 2 kgs and 1 kg packs. Locally produced heirloom pigmented rice from the Temburong District is sold in 1 kg packs. This is probably due to limited supply and high price of at least BND 7 per pack. As to purchase channel, we observed that both locally produced and imported rice are sold through modern retailers comprising of supermarket chains, hypermarkets, and convenience stores or mini markets. We did not observe the selling of loose rice sold in public markets common in ASEAN countries with lesser per capita GDP compared to Brunei.

E-Commerce in Brunei Darussalam

14. E-Commerce is used globally, and 76% Bruneians are already using e-Commerce¹⁵, suggesting a potential platform for online buying of fast-moving consumer goods including rice. Potential drawbacks are the various challenges affecting consumer consumption of e-Commerce services. These include (1) Fear of credit and debit card fraud; (2) Preference for direct purchasing in physical shops; and (3) Worried that the goods ordered would not arrive. Furthermore, top items purchased online in Brunei according to order of preference are: (1) Clothing and accessories (73 %); (2) Travel and tourist services (50%); (3) Cosmetics and healthcare (32%); (4) Consumer electronics (31%); and (5) Digital content (e.g. apps) at 26%¹⁶. Although e-Commerce can be used for online buying of consumer goods including rice, Food, is nowhere to be found in the list of preferred items to buy online in Brunei. However, as the study was conducted prior to Covid-19, buying preferences may have been changed resulting from the intermittent lockdowns during 2020 and 2021 when consumers have no choice but to stay at

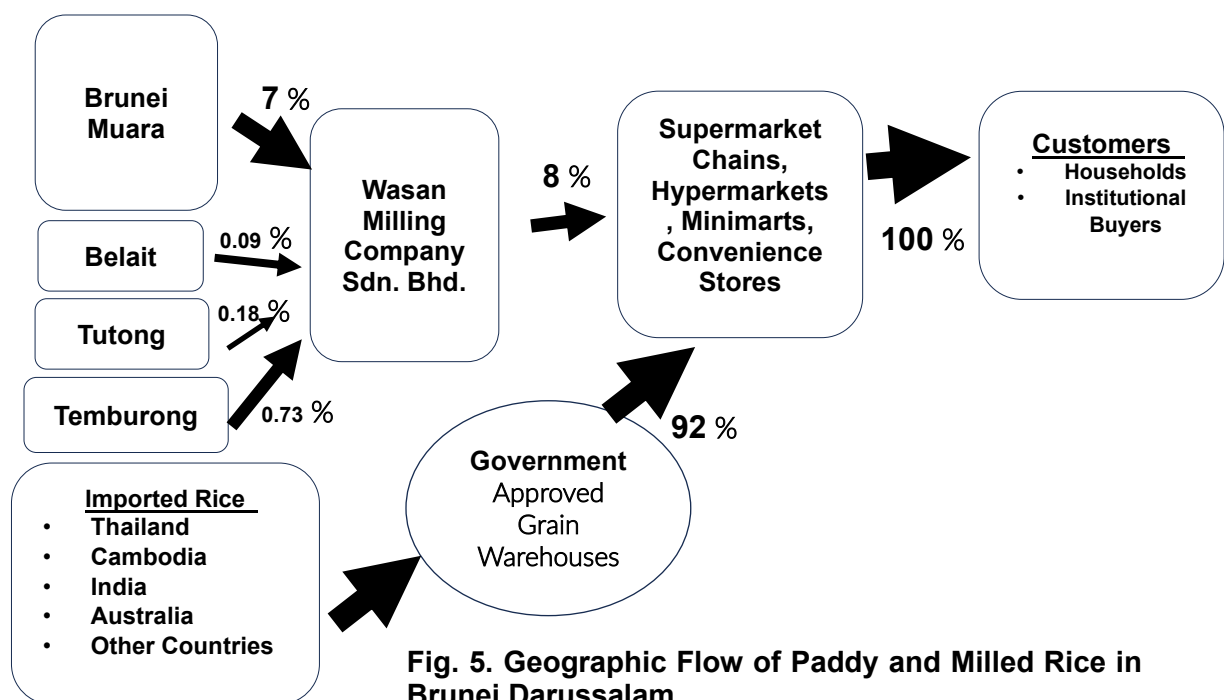
¹⁵ Authority for Info-Communications Technology Industry of Brunei Darussalam. 2019. *E-Commerce Survey for Consumers in Brunei Darussalam: 2018 Report*. AITI: Bandar Seri Begawan, Brunei Darussalam

¹⁶ Authority for Info-Communications Technology Industry of Brunei Darussalam. 2019. *E-Commerce Survey for Consumers in Brunei Darussalam: 2018 Report*. AITI: Bandar Seri Begawan, Brunei Darussalam

home, thus increasing preference to buy Food online. Currently, there is no available information to update on the current trends on online buying of fast-moving consumer goods including rice in Brunei.

Geographic Flow of Paddy Rice and Milled Rice in Brunei Darussalam

15. Movement of paddy and milled rice from the production source to the final consumption point can be traced through geographic flows. By following the product flow, the importance of supply areas in relation to demand centers is understood. In a small country like the Brunei Darussalam, land transport is the main means of transporting goods. Based on interview with Key Informants, we reconstruct the geographic flow of paddy rice and milled rice from the four rice growing districts to the Wasan Rice Mill and eventually in supermarket chains and other forms of retail format.



16. This is summarized in Figure 5. As presented earlier, local production contributed an average of 5.3 percent over a 17-year period from 2006 to 2023. More than 94 percent are sourced from the major rice exporting country of Thailand and in recent years from Cambodia. With a narrow market gap as shown in Figure 5, from production to consumption, rice consumers in Brunei should be able to benefit from better global prices through open trade as an alternative option.

Section 3. Rice Value Chain Mapping

Domestic Rice Value Chain Map of Brunei Darussalam

17. Drawing from information culled from various sources, presented in Figure 6 is a synthesis of the Brunei Darussalam rice value chain. The map summarizes the segments, functions, actors, standards and enablers. For rice to be available for consumption, it has to go through a series of production processes from breeding and varietal selection, production, commercialization and seed distribution, seedling establishment, land preparation, transplanting or direct seeding, water and nutrient management, pests and diseases management, and harvesting as paddy rice. After harvest, paddy is dried to the desired level, stored, milled, packed and distributed to consumers. A detailed listing of the actors by segment of the Brunei Darussalam rice value chain is summarized in Table 1.

Figure 6. Summary of the Brunei Darussalam Rice Value Chain - Segments, Functions, Actors, Standards and Enablers

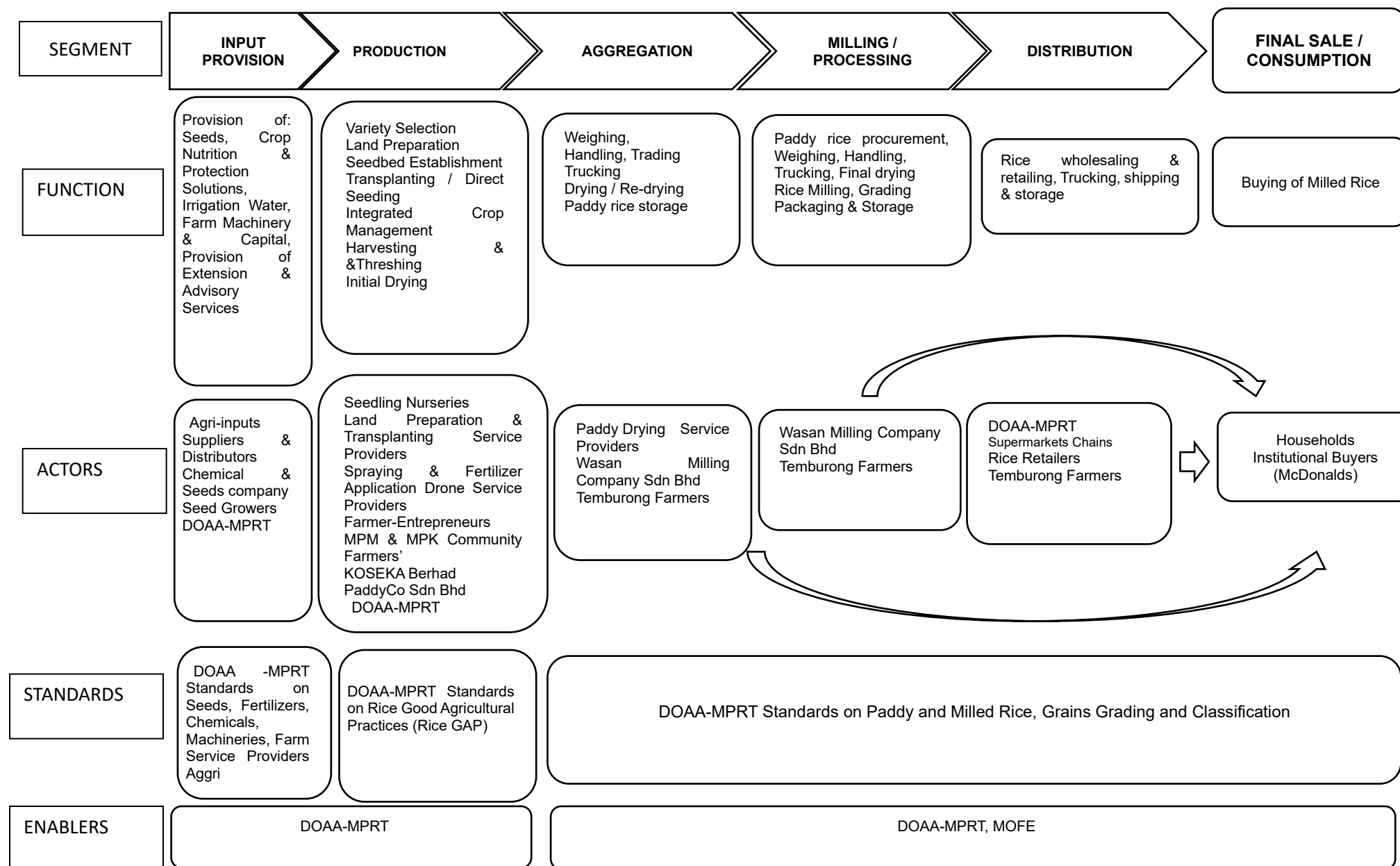


Table 1. Specific Actors by Segment and Sub-segments of the Brunei Darussalam Rice Value Chain, 2024

No.	Value Chain		Actors
	Segment	Sub-Segment	
1	INPUT PROVISION	Research & Development / Rice Breeding	• Malaysian Agricultural Research and Development Institute (MARDI) • Longping High Tech Company, Ltd. China • Hunan Hybrid Rice Research Centre, China • PT Biogene Plantation, Indonesia • International Rice Research Institute (IRRI)
		Seeds Supply	• Yaz & Wyn Enterprise (PT Biogene Plantation, Indonesia) • Jia Yuan Agriculture Co.Ltd (Yuan's Seeds Company, Ltd. China) • Bina L.N.S. Sdn Bhd
		Seeds Production / Commercial Multiplication	• Syarikat Pakatan Mekar Hijau Sdn Bhd • Bina L.N.S. Sdn Bhd • Traditional farmers practicing Farm Saved Seed
		Rice Seedlings Nursery	• Chantika • Jiayuan Agriculture Trading Company • Yaz & Wyn Enterprise
		Sale of Agricultural Inputs	• A.E. Enterprise (Pesticides, Fertilizers) • Pertanian Tropikal Utama (Pesticides, Fertilizers) • Syarikat Bumimedic (Pesticides, Fertilizers) • Chenyi Agro (Fertilizer) • Biofield Solution(Compost) • Sin Soon Lee (Compost)

			• K.N. Nursery (Compost)
2	PRODUCTION	Land Preparation	• Pertanian Tropikal Utama • ASMRA Trading Company • Hasmit Enterprise • Koperasi Pengangkutan Pengkalan Batu • Noor Azmi bin Haji Suhaimin • Haji Tungal bin Kahar • Abd Azih bin Abd Ghani
		Transplanting	• Pertanian Tropikal Utama • ASMRA Trading Company • Hasmit Enterprise • Koperasi Pengangkutan Pengkalan • Noor Azmi bin Haji Suhaimin • Haji Tungal bin Kahar • Abd Azih bin Abd Ghani
	PRODUCTION	Fertilizer & Pesticides Application by Drone	• Innovaero Sdn Bhd • Nem Sdn Bhd
		Harvesting	• Pertanian Tropikal Utama • ASMRA Trading Company • Hasmit Enterprise • Koperasi Pengangkutan Pengkalan • Noor Azmi bin Haji Suhaimin • Haji Tungal bin Kahar • Abd Azih bin Abd Ghani
		Paddy Drying	• MSP Jaya Company • Hasmit Enterprise

			• Noor Azmi bin Haji Suhaiman • Haji Yakub bin Haji Othman • Haji A Yahaya bin Murah • Haji Khamis bin Haji Akim • Hajah Sadiah bin Haji Liman
		Corporate / Clustered Farming	• Yaz & Wyn Enterprise • Paddyco Sdn Bhd • KOSEKA Berhad • MPM and MPK Community Farmers
3	PROCESSING	Storage	• Wasan Milling Company Sdn Bhd
		Milling	• Wasan Milling Company Sdn Bhd
		Packing	• Wasan Milling Company Sdn Bhd
4	DISTRIBUTION & WHOLESALING		• MPRT-DOAA • Wasan Milling Company Sdn Bhd
	RETAILING		• Hua Ho Department Store • Giant Supermarket • Ya-Nur Supermarket • Orbit Supermarket • Feliss Minimart • Mahamas Mini-Mart • Harihari Maju • Taniem Minimart • Other Minimarts all over Brunei • 24/7 Convenience Stores

Source: Department of Agriculture and Agrifood, Ministry of Primary Resources and Tourism

Opportunities for Business Creation in the Brunei Darussalam Rice Value Chain

18. While regarded as backbreaking and low value, there are various ways that rice farming can be profitable beyond paddy and milled rice. Summarize in Table 2 are potential business opportunities in the rice value chain.

Table 2. Opportunities for New Business Creation by Segment of the Brunei Rice Value Chain.

Rice Value Chain Segment	New Business Creation Opportunities
Input Provision	• Agri-input Suppliers for Traditional and Non-Traditional Inputs for Integrated Rice Crop Management • Certified Seed Contract Growers for Climate Smart & Novel Rice Varieties (both inbred and hybrid) • Rice Seedling Nursery • Compost / Organic Fertilizer Manufacture
Production	• Farm Machinery Rental Services for Land Preparation, Direct Seeding / Transplanting and Harvesting • Farm Mapping, Direct Seeding, Crop Nutrient and Crop Protection Application, Rice Crop Health Monitoring through Agricultural Drones Services • Integration of Fish, Duck, and Vegetables in Rice Farming • Rice Farm Tourism
Aggregation	• Transportation Services (powered by conventional & renewable energy) from Farm to Drying and Storage Facilities
Processing	• Custom Drying, Milling and Packaging Services • Processing of Paddy Rice Products (aside from milled rice) and By-Products
Marketing and Distribution	• Market Survey and Marketing Strategy Consulting Services • Transportation Services from Storage to Wholesale and Retail Points
Final Sale	• Online Selling & Home Delivery

Source: Author's contribution after review of information provided in Department of Agriculture and Agri-food. 2024. *Presentation on Business Opportunities in Rice Industry*.

Who is the Brunei Darussalam Rice Farmer-Entrepreneur

19. Rice producers are at the heart of the rice value chain as the trading of farm inputs and farm products will terminate and start from them, respectively. Rice farmers are buyers of farm inputs used in farming and once produced, they sell their harvest of paddy rice to traders, processors, distributors or the ultimate product, milled rice to consumers. Playing the most crucial role at the base of the value chain are farm households who exert labor for rice production to be possible. The same is true in the agricultural context of Brunei. What needs to be added though are the temporary foreigner workers who perform for a fixed monthly salary most of the day-to-day tasks of integrated rice crop management under the management and supervision of their Bruneian employers and farmer-entrepreneurs. Based on previous and current surveys and data from the DOAA-MPRT, the average Bruneian rice farmer-entrepreneur is as follows:

- A married male with a household size of 5 to 10 members;
- With an average age of 58 years old;
- Cultivates a farm of about 1.53 hectares either of state-land or gazetted land;
- A Malay or Iban by ethnicity;
- Full-time in farming in the Brunei-Muara District;
- With household income of between BND 2,000 to BND 5,000;
- With education ranging from Primary to Secondary Level Form 5; and
- With 10 to 20 years working experience in rice farming.

We were unable to gather information about the temporary foreign worker except that he is most likely a male worker from Indonesia.

Preparing the Next Generation of Farmer-Entrepreneurs in Brunei Darussalam

20. With the ageing Bruneian farmer-entrepreneur and the high possibility of encountering difficulty in hiring temporary farm workers from foreign countries in the coming years, it is high time for Brunei to look inwards for future generation of farmers. While the country's educational system offers the technical-vocational and college degree paths for agriculture, the main concern is the attractiveness of farming and agri-business to the youth. A recent survey which assessed the awareness, perceptions and interests of Bruneian youth in agriculture and rice farming revealed the following:

- **Majority** of youths (64%) strongly **agree that they want to be farmer rather than be unemployed**, and **working in agriculture** is an **acceptable way of earning a living** (90%);
- **Majority** of respondents (97%) would still **prefer a non-agriculture related job** as their **number one** (1) preferred job;
- **Significant proportion** of youths (37%) are **not interested** in pursuing a **course and career in agriculture**.

21. What can be deduced from this survey is that agriculture is the **choice employment of last resort**. A rejoinder though is that the lack of interest of the youth to pursue

careers in agriculture is a global phenomenon in both developed and developing countries. Given this reality, it will be a big challenge for policy makers and educators to ensure that there will be enough skilled and educated food producers in the coming decades.

Economic Analysis

22. Due to data privacy concerns, we were not able to complete at this stage of the research the collection of needed data and information to do an economic analysis of the Brunei Darussalam rice value chain. What is available is farm level data on costs and returns of paddy rice production.

Breakeven Cost and Returns of Paddy Production

23. Shown in Table 3 is the costs and returns analysis at break-even of dry paddy during the year 2024. Based on the table, for a farmer to earn profits from rice farming, s/he should be able to produce a minimum of at least 3.13 metric tons of clean and dried paddy with moisture content (MC) of 10-13 percent. The high purity and dryness of delivered paddy rice is required by the DOAA-MPRT in order for a farmer to qualify in the government buy-back scheme with a guaranteed price of **BND 1.60**. This means that at a field MC of 27 during dry season to 35 percent during wet season, **fresh paddy harvest should be between 4.5 to 5.5 metric tons per hectare**. Using the rule of thumb of two kgs dry paddy to produce one kg of milled rice and including all the associated costs till it reaches the customer, the price of milled rice in Brunei Darussalam will shoot up to **BND 3.20**, about **4x** of the global price of Thai Fragrant Rice, 5 percent broken. At this price level, locally produced Brunei rice will find it difficult to compete with imported rice.
24. For costs distribution, the **highest share** goes to **hired labor** at **52 percent**. The **largest farm expense** at **48 percent** of the total, goes to the hiring of a **temporary foreign farm-worker** from neighboring Indonesia for a total of **BND 2,400 for six months full time or one cropping season only**. To promote farm efficiency and improve profitability in rice farming in Brunei, alternatives should be explored to lower farm labor costs. As most of the farm operations are already mechanized through hired farm services providers, other functions performed by the farm laborer will need to be looked at. This includes irrigation water and drainage management, daily monitoring of rice crop health, crop nutrient and protection, as well as destructive pests management to include rodent control and bird watching. If the **remaining farm tasks can be mechanized** through the use of agricultural drones for crop health monitoring, application of fertilizers and crop protection, and bird and rodent watching, the scope of the hired farm laborer's tasks can be expanded from the current one hectare per person to as high as 8 to 10 hectares. Increasing the area coverage will significantly reduce farm labor expenses.

25. Next to farm labor is **farm inputs** at **27 percent**, of which 20 percent goes to crop nutrient and protection solutions. Last is **hired farm services** of land preparation, transplanting, harvesting and drying at **21 percent** of the total costs. These includes land preparation, transplanting, harvesting, drying and transport of produce to the drying facility and deliver to the Wasan Milling Company where the dried paddy is stored until milled.

Table 3. Break-even Costs and Return Analysis for One Hectare of Paddy Rice Production, Brunei Darussalam, 2024

No.	<u>Costs Item</u>	<u>Amount (BND)</u>	<u>Share (%)</u>
1.0	Farm Inputs	1,352.00	27.0%
1.1	Rice Seedlings (220 trays per hectare @ BND 1.60/tray)	352.00	7.0%
1.2	Fertilizer (<i>Baja</i>)	600.00	12.0%
1.3	Crop Protection / Agricultural Chemicals	400.00	8.0%
2.0	Farm Services	1,046.25	20.9%
2.1	Land Preparation (<i>Servis M eradu</i>)	300.00	6.0%
2.2	Transplanting (thru use of Mechanical Transplanter)	150.00	3.0%
2.3	Harvesting (thru Combine Harvester -Thresher, <i>Servis Menuai</i>)	250.00	5.0%
2.4	Drying of Harvested Paddy Rice (Mechanical Dryer service @ BND 80/MT)	240.00	4.8%
2.5	Transport of Dried Paddy to Wasan Rice Mill (BND 100)	100.00	2.0%
2.6	Land Rental (<i>Sewa Tapak</i> @ BND 12.50/ha/annum)	6.25	0.1%
3.0	Farm Labor	2,600.00	52.0%
3.1	Hired Farm Laborer (BND 400/month for 6 months)	2,400.00	48.0%
3.2	Part-time Laborer / <i>Mengurus Lepas Tuai</i> (BND 30/hr @ 6.67 hours)	200.00	4.0%
	All Costs Items	4,998.25	100.0%
Break-Even Yield at Guaranteed Purchase Price of Paddy Rice at BND 1.60(Clean & Free from Impurities, Dried, 10-13 % Moisture Content), kgs		3,126.50	
Production & Processing Costs per kg		1.60	

26. The table shows that to attain a break-even yield of between 4.5 to 5.5 tons of fresh paddy depending on the season, at least **BND 1.60** is required to produce one kilogram of dried paddy. The break-even price is the same as the buyback price offered by the DOAA-MPRT to farmer-participants of its Special Necessities Incentive under the *Skim Insentif Pertanian Dan Agrimakanan* (SIPA) support program. The costs figures suggest ways to increase farmers income and make rice farming attractive to future generations - increase yield through better-quality seeds and inputs coupled with appropriate technical know-how and farm management; and reduce costs by intensifying mechanization and increasing farm labor efficiency.
27. The use of hybrids from Indonesia and China has been introduced to increase yields. However, to meet the yield requirement a more suitable hybrid variety for Brunei Darussalam's condition is needed. At the same time the suitable hybrid variety must meet the preferred attributes of the Brunei rice consumers.

Relative Financial Positions of Rice Value Chain Players

28. Except for the farmer-producer, we were not able to determine the relative financial position of rice value chain players due to lack of access to the needed data.

Employment Creation Per Value Chain Segment

29. With the data available, we were only able to estimate employment creation at the farm level involving the hiring of **one full time foreign temporary worker per hectare for six months** to perform rice crop management practices outside the services provided for by farm service providers. In addition, **6.67 hours of part-time labor** per hectare is created to perform other farm functions. We view these figures though as highly in-efficient use of farm labor. Therefore, there is a need to review the daily working schedule of the farmworker and identify manual tasks that combined or mechanized. For example, manual tasks can be combined or mechanized and more freed time can be allocated to other more income earning opportunities such as growing vegetables in empty areas separating paddy fields.

Interfirm Relations and Value Chain Governance

30. How the value chain actors inter-act and transact with each other through relationships and linkages, can be summarized and classified into four broad categories. These are: spot market relations, persistent network relations, vertical integration and horizontal integration.
31. **Spot market relations** – as the term implies, transaction relationships are created 'on the spot. In this kind of relationship, the buyer and seller meet, negotiate on price and volume, and other requirements, and may come into an agreement or not. In the rice VCA, this happens during input provision wherein there are many active players in the

market, and product aggregation during periods of high demand and in retail distribution of milled rice. This kind of relation is not present in the Brunei Darussalam rice industry.

32. **Persistent network relations** happen when two actors have been transacting with each other whereby a higher level of trust and interdependence has been developed over a period of time. Persistent network relationship can be formalized in a contract or not. This kind of relation may be happening in the farm services provision where the farmer gets to choose which company or individual s/he may engage for the service. Depending on the level of satisfaction of the service provided, the relations may continue for the next and succeeding cropping seasons.
33. **Vertical Integration.** Integration is beyond “relationships” as it happens when the same enterprise (whether a private company or a farmers’ cooperative) undertakes the same set of product transformation processes throughout the value chain. This is not happening in the Brunei Darussalam rice industry.
34. **Horizontal Integration.** This relationship happens when different actors performing the same process in a value chain segment decides to collaborate with each other. This is not happening or has yet to happen.

Competition in the Brunei Darussalam Rice Industry

35. With strong government involvement in local production up to processing and distribution and in rice importation, it can be said that competition in the Brunei Rice Industry is limited. It is only in the retailing of milled rice where competition may be present as to the place where the customer decides to make the point of purchase. But since there is no product differentiation and that retail price is the same anywhere for the subsidized price wherein margin is slim or even non-existent, retailers compete only for the volume of sales, not for anything else.

Section 4. Constraints, Opportunities, and Proposed Interventions for Upgrading the Brunei Darussalam Rice Value Chain

36. Presented in this section are the results of the SWOT analysis and the identification of constraints, opportunities, and proposed interventions in upgrading the different segments of the Brunei Darussalam rice value chain.

Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis

37. The conduct of a participatory SWOT analysis among stakeholders should have been the preferred method for brainstorming, identification and prioritization of internal and external factors critical to the success of an industry in order to craft appropriate strategies. Since this is not possible due to budget and time constraints, the SWOT analysis for the Brunei Darussalam rice industry was conducted based mainly on desk

review the findings of which were validated based on the author's own expert understanding of the industry. The result of the SWOT Analysis is summarized in Figure 7. For further validation by industry stakeholders, we intend to present the results during the planned workshops in the coming months.

Fig. 7. SWOT Analysis of the Brunei Darussalam Rice Value Chain

<u>Strengths</u> • Government subsidy on rice farm inputs thru DOAA-MPRT. • Assured market at established buying price of BND 1.60/kg. • Wide range of privately owned and managed farm services available. • Strong Brunei Darussalam Government support thru the DOAA-MPRT. • Promising results and Lessons Learned from previous rice value chain enhancement related projects. • Agriculture and agribusiness education available at the technical / vocational and university levels. • Opportunities for the expansion of existing farmers and the development of newer generation farmers may arise because of the decreasing number of farmers.	<u>Weaknesses</u> • Diminishing number of farmers, which can also be an opportunity. The risk is in the potential lack of interest of youth. • Perception and practice of rice farming as hobby after retirement vs farming as a full-time agri-enterprise. • High dependence on temporary foreign labor to perform day-to-day rice crop management tasks at full-time engagement. • Low interest of the Brunei youth in farming • Dependence on farm inputs sourced externally resulting to limited options leading to high production and marketing costs. • Limited land area for rice production resulting into micro-sized farms unable to maximize economies of scale. • Presence of heavy metals and high soil acidity in soil as reported by Zin et. al's 2017 study. However, MPRT-DOAA findings noted presence of only Cadmium, Lead, Nickel and Cobalt below threshold levels. • Government domination of the rice value chain resulting to weak intra-value linkages among private sector players. • Weak backward and forward integration due to the limited size of the domestic market. • Insufficient investments in labor-saving agricultural machinery. • In-adequate farm infrastructure (farm-to-market roads, irrigation and drainage system) and post-harvest infrastructure (drying) leading to quality and quantity losses. • Insufficient branding, market development and strategy for locally produced rice.
<u>Opportunities</u> • Substitution of huge volume of imported with locally produced rice.	<u>Threats</u> • Cheaper and perceived to be better quality imported rice. • Price volatility of the global rice market.

• Growing awareness among actors about value chain related issues. • Steady demand for milled rice and growing and evolving market for rice by products • Brunei Government support program for economic diversification in general and for crop diversification in particular. • Concrete example of circular economy in rice value chains • Presence of advanced technologies ready for adoption. • Growing poultry and layer industry as source of raw material for compost / organic fertilizer. • Presence of local in-organic fertilizer manufacturer using by-products of petroleum processing as raw material.	• Populist policies in some of the biggest rice exporting countries resulting to trade restrictions. • Production segment focused vs unified rice value chain development strategy. • Weather impact and climate change. • Need to ensure rice security and sufficiency among rice exporting countries • Increasing quality requirements and demand for food safety. • Perception and succession issue - lack of interest among the youth to pursue careers in agriculture. • Steady decline in the global oil and natural gas market as major source of Brunei Government revenues to fund/leverage investment needs of other sectors including vital agriculture and agrifood related infrastructure.
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Proposed Interventions

38. Proposed interventions for upgrading of the Brunei Darussalam rice value chain are summarized in Table 4. While the interventions are specified for each segment, the recommendations should be viewed as a unified development strategy to attain the objectives of **a competitive, resilient and climate adaptive rice value chain** for the Brunei Darussalam. A value chain can be considered as fully functioning when the value willingly paid for by the customer for a product and not artificially priced through government subsidies— in this case milled rice and its derivatives, are equitably distributed among the segment actors according to functions and returns to their investments. Unfortunately, we were not able to determine the value created at each segment of the chain because of difficulty in accessing sensitive information.

Table 4. Proposed Interventions for Upgrading the Brunei Darussalam Rice Value Chain by Segment

Value Chain Segment	Proposed Interventions
PRODUCTION	• Improve soil health through the use of soil remediation techniques such as planting of sweet potato or similar crop for a continuous period of at least two years to lessen heavy metal concentrations, as reported by Zin et. al's 2017 study. However, MPRT-DOAA's findings noted presence of only Cadmium, Lead, Nickel and Cobalt below threshold levels. • . Improve soil texture and beneficial soil micro-organisms concentration by application of fully decomposed chicken dung and other by products from the Brunei layer and broiler chicken industry and bio-degrade-able waste from households and commercial establishments. Feeding the waste to earthworms to further increase soil fertility and reduce the use of in-organic fertilizers. • Improve paddy rice productivity by promoting yield increasing package of technologies and practices. This includes increase use of high quality inbred and hybrid seeds with the traits preferred by customers; better water and nutrient management through Alternate Wet and Dry (AWD) technology; pests and diseases management by reducing use of synthetic Nitrogen; and ensure wider adoption of Brunei adapted PalayCheck, Rice Crop Manager and other yield enhancing and income increasing applications

PRODUCTION	• Intensify farm lands utilization by expanding irrigation through higher public investments in rehabilitation of existing and construction of new systems over a period of 10 years giving priority to lower-costs small irrigation projects and rain-water harvesting technologies powered by renewable energy • Enhance access to and increase adoption of appropriate post-harvest facilities such as improved solar and mechanical driers, and warehousing and storage through common services facilities in appropriately sized farm clusters • Shift to targeted subsidy of seeds of rice varieties meeting customer preferences and fertilizers – with bias on organic fertilizers and soil ameliorants • In partnership with the private sector, equip farmer-entrepreneurs with the appropriate knowledge, skills and mindset to pursue off-farm livelihood activities, increase entrepreneurial skills, and facilitate market linkages beyond government initiatives to broaden income sources • In partnership with their Bruneian agri-entrepreneur employers, equip the temporary hired foreign laborers with the appropriate knowledge and skills in integrated rice crop management through an applied training and extension program providing a perfect balance between classroom learning and practical application. • Improve access to better adapted rice varieties by joining the International Rice Research Institute's (IRRI) networks of improving rice varieties such as the International Network for Genetic Evaluation of Rice (INGER), the ASEAN RiceNet, the Network for Accelerated Rice Varieties for Impact (NARVI), and the Hybrid Rice Development Consortium.
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AGGREGATION	• Review the performance of the current model of individual farmers' produce aggrupation into a centralized storage and milling through the Wasan Milling Company Sdn. Bhd., identify areas of improvements, and adjust organizational arrangement as needed. • Encourage farmers to process and market their own rice produce by exploring the potential benefits of introducing smaller but more energy efficient mill-by-demand household and village type rice mills as micro-business and employment creation and value adding strategy • Beyond distribution, conduct competency-based training of farmers, farmer-cooperatives / associations on proper operation and maintenance of post-harvest and rice processing technologies • Reconcile the DOAA-MPRT standards with global private sector standards on grain quality grades, and disseminate widely and ensure adoption of the standards by farmers and other rice value chain actors.
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PROCESSING	Reduce handling, milling and marketing costs through better logistics, infrastructure, and market by: • Increased milling recovery and improve rice quality at reduced costs through the cultivation of better variety/ies coupled with appropriate agronomy, better drier and storage facilities and just-in-time milling. To ensure freshness and to be attractive to potential buyers, if not stored through horizontal warehousing and not vertical through silos which are costly to maintain, paddy rice should not be kept in storage beyond three months. If not vacuum-packed, rice should be sold immediately after milling. • Reduced electricity costs by promoting the use of Renewable Energy (solar & wind) and establish rice-husk and other biomass powered plants to reduce dependence on grid electricity • Development of a professional core of managers and related professionals for integrated rice processing systems • Continual breeding and market introduction of rice varieties with high head rice recovery and increase adoption of existing varieties with the desired trait coupled with better agronomic practices to increase yields. • Extract more value from rice through the utilization of products and by-products for higher value consumer and industrial goods . These include utilization of rice straw into higher end products
DISTRIBUTION Wholesaling & Retailing	• DOAA-MPRT in partnership with Wasan Milling Company Sdn. Bhd.to commission the conduct of periodic consumer preferences surveys to inform and guide breeders, seed companies /producers, farm input distributors, farmers and other VC actors on changing preferences of the Bruneian customer. • Review the subsidized pricing of rice for all towards regardless of economic status. Limited government subsidies should be targeted to benefit only those who are in need. • Better implementation of paddy and grain trading and pricing standards to ensure quality; and improve timing of entry of rice imports so as not to coincide with local harvests

CROSS-CUTTING	• Review the current role of the Brunei Government, through the DOAA-MPRT in acting both the developmental and regulatory role in the Brunei Rice Industry. Need to attain a balance of the two roles to re-invigorate the industry. • Minimize the intervention role of government by promoting stronger private sector participation in the Brunei rice industry incentivized not by subsidized farm inputs and guaranteed price but the possibility of fair returns to private investment through a business supportive regulatory environment. • Laydown a policy framework that will make agribusiness in general and rice value chain related businesses in particular, as viable career option for the Brunei youth.
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