

Agronomic results from Myanmar

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Introduction

- ❑ Cassava is one of the most important crops in upland areas of Myanmar where rainfed agriculture is predominant especially in Ayeyarwady region.
- ❑ Many farmers in the Ayeyarwady region like to grow cassava over other cash crops as cassava a relatively undemanding in terms of inputs (such as fertilizers, water, and labour, etc.) compared to other key crops.
- ❑ Beyond the food and feed value, cassava is also important for a range of industrial purposes when it is converted into starch, sweeteners and alcohol, etc.
- ❑ The crop has been both a mechanism for livelihood improvement at the household level, and a key contributor to the regional and national economy.

Harvested area, yield, and production of cassava in Myanmar

Region/State	Harvested area (ha)		Average yield (t/ha)		Production (t)	
	2008/09*	2018/19**	2008/09*	2018/19**	2008/09*	2018/19**
Ayeyarwady	11,009	12,744	8.7	14.78	95,877	188,355
Bago	760	130	5.3	21.33	4,060	2,773
Chin	80	80	2.8	4.35	222	348
Kachin	744	15,409	8.8	9.93	6,572	153,034
Kayah	-	-	-	-	-	-
Kayin	264	1,113	4.6	13.40	1,222	14,911
Magway	-	-	-	-	-	-
Mandalay	26	-	2.6	-	68	-
Mon	311	293	9.0	14.43	2,794	4,228
Rakhine	208	292	3.8	6.31	787	1,842
Sagaing	461	1658	8.6	8.78	3,956	14,563
Shan	1,172	314	1.4	7.58	1,602	2,380
Thanintharyi	750	700	4.5	12.89	3,356	9,023
Yangon	1,906	654	4.5	14.90	85,21	9,747
Total	16,037	33,387	8.5	14.78	129,224	401,204

Sources: *DOA 2009; **DOA 2019

Cassava production in the country has more than 3 times in the past 10 years, from 129,224 tonnes in 2008/09 to over 400,000 tonnes in 2018/19.

Ayeyarwady Region in brief



- ❑ Ayeyarwady is Myanmar's most populated region with an estimated population of 6.32 million.
- ❑ Ayeyarwady is the region with the greatest percentage of people living in rural areas (88%) relative to those living in urban areas (12%).
- ❑ This region shares a border with Rakhine, Bago, and Yangon.
- ❑ This region consists of 26 townships and covers a total area of 35,964 km² with various agro-ecological zones.

Role of cassava sector

Key crops and sown areas in Ayeyarwady region in 2018/19

Crops	Sown area (ha)
Paddy	1,502,000
Pulses	536,000
Maize	23,000
Cassava	12,744

- ❑ Cassava is one of the most important economic crop, and is essential for local food security, nutrition, and livelihoods of rural people
- ❑ Farmers also grow other upland crops such as chili, maize, pulses, sugarcane, and tomato but cassava is by far the third most important upland crop after pluses and maize

Source: DOA 2019

Cassava harvested area, root yield, and production in the districts of Ayeyarwady region (2018/19)

District	Harvested area (ha)	Root yield (t/ha)	Production (t)
Patheingyi	7,499	15.60	116,970
Hinthada	4,260	13.63	58,083
Myaungmya	516	14.80	7,635
Labutta	463.5	12.08	5,598
Maubin	5.5	12.55	69
Total	12,744	14.78	188,355

Source: DOA 2019

- ❑ Ayeyarwady region has a long history of cassava production however low crop productivity is still a main challenge among smallholder farmers.
- ❑ Unfortunately a growing number of farmers are now also confronted with land degradation issues, excessive production costs and indebtedness, especially amongst smallholder farmers.

Main objective of cassava demonstrations

- ❑ To showcase the performance of improved cassava varieties, suitable planting methods, better fertilization and multiplication of promising varieties in order to increase cassava yields in a sustainable and profitable manner in Myanmar

Locations of townships selected for R&D in Ayeyarwady region



- The cassava crop has been designated a priority crop in Hinthada district and Patheingyi district mainly for sale as a cash crop.

Introduced cassava varieties





Cassava demonstration trials in 2018/19 and 2019/2020

Three types of cassava demonstrations were conducted with local processors and farmers:

- 1) planting methods
- 2) balanced fertilizer application trials, and
- 3) multiplication of promising cassava varieties

List of champion farmers and processors who participated in demonstration trials (2019/20)

Name	Township	Village	Position
U Sein Tin (ST)	Kyonpyaw	Sharkhe	Champion Farmer
U Tun Wai (TW)	Kyonpyaw	Sharkhe	Champion Farmer
U Aung Moe (AM)	Kyonpyaw	Sharkhe	Champion Farmer
U Myint Soe (MS)	Kyonpyaw	Sharkhe	Champion Farmer
U Tun Aung (TA)	Kyonpyaw	Sharkhe	Champion Farmer & Processor
U Ka Yin Kyi (KYK)	Kyonpyaw	Sharkhe	Champion Farmer & Processor
U Kan Thein	Kyonpyaw	PaLin	Champion Farmer & Processor
U Kyaw Thura	Kyonpyaw		Champion Farmer & Processor
U Joe (UJ)	Kyonpyaw	Balate	Champion Farmer & Processor
U Aung Myo (UAM)	Hinthada	Yonthalin	Champion Farmer & Processor
Daw Mar Mar Kyu (MMK)	Hinthada	Yonthalin	Champion Farmer & Processor
U Sithu	Hinthada	Yonthalin	Champion Farmer & Processor
U Tin Win	Hinthada	Yonthalin	Champion Farmer & Processor
U Than Myint (TM)	Laymyethna	Khamoutsu	Champion Farmer & Processor

Planting methods



Planting method demonstration trials in Kyonpyaw Township

Root yields of planting method trials (2018/2019)

Planting Method	Root yield of Malaysia (t/ha)						Starch content (%)					
	ST	MS	YN	KT	AM	Ave	ST	MS	YN	KT	AM	Ave
Ridge	29	30	18	22	29	26*	31.1	31.1	34.0	31.1	33.2	32.1
Mound	26	28	11	21	28	23	31.1	31.1	31.1	31.1	33.2	31.5

Root yields of planting method trials (2019/2020)

Planting method	Root yield of Bangkok (t/ha)			Root yield of Malaysia(t/ha)	
	TW	AM	TA	MMK	UAM
Ridge	36	27	25	23	25
Mount	15	20	16	21	23

- ❑ Many farmers around the demonstration areas have started to adopt the ridge planting methods.

Cost of productions by planting with mount method and ride method (kyat/ha)

Activity	Mount	Ridge
Land preparation	118,560*	111,150
Plant material	na	na
Planting	na	44,830
Weeding (and hill up)	577,980**	358,644
Fertilizers (250 Urea: 125 TSP: 250 KCl kg/ha)	353,210	353,210
Total production cost	1,049,750	867,834

*including cost of planting; **including cost of hill up

- Even higher yields with low production cost, some farmers choose not to adopt the ridge planting method as the use of mount planting results in fixed pay.
- Usually farmworkers are not paid daily wages when planting cassava, which can be challenging for those who rely on hire labour. Workers assume then that the mount planting method is generally more beneficial in terms of income than its more effective counterpart.

Balanced fertilizer application trials



- ❑ *The effect of NPK fertilizers on the cassava plant growth (plants without fertilizers - in front; plants with fertilizers – in back)*

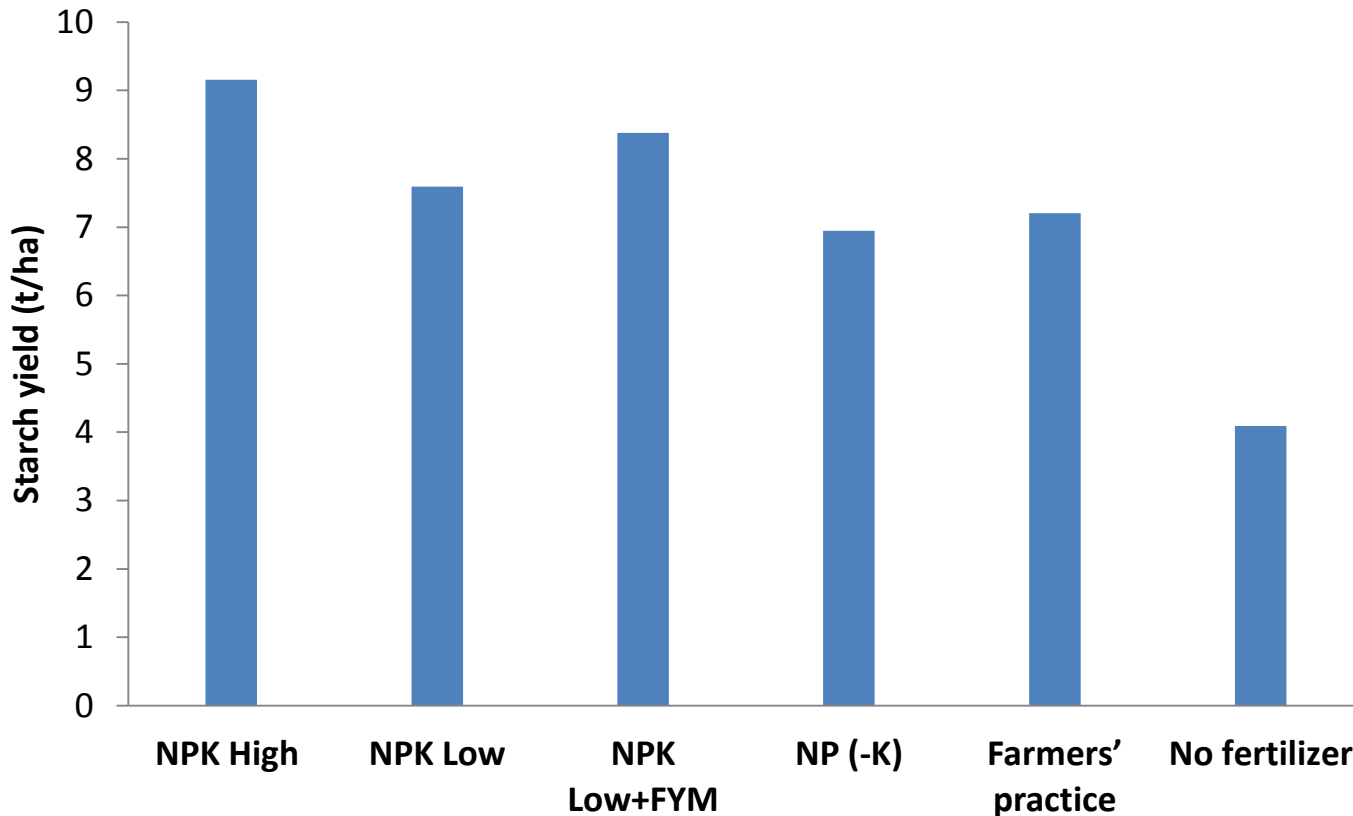
Results of the fertilizer demonstration trials in 2018/2019

Treatment	Root Yield (t/ha)						Starch content (%)						Starch Yield (t/ha)
	ST	MS	YN	KT	AM	Ave	ST	MS	YN	KT	AM	Ave	Ave
NPK High	30	27	30	21	37	29 ^a	31	31	35	31	31	32 ^a	8.9 ^a
NPK Low	20	22	27	22	45	27 ^{ab}	31	31	31	31	31	31 ^a	8.4 ^a
NPK Low + FYM	23	22	26	27	40	28 ^{ab}	33	29	31	31	31	31 ^a	8.6 ^a
NP without K	22	16	19	21	46	25 ^{ab}	31	31	31	31	29	31 ^a	7.2 ^{ab}
Farmers' practice	27	15	20	23	25	22 ^b	29	31	29	29	27	29 ^b	5.8 ^b
No fertilizer	13	7	4	6	20	10 ^c	31	29	27	27	27	28 ^b	2.6 ^c

Results of the fertilizer demonstration trials in 2019/2020

Treatment	Root yield (t/ha)							Starch Content (%)							Starch Yield (t/ha)
	MS	KYK	AM	ST	TW	TA	Ave	MS	KYK	AM	ST	TW	TA	Ave	Ave
NPK High	34	30	27	27	36	25	30 ^a	29	31	31	31	31	31	31 ^a	9.2 ^a
NPK Low	26	27	23	20	35	22	26 ^{ab}	29	31	31	31	29	27	30 ^b	7.6 ^b
NPK Low + FYM	27	28	28	21	38	25	28 ^{ab}	29	31	31	31	29	29	30 ^b	8.4 ^b
NP without K	25	27	22	19	30	21	24 ^b	29	31	31	27	29	27	29 ^c	6.9 ^b
Farmers' practice	25	28	26	24	27	20	25 ^b	29	31	31	27	27	27	29 ^c	7.2 ^b
No fertilizer	16	19	19	13	4	16	15 ^c	27	29	31	27	27	27	28 ^d	4.1 ^c

The effect of NPK fertilizers on the starch yields of cassava



- ❑ One constraint is that right fertilizers are difficult to access for cassava farmers in the region.

Production costs (kyat/t) of individual farmers using different fertilizers

Treatment	Production cost (kyat/t)					
	MS	KYK	AM	ST	TW	TA
NPK High	26,011	29,288	32,673	32,205	24,068	34,746
NPK Low	26,678	25,559	30,191	34,562	19,680	31,208
NPK Low + FYM	30,493	29,286	29,537	39,261	21,550	33,192
NP without K	25,081	23,234	27,923	32,030	20,644	29,908
Farmers' practice	24,950	22,150	23,837	25,568	22,785	30,306
No fertilizer	32,208	27,018	27,689	40,116	114,527	31,439

Net income (kyat/ha) of individual farmers using different fertilizers

Treatment	Net income (kyat/ha)					
	MS	KYK	AM	ST	TW	TA
NPK High	3,249,984	2,788,242	2,408,560	2,456,326	3,583,124	2,212,595
NPK Low	2,494,637	2,634,262	2,123,529	1,767,118	3,628,783	2,031,670
NPK Low + FYM	2,500,150	2,637,325	2,607,931	1,756,709	3,881,702	2,229,474
NP without K	2,401,817	2,641,874	2,094,398	1,746,560	3,050,951	1,914,355
Farmers' practice	2,422,594	2,807,174	2,564,668	2,349,107	2,711,642	1,884,915
No fertilizer	1,437,995	1,812,777	1,756,437	1,053,414	35,621	1,485,761

Multiplication of promising cassava varieties

- ❑ In 2019/20 cutting season, some champion farmers have started to multiply high-yielding varieties such as KU50, Rayong 9, Rayong 72, and KM98-1.



On-farm multiplication of Rayong 9 in Laymyethna Township

- ❑ Japan and Bangkok varieties were also used for the demonstration of cassava multiplication as both are popular varieties in 2018/19 cropping season.
- ❑ Farmers conduct assessments usually through visual observation only and through their own preferred qualifying factors, such as yields and growth habits.
- ❑ There has been no evaluation done on performance systematically.

Results of cassava multiplication demonstration plots in Hinthada township (2018/2019)

Variety	Root Yield (t/ha)	Starch Content (%)	*Stem Yield (stem/ha)	**Gross Income (kyat/ha)	Production Cost (kyat/ha)	Net Income (kyat/ha)
Bangkok	33	31.1	20,000	4,182,000	749,000	3,433,000
Japan	19	31.1	18,000	3,305,000	749,000	2,556,000

estimated number of stems per ha

**excluding potential income from stems

Conclusion

- ❑ Thai varieties such as KU50 and Rayong 9 could be considered the best high-yielding varieties with high starch contents.
- ❑ The ridge method have many advantages than traditional mount method in terms of reduced labour, but also allowed for easier cultivation in terms of fertiliser application and weed control; and consequently reduce net cost per unit produced of root (kyat/t).
- ❑ Results of 3-year on-farm demonstration trials confirmed that balanced fertilizer application is one of the most effective ways to increase fresh root and starch yields; and hence net incomes.
- ❑ Low-cost multiplication of promising cassava varieties is important for local farmers in order to disseminate best adopted cassava varieties among farmers to increase cassava production.
- ❑ Ultimately cassava will be acknowledged as an important crop for the livelihoods of millions of smallholder farmers including the people who live in the isolated conflict-affected areas of Myanmar.

Thank you!



Ayeyarwady farmers