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CASSAVA

AGRO-INDUSTRIALISATION

How the Government can support the processing of cassava for value addition

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Introduction

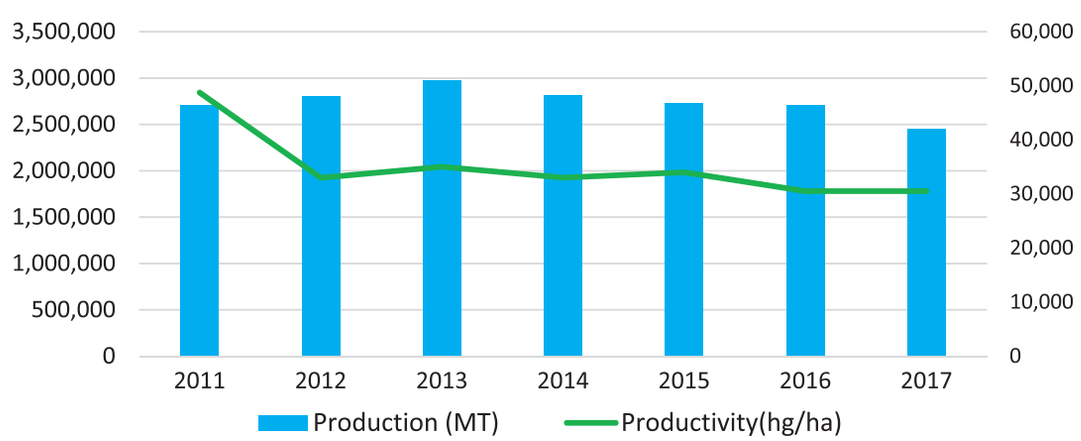
Annual cassava production at the global level stands at 278 million MT; with 56% (156 million MT) coming from Africa. Nigeria is the largest producer in Africa at 55million MT. Uganda is the 22nd largest cassava producer in the world at 2.9 million MT behind Tanzania and Rwanda which produce 5.8 million MT & 3.5 million MT (FAO, 2018). According to Uganda's national agriculture strategic plan, the country's cassava production target is 3.5million MT by 2020 . Cassava is a known staple food for communities in almost all parts of Uganda and is also a backbone for food security. This is due to its high yielding ability, drought resilience, and high carbohydrate content and long storability of roots in the ground with minimum deterioration. Cassava is the second largest crop grown in the country. The eastern region in Uganda is the largest cassava producer (1,061,186 MT) followed by northern region (983,124 MT), central region (409,810 MT) and finally, western region with 440,189 MT (UBOS 2018). Cassava is often consumed at house hold level as tubers, in form of cassava chips. It is also processed into products like high quality cassava flour (HQCF), starch and high-quality cassava grits (HQCG). Cassava and cassava products are often used as raw materials in bakeries to make biscuits and bread and in breweries to make beer such as *Senator* and *Engule*. It can also be used for starch, livestock feed, packaging, paper board making and in pharmaceutical industries among others. The case study examines the prospects for processing cassava for value addition in Uganda. It is based on review of global and national documents as well as interview of key cassava stakeholders.

Production and productivity

According to the Agricultural Census (UBoS, 2009) the national yield of cassava was estimated to be 3.3 Mt/Ha. The number of plots under cassava production was estimated to be 3.1 million with 1.9 million (61.2%) under pure stand. Cassava production in Uganda has generally remained constant since 2011 with the highest being in 2013 at 2.8million MT and the lowest in 2015 at 2.4million MT. The average productivity per hectare has declined since 2011 from 48,728 hectograms[1] to 30,515 hectograms in 2017 as illustrated in Figure1. This decline can be attributed to recycling of seed cuttings beyond their viable lifespan.

1 The conversion rate for hectogram to tones is 9071 to 1, implying that 48,728 hectograms is 5.4 metric tons.

Figure 1: rends in cassava production and productivity (2011-2017)



Data Source: UBOS (2018)

The cassava value chain comprises of input suppliers, farmers and farmer cooperatives, processors, traders, collectors, intermediate and final consumers within and outside Uganda. Cassava is grown by nearly every household in Uganda. Cassava farmers can be grouped into small, medium and large-scale growers depending on the hectares planted. Those starting usually cultivate approximately 1 acre or less of cassava which graduates to between 2 to 5 acres.

Medium scale farmers in Uganda cultivates between 10 and 20 acres. There are over 300 farmers who have 30 to 50 acres of cassava and over 100 farmers have between 100 and 500 acres of cassava. Uganda boasts of 20 large scale cassava farmers each growing over 500 acres of cassava (CAVA project). It is noted that all these are individuals and not limited liability companies.

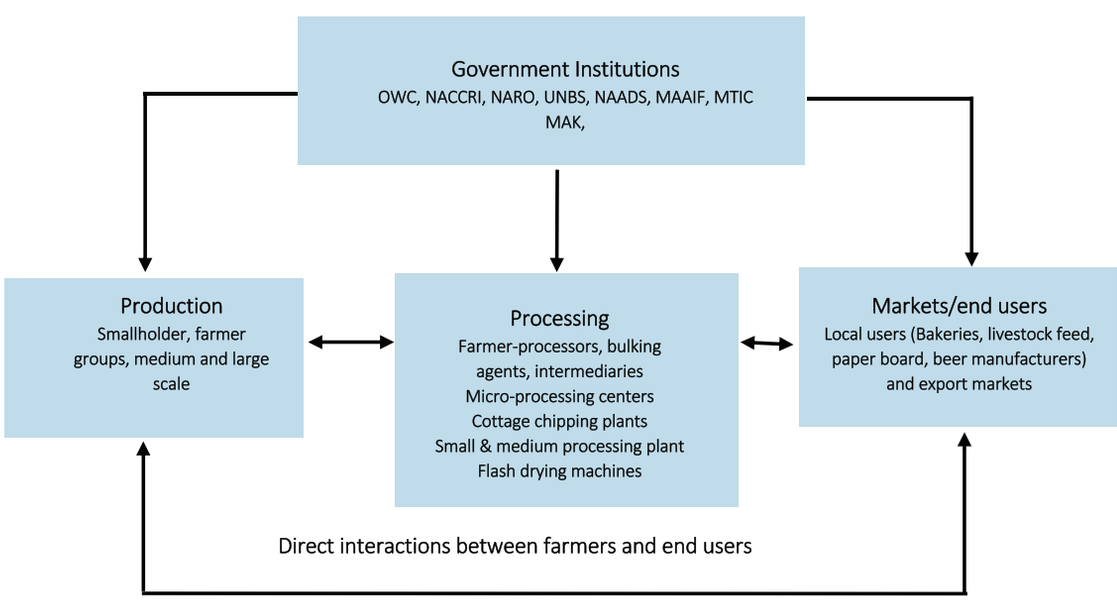
Farmers grow high yielding varieties such as NASE 14, NASE 19 and NARO CASS 1 which are developed by National Agricultural Research Organization (NARO) and Makerere University. Currently, the varieties are distributed by Operation Wealth Creation (OWC). For processing, the preferred varieties are NASE 14, 15 and partially 19, NAROCAS 1. This is because they take only 8 months to mature and their conversion ratio is good. One kg of flour is produced from 4 kgs of fresh roots for sun drier but for the flash drier, the ratio is 1:8. However, other local varieties, locally known as "***Mogo bao***" are also used in Northern Uganda.

Processing

Following harvest, cassava is dried using different techniques and in Uganda these include: sun drying, solar drying and flash drying. Sun drying is done on the ground and on rocks. Most farmers use raised drying methods for example on a slab or tarpaulin. There are 5 to 10 good solar dryers in Uganda. Other solar dryers are made by farmers using rudimentary techniques. Flash drying is the most efficient drying technique. It can dry a kilo of cassava in seconds. There are 2 flash dryers in Uganda: in Lira and Apac. Flash drying machines cost approximately UGX 400 million each. Cassava drying techniques employed depend on the minimum standards of the target market. Sensitive markets demand a specific drying technique of drying. Overall, the drying of cassava still presents a big problem in the value chain given that the majority of farmers use rudimentary methods.

Small scale farmers usually process their harvest at the household level using mortar and pestle; or take their cassava to micro processing centers, cottage mills and small and medium processing plants that are commonly owned by large scale farmers. These act as processing centers for the areas in the vicinity. Whereas the micro farmers gather their products to be processed so as to get improved cassava products used both as food and industry raw materials, the small and medium enterprises buy fresh roots from farmers and process them into flour and grits. Some of the notable processing centers

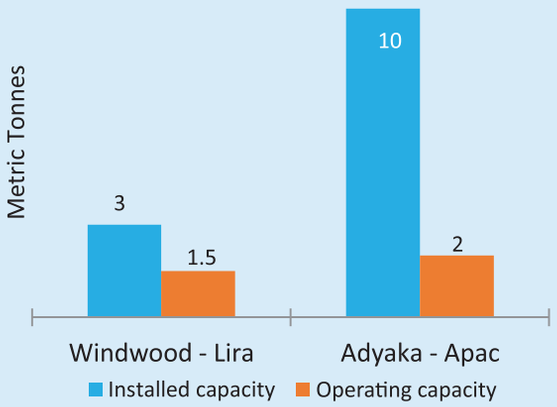
Figure 2: The cassava value chain



Source: Adapted from the EPRC Agro-industrialization model

Box 1: Insights about Cassava led agro-manufacturing efforts in Northern Uganda

- *Background*: Two cassava agro-industry firms (Windwood Millers and Adyaka) located in Lira and Apac districts respectively show opportunities and challenges to build agro-industries in the northern Uganda.
- It is observable that both factories operate at 50% and 20% capacity respectively. This is the capacity for processing of raw cassava into High Quality Cassava Flour (HQCF), using the flash drier (pic 2) that shortens drying cassava in a day run by electricity and diesel fuel.
- *Opportunities:*
  - *Product space*: Products from cassava include; High Quality Cassava Flour-HQCF (i.e. Organic Cassava Flour, Cassava Cake Flour, Classic Baking Flour); Starch; Charcoal briquettes from cassava peelings; local brew from cassava off-cuts.
  - *Markets*: Potential market from large scale and high-end manufacturers such as; Uganda Breweries, Nile Breweries, and Britania Allied Industries Limited (Biscuit manufacturers). Availability of local market for HQCF e.g. local consumption in homes, bread and cake making, etc.
  - Source of Raw materials: Many farmers in the North (especially Lango sub-region) are engaged in cassava production
- *Challenges*:
  - Under capacity utilization (50%) of the Lira based factory is attributed to; unstable supply of raw materials (cassava); high cost of energy/electricity.
  - The Apac based factory has the lowest capacity utilization of only 20%, and this is attributed to: inadequate market because Apac is a remote district with a small local market; high cost of fuel, given that power from the national grid is not accessible by the factory (see Pic 1).
- *Financing*: Favourable financing terms from Africa Innovation Institute (AFRII). Processing machines were installed by AFRII as a loan, on condition that the industrialists invest in constructing factory premises. The loan is patient and is only serviced when the processing plants are operational.



Source: Author's computations (2018)

- **Pic 1: Inaccessible power to Factory in Apac**

- *Pic2: Flash drier that is run by electricity and diesel fuel*

in Uganda include: Windwood millers in Lira and Adyaka Wholesalers in Apac. Figure 2 is a summary of the value chain.

The major constraints to production in Northern Uganda—especially in the Lango region are costly and irregular supply of power. Processors resort to the use of generators which are not only costly but time consuming.. Weather conditions are also a major challenge especially since some of the drying is done by solar due to low levels of raw materials supplied which affects the economic viability of using electricity. Among all the cost items in their operations, electricity constitutes the largest share of the costs.

Cassava producers, some organized in groups and others acting alone, sell the harvested roots to bulking agents and intermediaries who transport the cassava tubers to both local and regional markets. The bulking agents commonly operate from trading centers and often mill the cassava into HQCF. Processed cassava for both domestic and industrial use is also supplied to the market by farmer-processors as cassava

grits or flour. The flour is packaged in 1kg to 50kg and sold in supermarkets, retail and wholesale outlets to domestic users for millet bread, porridge and other uses.

For the Lango region, the products are sold in the domestic market to companies such as Britania Allied Industries Limited, one of the leading producers of confectionary products in Uganda. The company buys 20 tonnes of flash dried cassava flour every 2 weeks. Uganda Breweries Limited also orders an average of 25 tonnes as and when required. Other products are sold locally using the distribution chain in the nearby supermarkets and local shops. The products are used to produce biscuits, cakes, bread, brewing of beer and making porridge.

Other end users in the cassava value chain are rural and urban bakeries, the biscuit industry, ethanol manufacturers, composite flour millers, animal feed manufacturers, paper board industry and breweries. These industries use cassava flour as one of the raw materials for the production of bread, biscuits, ethanol, plywood, paperboard, animal feeds among others. This is mainly due to the high costs of substitutes like maize bran for feed, high costs of importing corn starch for paperboard and the need to utilize more local resource for the breweries.

Export of Uganda's cassava

The cassava products like tubers, flour, starch and roots are exported by Uganda to Kenya, Rwanda, Burundi, South Sudan and the Democratic Republic of Congo. There is a huge opportunity for Uganda to increase its cassava production since the market is still available both domestically and among the trading partners. Table 1 illustrates the exports of flour, tubers and starch suggesting that the country largely exports tubers and a bit of flour and very limited starch. Furthermore, Uganda's global export shares of the same are all less than one percent. For agro-industrialization, the target should be processing given that Uganda's global share is extremely small and the market exists.

Table 1 further gives the global share in value and what Uganda earns revealing that the country is a negligible participant especially in the area of starch. If Uganda processes cassava into starch for exports, there are higher chances of gaining from it more than the other forms.

Table 1: Uganda's cassava and products export (2013-2017)

Cassava export (MT)	2013	2014	2015	2016	2017[P]
Flour	4,070	5,665	748	653	628
Tubers	8,858	5,909	7,798	11,035	14,944
Starch	632	617	251	894	754

Uganda's percentage share in world export market for cassava

Flour	0.47	0.62	0.062	0.07	0.07
Tubers	0.03	0.03	0.082	0.11	0.18
Starch	0.003	0.002	0.001	0.01	0.01

Uganda, world value of cassava exports in $ '000' (2013-2017)

	2013	2014	2015	2016	2017[P]
Uganda - flour	367	546	93	87	77
World - flour	78,243	88,071	150,800	123,135	113,114
Uganda - tubers	636	617	1,724	1,742	3,367
World - tubers	1,866,003	2,080,263	2,090,013	1,562,734	1,840,728
Uganda - starch	64	56	29	185	85
World - starch	1,955,502	2,090,813	2,186,890	1,928,184	1,382,868

Source: FAO STA, Trade Maps. P- Data still being collected

Research and development

Cassava research in Uganda is an integrated effort by government institutions, non-governmental organizations (NGOs), private enterprises and foreign donors like Bill and Melinda Gates Foundation and World Bank. At the production level, new varieties which are resistant to cassava diseases (brown streak disease and cassava mosaic) and are highly productive like NASE 14, NASE 19 and NARO CASS 1 are developed by NARO and National Crops Resources Research Institute (NaCCRI). African Innovations Institute (AfrII) and cassava (Community Action Research Programme) CARP under RUFORUM are also key players in research and development (R&D) with regards to cassava production and varieties and the overall cassava value chain.

With regards to processing technology, R&D is being done by joint effort of many actors including SASAKAWA Global 2000, International Centre for Tropical Agriculture (IITA), Makerere University Agricultural Research Institute Kabanyolo (MUARIK) and CAVA-Uganda in collaboration with manufacturers of processing equipment like Tonet Agro-engineering Company Limited, IRVIN Global Limited and Agro-Tech Engineering Services. These institutions carry out research and develop prototypes for best processing equipment. Subsequently, they facilitate training of engineers to manufacture and maintain cassava processing equipment. These are entry point areas in supporting the cassava value chain given that processing is faced with many challenges.

Gaps

Cassava production in Uganda is greatly limited by diseases; particularly cassava mosaic disease (CMD) and cassava brown streak disease (CBSD) that cause severe yield losses. Although the seed producing institutions have done a tremendous job to avail planting materials, distribution has had a few challenges. In addition, some farmers keep recycling the seed cuttings beyond the recommended time. Farmers also struggle with post-harvest losses which is a result of poor post-harvest handling methods. During processing the equipment used such as the screw press and graters handle small quantities of cassava at ago. This means that farmers cannot process large quantities of cassava needed to meet local and international demand. It also compromises the quality of cassava products like flour hence limiting its uptake in the manufacturing sector. It should be noted that there are still many potential end users of cassava that are unaware of its application in their production chain. Urban bakeries, for instance, are not up to par in demand for cassava flour when compared to rural bakeries in spite of the fact that cassava is a cheap substitute for wheat.

Box 2: Cassava varieties, food security and commercialization

There have been 21 improved varieties of cassava released in Uganda since 1991. Between 1991 and 1994, NASE 1, 2, 3 and 4 were released. The purpose of these varieties was to fight cassava mosaic disease which had wiped out cassava plantations. NASE 3 has persistently succeeded among farmers since its release and can commonly be found in Eastern Uganda. NASE 3's outstanding success has been attributed to its resistance to cassava diseases (brown streak and cassava mosaic) and the white flour it produces. NASE 5, 6, 7, 8 and 9 were developed because feedback from farmers indicated that NASE 1-4 varieties did not taste good. NASE 5-9's taste is similar to that of rural cassava like *Mukalasa*. Between 1994 and 2012, NARO released NASE 6-11 varieties. In 2004, cassava brown streak hit many parts of Uganda. This led to the release of NASE 12-19. The latest release of varieties is NARO CASS 1 and NARO CASS 2 in 2016. There is also yellow cassava found in small quantities in West Nile and other parts of Uganda. It is the most nutritious type of cassava but it is reserved for ceremonies. Notably, it takes 4 to 6 years to develop a variety. NARO and its partners mainly develop cassava varieties with a target of ensuring food security. However, there has been growing industrial interest in cassava which has led them to evaluate existing varieties for commercial use. It has been discovered that NASE 3 is the best flour for confectionaries. NASE 19 and NASE 14 are also good for commercial purposes. There are varieties that produce good ethanol which have been recommended to Uganda Breweries for the production of *engule*. There are yet other cassava varieties which make good sweeteners. These are used by the soft drinks industry. Future cassava breeding work is set to target addressing the industrial and commercial needs and opportunities.

Source: Key Informant Interview at NACCRI-Namulonge

Policy implications

1. The varieties developed have a 5-year lifespan of resistance. This implies that breeders need to continuously develop new varieties

2. Given that different cassava varieties have different component attributes, R&D should develop varieties to meet the different needs of the product space. The varieties can then be clustered in different zones to serve the different product types. This is intended to promote specialization in the sector for effectiveness, efficiency and economies of scale.

3. There is need to develop industrial clusters as structures for the cassava sector, taking into consideration the cassava varieties. The clusters should be supported by cassava processing and marketing centers, incubation centers (where entrepreneurs can learn how to develop different products), resource center, information centers, demonstration centers on agronomic practices, and agro-inputs centers.

4. Creation of cassava clusters should benefit from the existing NARO zonal offices system which should be strengthened for the purpose and linked to the existing district agricultural system (production and extension). This will entail both human and financial resources to achieve the objective.

5. For purposes of promoting investment in the sector, UIA can serve to guide and help investment growth. This will overcome the disjointed investments and interventions that have limited information. Therefore, UIA should be a real one-stop center for all investment information along the entire value chain.

6. Government needs to use different incentives to support investment in the sector, for example protection of identified infant industries against more competitive ones using the EAC Common External Tariff sensitive list being revised.

7. Cassava storage facilities is still an issue leading to high post-harvest losses by especially farmers. There is need to develop technologies or invest in existing technologies to avoid associated problems like aflatoxins and post-harvest losses etc.

8. Research institutions need to be facilitated to improve processing equipment to reduce post-harvest losses. Capacity building is required in the areas of human resource e.g. nutritionists, biochemists and physical infrastructure e.g. laboratories for further research.

9. The problem associated with a project intervention approach in MDAs limits progress, coherency and consistence in investments and outcomes. There is need for programme approach instead to overcome these challenges. This should be done with clear government objectives and financing. Development partners led investment in the sector has limitations so far.

10. There is need for research agencies to have gene banks especially to protect the indigenous gene pool which has demonstrated resilience to disease and pests.

11. Regionalization of UIRI through a tailor system, to all parts of Uganda is important to reach the entire country with innovations and scientific developments instead of operating at the center in Kampala.

12. There is need to research into critical aspects of cassava products with a view to understand the pricing regimes, standards and certification, and regulations for the different cassava products.

13. Financial support for cassava is needed in the form of loans to foster industrialization. Flash dryers and other modern, large scale production techniques require a large initial capital investment which few farmers can afford on their own.

14. Farmers need to be mobilized into organized groups through which they can access training and inputs. This calls for greater involvement of both government and NGOs.

15. There is need to innovatively develop cassava products markets to support production (such as starch and ethanol products among others). This may entail identification and popularization of high end cassava products.

16. Promotion of innovation for example the Ugandan student who developed bio-degradable bags made from cassava as part of his PhD program. The patents

laws become relevant.

17. Research on improving the quality of cassava for industrial use should therefore focus on the best varieties for different industrial use and have it distributed to farmers. In addition, government should support mechanization e.g. use of tractors and planters at subsidized costs to help farmers with bush clearing; the current use of ox ploughs is not efficient.

18. In order to increase cassava value addition across Uganda, there is need to sensitise farming communities about the importance of cassava and the possible products that can come out of cassava. In addition, support should be provided to set up cassava processing in different regions of Uganda in order to make them more accessible to farmers.

19. To address all the above policy gaps, government should formulate an appropriate policy and regulatory framework for cassava and cassava products development in the country. The policy should aim at comprehensively addressing all the gaps and loose ends in the sub-sector with a view to unlock all the potential therein.

Conclusion

There has been a lot of initiatives by both public and private players to ensure that cassava varieties are developed and distributed to farmers. However, this has been done largely to ensure food security. The strategic direction to further develop varieties for commercial and industrial purposes at this time is a welcome move which needs a lot of support. The processing of cassava node of the value chain is still facing a lot of challenges as the technologies used are either expensive or have not been well propagated to farmers. Unlocking the potential in the sector may need to put emphasis on processing especially by large farmers who will act as nuclei for the many farmers.

References:

1. Howeler, R. H. (2001). Proceedings of the Validation Forum on the Global Cassava Development Strategy, Rome, 26-28 April 2000. In *Validation Forum on the Global Cassava Development Strategy (2000: Rome, Italy)*. FAO.
2. International Institute of Tropical Agriculture. (1990). *Cassava in tropical Africa: a reference manual*. IITA.
3. Kilimo Trust (2012) Development of Inclusive Market in Agriculture and Trade (DIMAT) Project: The Nature of Markets and Cassava Value Chain in Uganda:
4. Kleih, U., Phillips, D., Jagwe, J., Kirya, M., & Innovations, A. (2012). Cassava Market and Value Chain Analysis Uganda Case Study. *Natural Resources Institute (NRI) and Africa Innovations Institute (AII).URLhttp://cava.nri.org/images/documents/publications/UgandaCassavaMarketStudy-FinalJuly2012_anonymised-version2. Pdf (last accessed: 04.03. 2016)*.
5. Republic of Uganda (2015) Agriculture Sector Strategic Plan2015/16-2019/20, Ministry of Agriculture, Animal Industry and Fisheries
6. UBoS (2009) Uganda census of agriculture 2008/2009 volume IV: crop area and production report

Key informant interviews

NACRRI-Namulonge,
AFRII (CAVA PROJECT)
Buganda Cultural and Development Foundation
Adyaka wholesalers Limited-High quality cassava flour factory-Apac
Windwood millers-Lira

Cassava

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Economic Policy Research Centre

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