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# IMPACT AND SUSTAINABILITY PATHWAY OF SMALLHOLDER CASSAVA FARMING IN NORTH SUMATRA

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# Background on adoption of technologies

- North Sumatera is one of the cassava production centre in Indonesia. Based on the data of Indonesian Statistic Agency (BPS), the average yield of cassava in the North Sumatera is around 30 t ha<sup>-1</sup>. Although this yield is considerably high enough, it is still lower compared to the potential yield which can reach to 50 t ha<sup>-1</sup>.
- The Rapid Rural Appraisal (RRA) and household survey that were conducted in 2016 and 2017 showed that farmers used only local cassava variety.
- Variety test carried out in 2016, showed that some introduced varieties yielded a higher tuber yield compared to the local variety.
- The Malang 4 variety has the highest average yield among the 12 varieties tested which is 49.83 t ha<sup>-1</sup>.
- The Malang 4 variety was also the most preferred by farmers in terms of the characteristics of branching, ease of harvest, tuber size, tuber type, plant height and starch content.
- Therefore, Malang 4 variety were chosen to be distributed to farmers through variety adoption activities.



# Methods and Design of Adoption

- Cassava was planted on farmer's field, by adopter farmers. The cultivation of cassava (land preparation, plant spacing, fertilizer, weeding) was done according to the farmers practice.
- The project helped with cutting material, fertilizer and herbicide, and supervised to ensure that the work was done correctly.
- In 2016-2017, there were 26 farmers planted Malang 4 which distribute in 4 sub-districts of Simalungun District and 1 sub-district of Toba Samosir District. Each farmer planted Malang 4 on area of about 0.2 to 0.3 ha.
- In 2017-2018, the number of farmers participate in the project increase to 51 farmers. The area includes Simalungun Regency (3 sub-districts), Toba Samosir Regency (1 sub-district), and Deli Serdang District (2 sub-districts). There are more farmers willing to participate, but there was not enough cassava cutting.
- In 2018-2019, it was expected around 60 farmers that willing to adopt, with the location in Simalungun, Toba Samosir, and Tapanuli Utara



# Farmers Technological Adaptation



## Stage of Malang 4 adoption in North Sumatera

2015

PT Bumisari buy Malang 4 Stakes from ILETRI

2015

CIAT was planted 12 varieties including Malang 4 in PT Bumisari's field

2016

Malang 4 Stakes from PT Bumisari were planted again by :

1. PT Bumisari (1 hectare), Simalungun
2. Farmer in Siberlawan (100 stem), Tebing Tinggi

2016

Malang 4 Stakes from CIAT were planting again :

1. For fertilizer and harvesting time trial, Simalungun
2. Planted by 6 farmers, Simalungun

2017

Malang 4 Stakes from PT Bumisari have been planted in Simalungun and Tapanuli Utara by :

PT Bumisari, 8 Farmers from pak Turisno group, 12 Farmers from bu Sirait group, Farmer in Siborong-borong

2017

Malang 4 stakes from fertilizer and harvesting time trial have been planted again by:

6 Farmers from pak Sitorus group in Toba Samosir

2018

Malang 4 Stakes have been planted again in Simalungun, Tapanuli Utara, and Deli Serdang by: 20 farmers from pak Turisno, 20 farmers from bu Sirait group, farmer in Tapanuli Utara and Deli Serdang

2018

Malang 4 Stakes have been planted again by 20 farmers from pak Sitorus group in Toba Samosir

2019

Malang 4 Stakes were planted again in : Simalungun, Toba Samosir, Tapanuli Utara

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# Results

- The total area of farmers who planted Malang 4 in 2016-2017 is around 4.68 ha.
- The total area of farmers who planted Malang 4 in 2017-2018 is around 8.22 hectares. The target of 60 farmers was not achieved because some farmers who adopted in 2017 failed to harvest due to drought.
- In 2018-2019, from the target of 60 new adopter farmers with an area of around 240 rante (9.6 ha), around 224 rante (8.9 ha) were achieved.
- The development of the area of farmers who adopted Malang 4 is very slow, because many farmers rent land, and many switch to other commodities
- For 2019-2020, the adoption activities will be shifted to areas with wider cassava plantations, namely Bandar Huluan and Siantar Martoba Subdistricts, for the Toba Samosir area, it is only necessary to expand because farmers there for adoption activities are running on their own.



**Table 1. Tuber yield of Malang 4 variety in several adopter farmers. 2017-2018 planting season.**

No	Name	Address	Variety	Yield (t ha <sup>-1</sup> )	Previous year
1	Pak Mukhlis	Kec. TapianDolok	Malang 4	30.40	Malaysia, the same
2	Pak RasmenPurba	Kec. TapianDolok	Malang 4	33.06	Malaysia, lower
3	DewiPangaribuan	Kec. TapianDolok	Malang 4	29.57	Malaysia, the same
4	LumonggaSiallagan	Kec. SiantarMartoba	Malang 4	33.45	Malaysia, lower
5	Edison Pasaribu	Kec. TapianDolok	Malang 4	30.00	Malaysia, the same
7	Bu Sirait	Kec. DolokPanribuan	Malang 4	34.75	ubi roti lampung
8	Pak Naryo	Kec. DolokMerlawan	Malang 4	44.02	ubi roti (30 t ha <sup>-1</sup> )
9	Pak Parmin	Kec. DolokMerlawan	Malang 4	38.10	ubi roti (30 t ha <sup>-1</sup> )
		Intercrop with maize	Maize	3.50	-
10	MarolopSitorus	Kec. Uluan, TobaSa	Malang 4	51.00	Adira 4 (40 t ha <sup>-1</sup> , 12 mo)
11	MarataSirait	Kec. Uluan, Tobasa	Malang 4	42.50	Adira 4 (37.5 t ha <sup>-1</sup> , 12 mo)
12	AfnitaSianturi	Kec. Uluan, Tobasa	Malang 4	44.50	Adira 4 (25 t ha <sup>-1</sup> , 12 mo)
13	RihardSitorus	Kec. Uluan, Tobasa	Malang 4	48.00	Adira 4 (25 t ha <sup>-1</sup> , 12 mo)
14	Jenti M. Manik	Kec. Uluan, Tobasa	Malang 4	50.50	Adira 4 (30 t ha <sup>-1</sup> , 12 mo)
16	Anita Manurung	Kec. Uluan, Tobasa	Malang 4	48.00	Adira 4 (25 t ha <sup>-1</sup> , 12 mo)



Table 2. Harvesting Malang 4 from several adopter farmers that harvest in 2018/2019.

No	Name	Village	Sub-district	District	Area (m2)	Yield (t/ha)
1	Muklis Silalahi	Beringin	TapianDolok	Simalungun	7600	34,69
2	Bu Tio	Beringin	TapianDolok	Simalungun	1600	31,44
3	Pak Turisno	Beringin	TapianDolok	Simalungun	11200	15,32
4	Pak MuaraSirait	Beringin	TapianDolok	Simalungun	6400	77,44
5	Pak Sunardi	TanjungPinggir	TapianDolok	Simalungun	1600	52,77
6	MarolopSitorus	DusunParik	Uluan	Toba Samosir	5000	37,50
7	Anita Manurung	DusunParik	Uluan	Toba Samosir	2800	37,50
8	OjakSirait	DusunParik	Uluan	Toba Samosir	3200	30,00

Table 3. Farmers that adopt Malang 4 dan Faroka in 2019-2020 (expected to be harvest in Juli-Agustus 2020).

No	Name	Village	Sub-district	District	Area (m2)	Yield (t/ha)
1	Sutikno	Tanjung Tonga	Siantar Martoba	Simalungun	2,000	Belum panen
2	Coki	Nagasoppa	Bandar Hulan	Simalungun	6,200	Belum panen
3	6 farmers	Lumban Julu	Lumban Lintong	Toba Samosir	28,800	Belum panen
4	Medayani Butar-butur	Dusun Parik	Uluan	Toba Samosir	2,400	Belum panen
5	Other farmers	Dusun Parik	Uluan	Toba Samosir	50,000	Belum panen



# Farmer Adoption in 2018/2019.



Porsea, Toba Samosir, North Sumatra  
2°27'34", 99°6'11", 954.0m, 269°  
07/08/2019 10:34:34



# Farmer Adoption in 2019/2020.



**Farmer Adoption in 2019/2020 (Will be harvest in July 2020).**

**KEC. BANDAR HULUAN, SIMALUNGUN**



**Malang 4**



**Faroka**

**Vati 1**



# KEC. SIANTAR MARTOBA, SIMALUNGUN



**Malang 4**



**Malang 4**



**Malang 4**



# KEC. ULUAN DAN KEC. LUMBAN LINTONG, TOBA SAMOSIR



Dolok Nagodang, Kec. Uluan, Toba Samosir  
2°27'47", 99°6'12", 968.0m, 280°  
13/12/2019 11:25:56



Dolok Nagodang, Kec. Uluan, Toba Samosir  
2°27'41", 99°5'12", 1019.0m, 70°  
13/12/2019 12:48:07

## Malang 4



Desa Lumbanlintong, kec. Lumbanjulu, Toba Samosir  
2°32'43", 99°3'24", 1159.0m, 49°  
14/12/2019 07:46:23

## Malang 4



## Malang 4



# Conclusion on Adoption

- Malang 4 variety has a high yield potential hence it can increase production, supported by good cultivation.
- Besides Malang, in Nagasoppa Kec. Bandar Uluan also developed the Faroka type and began to plant varieties Vati1, in Toba Samosir also planted Vati 1 and Vati 2
- Until now there are many farmers in Simalungun, Toba Samosir, and North Tapanuli who still want to planted Malang 4 (followed the project since 2018)
- However, there are also some farmers that do not plan to continue planting cassava, due to changing to other higher economic value commodities such as corn or ginger.

# Conclusion on Adoption

**Field Day (2019 )** in Tobasa, open new opportunities for farmers to collaborate with PT Hutahaean (Tapioka starch factory) to spread the Malang 4 in Tobasa



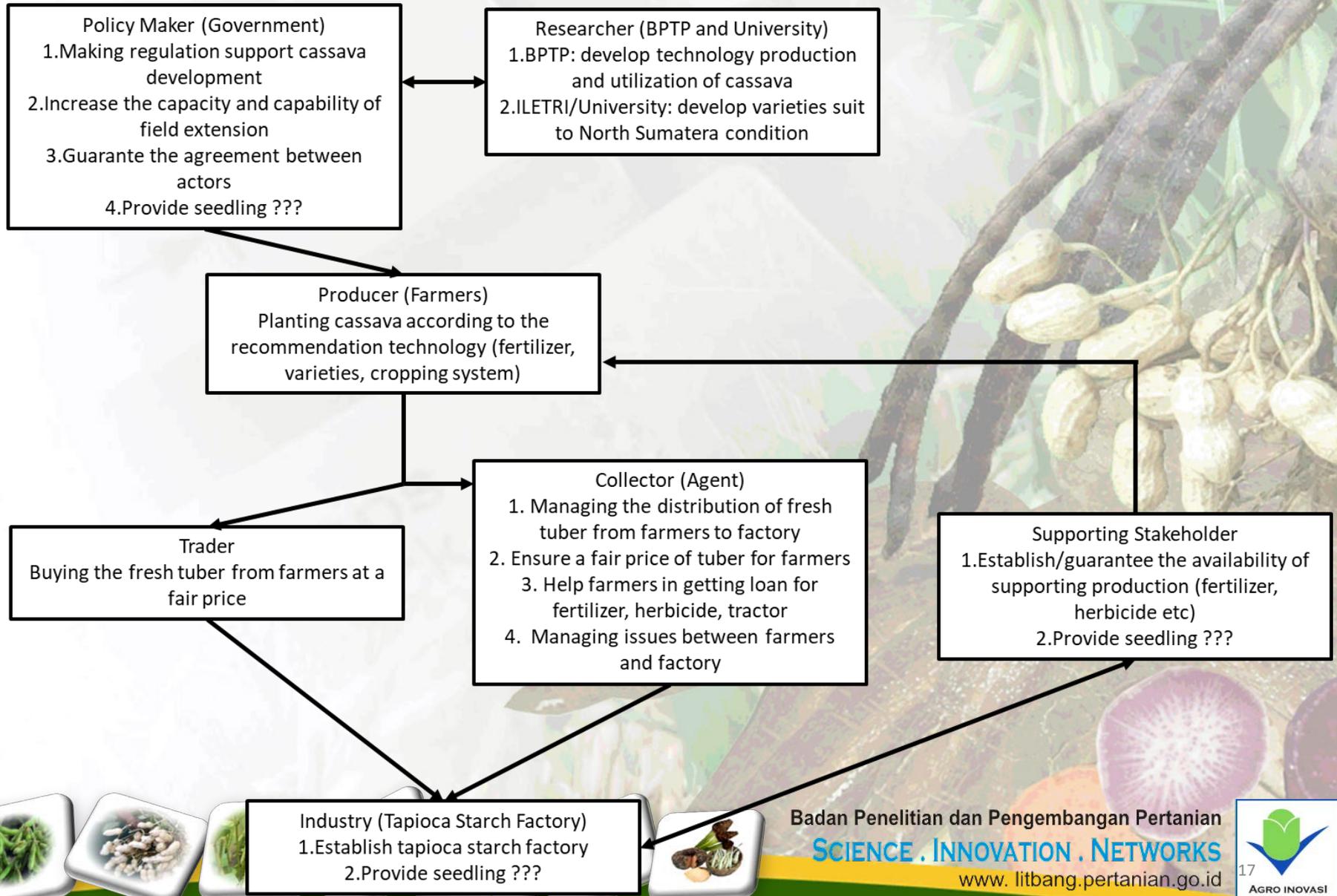
**Field Day** in 2018 encourage farmers that did not participate in the project to try planting Malang 4 in 2019



# Business Model and Impact Survey on Sustainability



# The Business Model in North Sumatera



# Factors Used As The Strategic For Developing Cassava Business Model Development In North Sumatera

No.	The factors influence cassava development in North Sumatera	Characteristic
1.	<ul style="list-style-type: none"> <li>• Farmers is experienced in cassava farming (more than 10 years)</li> <li>• Technology (varieties, fertilizer, land preparation)</li> <li>• Good climate and land condition</li> <li>• Cassava Harvest is handled by agent/collector</li> </ul>	<b>Strengths</b>
2.	<ul style="list-style-type: none"> <li>• Production is not optimum</li> <li>• Limited capital</li> <li>• Farmers income relatively low</li> <li>• There are no farmers group</li> </ul>	<b>Weakness</b>
3.	<ul style="list-style-type: none"> <li>• Demand of fresh tuber is high</li> <li>• Additional income from cassava</li> <li>• Tapioca factory facilitate loan</li> </ul>	<b>Opportunities</b>
4.	<ul style="list-style-type: none"> <li>• Fresh tuber price is fluctuating</li> <li>• Limited fertilizer and Stakes availability</li> <li>• Agricultural land is declining</li> <li>• Less support from the Government</li> <li>• Competition of land use from other crops (maize, palm oil)</li> </ul>	<b>Threats</b>



# Impact Survey on Sustainability

## Key issues (question):

- How is the level involvement of farmers in the project throughout 2017-2019?
- How is the farmers perception of the new varieties introduced by the project (preferred varieties, distribution of new varieties, did the new varieties improve income/profit/food security)?
- How is the farmers reaction to the fertilizer recommendation/trial from the project (what is the suitable fertilizer type and amount for the farmers need, would the farmers continue to used fertilizer in their field)?
- Is there any changes in the way of profitability of cassava farmers?
- What is the main challenge to improve the cassava farming?



# IMPACT SURVEY : Level of Involvement

Respondent (15 Farmers that involved in the project; 5 farmers that want to adopt the variety and fertilizer recommendation).

All the respondent are in the Simalungun and Toba-Samosir area.

- Age of the farmers (years) : 28-69 years
- Land area : 0,16 – 0,84 ha
- Amount of farmers were aware of an experiment : 93,3%
- Farmers were aware of cassava collaboration activities : 86,7%
- Always present of activities carried out by the team : 73,3%



# IMPACT SURVEY : New Varieties

New variety was introduced : Malang-4

- In overall there were increasing number of farmers who adopt the Malang-4 variety, due to higher yield compared to the local/old varieties. [20% farmers who involved in the project (2016); increase to 73% (2017); and 100% in (2018)]
- There are growing interest in planting Malang-4 among farmers who didn't involved with the project in Tobasa and Sibisa (due to the higher yield obtain by the Malang-4 from their neighbours).
- By 2019, there are still new farmers asking for Malang-4 planting material (stakes) from the project participant that willing to sell the planting material at price of IDR 500 – 1,000 per stem.



# IMPACT SURVEY

## The implementation of the fertilization experiment by collaboration

- All of the farmers involved in the project attend the fertilizer trial and the field day. Around 67% of farmers who involved in the project were attending the fertilizer training.
- Farmers who didn't involved with the project understand the importance of applying the correct doses and types of fertilizer and want to adopt the recommendation

## The majority of farmers using a combination that is always available is Urea and Ponska with varying doses:

Urea : 156 – 333 kg/ha

Ponska (11:11:11) : 156 – 333 kg/ha

Farmers use manure (goat manure) : 6,7%

Farmers use TPS (Triple Super Phosphate) : 6,7%

At (100kg/ha)



# IMPACT SURVEY

## The main challenge to improve the cassava farming

–Three changes felt by farmers in cassava cultivation after an experimental collaboration with research team:

1. Regarding the spacing and fertilizing : 60% of farmers
2. Regarding plant spacing : 26,7% of farmers
3. Regarding planting distance, fertilizer, and making mounds : 13,3% of farmers

- The majority of farmers (86,7%) are still continue to planting cassava with fertilizer recommendation and prefers the Malang-4 variety
- The rest said that there are a few problems faced, namely the length of time waiting for the tractor to fill the soil, where the number of tractors leased is relatively limited.



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# Conclusion on Impact Survey

- The Malang 4 varieties are well received by farmers, and they are asking for more planting material. This can be arranged with the help of Agents-Factory.
- Farmers level of adoption and sustainability are depend on the level of involvement/activities from the Agents to support the farmers (in terms of planting material, and fertilizers).



# Conclusion on Impact Survey

- The sustainability of farmers-agent will depend on the agent orientation (instant profit or sustainability). There are 2 types of Agent :
  - Agent that profitability oriented (not sustainable) – once the project ended the agent reluctant to do more work in expanding Malang-4 and fertiliser recommendation
  - Agent that fully committed to farmers (sustainable) – willing to expand the Malang-4 cultivation and support farmers in term of fertiliser and planting material
- Agent that sustainable continue to support farmers to planting cassava with recommended technologies (varieties and fertilizer).





There are 4 agent (Mr Sitorus, Mr Coki, Mr Sutikno, dan Bu Sirait) that continue to planting Malang4 and expand the Malang4 into other areas (District Toba Samosir, Bandarhuluan, Lumbanjulu, dan Siantar Martoba).



# Thank You



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