Funded by the Ministry of Agriculture, Forestry and Fisheries of Japan

Feasibility Survey on Local Production for Local Consumption (Chisan-Chisho) Activity and Extension in Africa

Final Report –Second Year-

March 2018

JAICAF ジェイカフ

Japan Association for International Collaboration of Agriculture and Forestry

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Collaboration of Agriculture and Forestry

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ISBN: 978-4-908563-32-4 print
ISBN: 978-4-908563-33-1 pdf
Printed in Japan by Shokou Insatsu Ltd.

Preface

In August 2016, The Sixth Tokyo International Conference on African Development (TICAD VI) was held in Nairobi, Kenya. At the conference, we were expected to link producers and consumers and develop new markets for contribution to economic diversification and industrialization by supporting agriculture and other industries. In Japan, we successfully vitalized local production for local consumption and produced new markets. We made such achievements as increasing local income, creating employment opportunities, and vitalizing regions. We think our past experiences are applicable to development in Africa. Moreover, we will support local production for local consumption by considering actual situations in Africa and promote shift from self-sufficient agriculture to commercial agriculture for increasing agricultural income.

Under such circumstances, our association has been implementing cereal popping technology in rural areas of Kenya and investigating the feasibility of diffusion since fiscal 2016. We have been promoting local production for local consumption by considering actual situations in Africa, with subsidies from the Ministry of Agriculture, Forestry and Fisheries (MAFF). In this fiscal year, we first expanded the sales of local pressure popping machines modeled from Japanese pressure popping machines and strengthened dissemination and enlightenment activities at agricultural fairs. We conducted trainings on those who purchased pressure popping machines. We urged them to master Japanese technologies about the production, processing, and sales of popped cereals. We also kept monitoring farmer organizations that implemented pressure popping machines to extract future issues. Meanwhile, we found successful cases where the utilization of pressure popping machine improved income greatly. This allow us to expect future activity expansion.

This report outlines the above activities and summarizes the achievements. We hope that the project achievements will be utilized among Japanese private companies and parties of international collaboration while contributing to local activities of local production for local consumption.

About project planning and evaluation, we received guidance and counseling separately from members of the evaluation committee set up within the secretariat. We also received cooperation in local specialist activities from the Kenya Office of Japan International Cooperation Agency (JICA), Dr. Morimoto, researcher at the International Plant Genetic Resources Institute in the Consultative Group on International Agricultural Research (CGIAR), and Dr. Kanda at CDC International. We would like to express our deepest gratitude for their cooperation.

Lastly, this report was created under the responsibility of our association and does not represent opinions of MAFF or the Japanese Government.

March 2018

Eiji Matsubara, President
Japan Association for
International Collaboration of
Agriculture and Forestry

Feasibility Survey on Local Production for Local Consumption (Chisan-Chisho)
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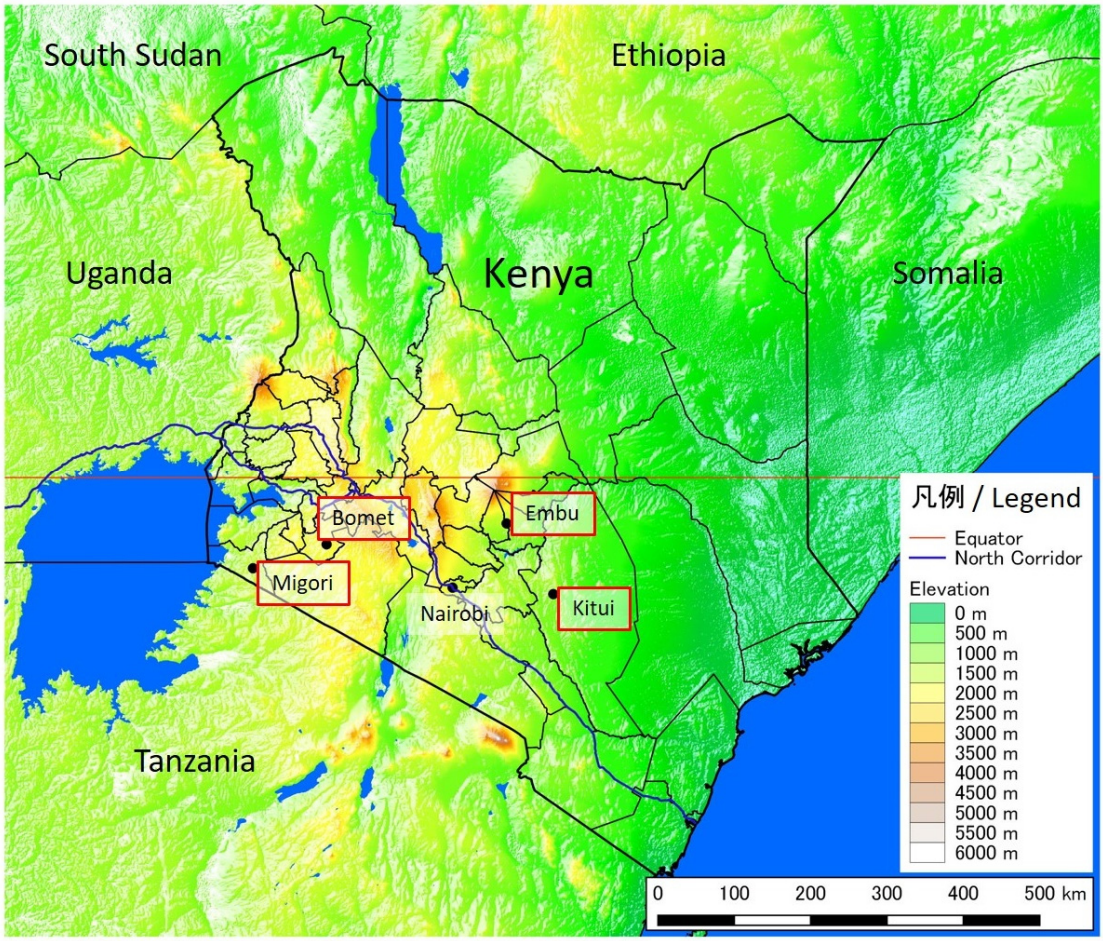

Project Activity Map

Main Activity County is marked red color (Javis, A., *et al.*, 2008).

Project Photos

Dissemination of popped cereal product

Migori member introducing popping process to junior high school students in Kisii

Migori member introducing popped cereal to elementary school students in Kisii

Production and sales of popped cereal

Mr. Gichangi's Factory of Kashate (molded popped cereal) in Embu

Packaging of kashata in Mr. Gichangi's Factory in Embu

Selling kashata in market day of Embu

Men who are surprised by kashata

Processing kashata in Kitui

Processing rice ball (molded popped cereal) in Migori

Making popped cereal in Migori

Cutting kashata in Bomet group

Motorcycle taxi drivers like kashata.

Children who eat kashata for the first time

Training in Japan

Leaning how to use popping cereal machine

Leaning how to make kashata

Packaging process of new flavor of kashata

Appealing new flavor kashata at the sales office near the factory

Workshop

Participants shared the results and challenges of each group and set new goals.

Participants shared the skills acquired in the training in Japan.

Abbreviations List

Abbreviation	Standard name
ASK	Agricultural Society of Kenya
JAICAF	Japan Association for International Collaboration of Agriculture and Forestry
JICA	Japan International Cooperation Agency
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KEBS	Kenya Bureau of Standards
KIRDI	Kenya Industrial Research & Development Institute
MSEA	Micro & Small Enterprises Authority
MOA	Ministry of Agriculture
NEMA	National Environment Management Authority
SACCOS	Saving and Credit Co-operative Societies
TICAD	Tokyo International Conference for African Development
UGITF	Uganda International Trade Fair

Kenya Shillings :
1 JPY = 0.94959 Ksh
(http://www.exchange-rates.org/converter/JPY/KES/1/Y, access 2018/03/14)

Summary

1. Purpose of Project

In August 2016, The Sixth Tokyo International Conference on African Development (TICAD VI) was held in Nairobi, Kenya. The declaration at the Conference states "to contribute in sustainable manner to economic diversification and industrialization by helping to accelerate the growth of industries including agriculture. From this perspective, the declaration states "We will create new markets by linking consumers, producers, farmers and economies through region-wide development."

In Japan, we promoted agricultural product processing as an integration project plan based on the Act Concerning Promotion of New Business Creation by Agricultural, Forestry and Fishery Workers Utilizing Local Resources, and Use of Local Agricultural, Forestry and Fishery Product (Law No. 67 in 2010). These efforts created new markets, raised incomes in rural areas, created employment opportunities, and vitalized local areas.

In this project, we study efforts complying with the actual situations of local production for local consumption in Africa by utilizing our findings in Japan. The purpose of this project is to raise the incomes of African farmers by promoting shift from self-sufficient agriculture to commercial agriculture in Africa through demonstration tests.

2. Contents of Project

This project follows that of fiscal 2016 as efforts complying with the actual situations of local production for local consumption in Africa. With exclusive focus on original local agricultural products, we mainly implemented popped cereal technology as food processing technology to add high values to local agricultural products, diversify the uses of such products, and generate incomes in rural areas.

As in the previous fiscal year, this project was mainly targeted at Kenya. We manufactured experimental pressure popping machines on site and evaluated the processes from production & sales to merchandise development and dissemination by leasing or selling the machines to farmer groups and entrepreneurs. As a survey incidental to local production for local consumption, we also surveyed governmental and other support measures to disseminate local production for local consumption and regulations concerning sales, such as agricultural product processing. As a model demonstration survey about local production for local consumption, we demonstrated a model contributing to the improvement of local incomes in several areas of Kenya by

utilizing local agricultural products. At the same time, we studied measures of diffusing the model to other areas.

In the current fiscal year, we conducted a training at a popped cereal manufacturer in Japan to improve the technology of producing, processing, and selling popped cereals. We also conducted follow-up activities in Kenya to check the skill level of the trainees.

As part of our achievement diffusion activities, we held a workshop by gathering farmer groups and entrepreneurs who have been producing and selling popped cereals, with government officials. We studied the future possibilities of activity expansion by sharing business experiences and networks.

3. Summary of Results

One of the achievements by activities in this project is the expansion of pressure popping machine production. A trial Kenyan machine modeled from a Japanese machine trial could be manufactured successfully in the last fiscal year. We also organized issues identified by field activities and worked out their solutions to establish a new technology for mass machine production. As a result, we have manufactured and sold five machines in total and are now more machines by expecting orders. We have received orders from semi-governmental organs and Japanese private companies, as well as local agricultural groups. Technical inquiries are not only from within the country but also from neighboring countries. They indicate strong interest in and concerns about this project.

Another achievement is the dissemination and sales of popped cereals, including the strengthening of their enlightenment. To raise of the social awareness of popped cereals, we made demonstrations using pressure popping machines at agricultural shows in various places and widely conducted diffusion and enlightenment activities. Consequently, we conducted activities a total of 25 times at agricultural shows in this project. Popped cereals were highly evaluated and awarded 37 prizes. Particularly at an agricultural show held in September 2017, President Uhuru Kenyatta came to our booth and tasted popped cereals. Many visitors to agricultural shows had interest and concerns. We received about 50 to 100 inquiries at each agricultural show. The activities were not limited to Kenya but also conducted in neighboring Uganda and Burundi.

The number of farmer organizations and entrepreneurs who implemented pressure popping machines increased one to four in total in this fiscal year. The activities were scaled down in Kitui County and Migori County because of such group issues as a money problem but are continuing. Difficulty in securing a sales network is also an issue. In Migori County, kiosks and other stores were secured as targets of sales. Our activities

in this fiscal year were affected particularly by the prohibition of plastic bags that started in August 2017. The purchasers of cereal popping machines were expected to change their means of packaging. An entrepreneur in Embu County solved this issue well and promoted sales by using not only paper packages and containers but also plastic cups and containers. The entrepreneur in Embu County is turning the cycle of kashata (called "okoshi" in Japan) production, processing, and sales very efficiently. Since the average monthly sales in a 10-month period became about 47,000 Ksh, the machine charge could be paid back in about 5 months. The entrepreneur is very enthusiastic about mastering techniques and active in sales activities. This may be the reason for the success.

We conducted a training in Japan to help trainees master Japanese technologies of producing, processing, and selling popped cereals. The trainees were entrepreneurs of seemingly high business mind from Embu County and Bomet County. The training was held at Ieda Seika, one of the major manufacturers of popped cereal in Japan. The trainees learned through sanitation management at food processing factory, an appropriate method of using a pressure popping machine, seasoning and molding as processing technologies, and sales activities at direct sales stores. We also developed new merchandise by using *baobab* and other African tastes, with an emphasis on kashata seasoning and molding technologies important for adding values to popped cereals. We confirmed that the entrepreneurs in Embu County and Bomet County mastered technologies acquired in the training by follow-up survey after the training. Particularly the entrepreneur in Embu County was found producing kashata rather efficiently. During the follow-up survey, the entrepreneur made efforts to add high values to merchandise also by developing new flavors.

In the last phase of this project, we developed puff-cracker machine as new agricultural product processing technology replacing pressure popping machine. Puff-cracker machine was verified expectable as a means of solving several issues at the implementation of pressure popping machine.

Chapter 1 Overview of the Project

1. Period of activities

The project conducted for eleven months from May11, 2017 (determination of subsidy) until March 31, 2018.

2. Contents of activities

In this project, we use popped cereal technology as food processing technology to process and add new values to local grains, beans, and nuts, and sell them as local brand products. The purpose of this project is to raise the incomes of farmers by promoting the local industry and increasing consumption. In the first fiscal year (2016), we manufactured Kenyan-made cereal popping machines experimentally and produced popped cereals from various local agricultural products. We proposed new ways of eating and evaluated marketability (JAICAF, 2017).

In the current fiscal year (2017), we continued the project of the previous fiscal year. We focused ourselves on three activities. The first activity was to improve cereal popping machines and establish a mass production system. The second activity was to promote dissemination of and enlightenment about popped cereals at agricultural exhibitions. The third activity was to develop original products, highly local and health-oriented. For merchandise development, we received cooperation from Ikeda Seika, a Japanese popped cereal manufacturer. Two Kenyan trainees attended a training in Japan and the merchandise development staff of Ikeda Seika visited Kenya for merchandise development and manufacturing skill training.

Business operators may be interested in purchasing pressure popping machines but hesitating to purchase expensive machines by considering worker employment and insufficient business experiences. For such business operators, we took up two processing technologies for hand-grilled cracker processing and puff cracker processing as startup technologies. These technologies allow business startup by small amounts of initial investment and business management investment, less than half the amount for implementing a pressure popping machine. We experimentally manufactured machines and products on site.

The following three activities were conducted:

(1) Strengthening the mass production and sales of Kenyan-made cereal popping machines

(2) Strengthening the dissemination and sales of and enlightenment about popped cereal products

-Demonstration sales and presentations at agricultural exhibitions and workshops studying value addition to local agricultural products and sales of health foods
-Business expansion in neighboring countries
-Providing voluntary entrepreneurs (individual and organization) with information about the handling of pressure popping machines, the acquisition of food sanitation certificates, and nutrition analysis, and with technologies by training guidance about manufacturing, sales, labeling, and packaging

(3) Developing local products under the leadership of farmers, training Kenyan people on production processing, merchandise development, and sales in Japan, and developing new merchandise and training people on development and manufacturing skills by Ikeda Seika staff visiting Kenya.

As demonstration incidental survey, we surveyed production & sales support systems for target farmer organizations, including business analysis, evaluation, and expansion, and partner identification for dissemination in succession to the last fiscal year. By this survey, we verified whether these food processing technologies of Japan are applicable the activities complying with the actual situations of local production for local consumption in Africa.

As demonstration incidental surveys, we conducted three surveys.

- Popped cereal product development and sales efforts, business analysis and issue identification, and efforts by agricultural organizations for solutions
    - Syokinili Self Help Group
    - Okonyo Migori Group
    - Gichangi Cereals and Spices
    - Koech Family (from this fiscal year)
- Support systems for business expansion
- Partner identification for diffusion
- Study of new startup technologies, trial manufacture of machines for hand-grilled cracker processing and puff cracker processing machines, and development of products by local production for local consumption

Chapter 2 Results of Activities

1. Strengthening the mass production and sales of Kenyan-made pressure popping machines

By activities in the last fiscal year (2016), we developed a machine modeled with high fidelity from a Japanese issho-type (1800 cc) pressure popping machine of the Yoshimura type and completed a trial machine. In the current fiscal year, we organized machine problems identified during on-site operation so far, reported them to an engineer in charge, and studied improvements. We also supported the establishment of new technology for machine production. We witnessed machine test operation and extracted and solved issues with focus on quality maintenance and improvement and engineer rearing.

As a result, we solve a total of five machines by the end of February 2018. We are now manufacturing two more machines by expecting further sales (Table 1). The sales price of the machine is 100,000 Ksh. The purchasers are not only local agricultural organizations but also semi-governmental Kenya Industrial Research and Development Institute (KIRDI) and Japanese private company. We also receive many technical inquiries about the machine from domestic individual entrepreneurs and neighboring countries but have not received orders yet. The inquiries are from Ethiopia National Rice Research and Training Center (Ethio-Rice) for Strengthening Project, Kikkoman Corp. (activities in Tanzania), United Nations Human Settlements Programme (UN-HABITAT), CARE (international NGO conducting humanitarian aid activities in Kenya), and Su-Re Coffee (environmental NGO devoted to the development of sustainable agriculture adapted to climate change in Bali, Indonesia, Bali. The inquiries show great interest in this project. DK Engineering is expanding sales activities by making the most of their web site[1] and unique network and continuing activities for dissemination of this project and enlightenment about the achievements.

Table 1 Organizations that DK Engineering has delivered machines since November 2016

	Organization	As of end-February 2018
1	Syo kinili Women Group, Kitui	Delivered
2	Migori Okonyo, Migori	Delivered
3	Gichangi Cereals and Spices, Embu	Delivered
4	Tenri, Embu	Delivered
5	John Koech, Bomet	Delivered
6	JKUAT/Nissin Co. Ltd, Nairobi	Delivered
7	Kenya Industrial Research and Development Institute (KIRDI) Bukula, Kakamega County (Women rep.)	Delivered
8	KERDI Kisii, Kisii County (Women rep.)	Delivered
9	TBD	Under production
10	TBD	Under production

[1] http://dkengineering.co.ke/index.php/2014-07-19-11-37-30/cereal-pop-machine

Now DK Engineering can manufacture one or two units a month. However, there is some business management problem because they are short of skilled engineers and more than one job must be done at a time. According to a report, they had to collect and repair a machine from a customer where the machine was found defective. The project staff always witnesses testing before machine delivery to find defects and maintain and improve quality in cooperation with engineers from DK Engineering. After the end of the project, however, DK Engineering needs to secure skilled workers by their own business efforts, improve processing technology by training workers, and strengthen their mass production system. DK Engineering thinks the dissemination of popped cereals will increase machine orders and help establishing, improving, and strengthening a machine production system.

DK Engineering also feels it necessary to support business using their machines while maintaining and improving machine quality. We are expected to provide continuous technical follow-up, such as the training of customer staff from management to manufacturing and sales.

Photo 1, 2 Manufacturing process in mass-production system (Left) and cylinder manufacturing (Right)

Photo 3 Testing with DK Engineering

Photo 4 Internal view of the DK Engineering

(2) Identification of Issues and Improvement of Machine

In the last fiscal year, three rural organizations implemented pressure popping machines. Their use has been clarifying fragile sections, parts requiring maintenance, and repairing costs. DK Engineering is focused on identifying issues, improving defective parts, and solving some issues free of charge (Table 2). They are strengthening part materials and studying screw positions and materials to unify and make common parts between different devices and between right and left sides. They are promoting further improvements to establish a mass-production system and meet increasing orders.

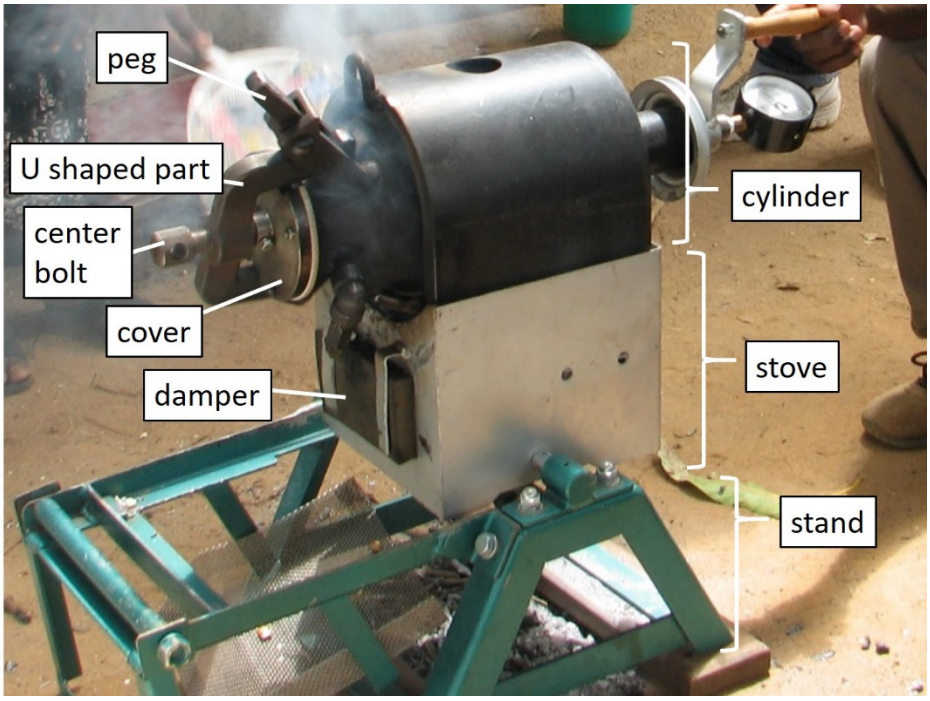

Photo 5 Name of each parts of pressure popping machine

Table 2 Main identified issues and solutions

	Issue	Cause	Solution / Improvement
Stand			
1	Size and diameter of bolt and nut different between machines	Issues at manufacturing processes. Using common parts and unifying right and left sides	Unification of parts and adoption of common parts to improve maintainability
2	Fatigue fracture of frame welded point	Handling at machine installation	Reinforcement, and strengthening of explanation about handling
Stove			
3	Mixing of smoke and charcoal	Use of firewood	Use of gas burner
4	Deformatation and distortion particularly at the front	Direct contact of the mount with the front part, General deformation by strong shock at striking.	Damper replacement and periodic inspection, and reinforcement by welding
5	Damper damage	Strong shock at striking	Damper replacement
Mesh cage			
6	Rupture of mesh cage	Cheap material or inadequate attachment	Change to durable material. Change of cage shape (rectangle). Adoption of cloth back.
Cylinder			
7	Pressure gauge damage	Strong shock at striking	Adoption of coupler joint. Improvement to allow pressure gauge removal at striking.
8	Peg and mount deformation and damage. Air pressure leakage from cover and Teflon seal ring deformation。	Bad material not strong enough	Adoption of En9 (toughened material). Change to dimensions similar to those of the original machine.
9	Fatigue fracture of cover and center bolt attachment part	Bad material not strong enough	Reinforcement and periodic inspection
10	Center bolt deformation and screw thread damage	Damper insertion failure or attachment error	Damper replacement and periodic inspection
11	Bearing damage and center shaft deformation	Bad material not resistant against heat	Replacement and periodic inspection
12	Shaft pin damage	Strong shock at striking	Pin groove re-machining
13	Handle attachment position and handle attachment bolt damage	Attachment error	Determination of attachment place
14	Electric motor position	User needs	Adoption under consideration



Photo 6, 7, 8 The handle attachment pin comes off and the cylinder is slid forward (left and center). Since the shaft pin could not be repaired, the part was welded directly (Left). DK Engineering deepened the pin grooved so that the pin would not come off.


Photo 9, 10 Thread-crushed handle attachment part (Left) and Z bearing of handle completely broken by heat and shock (Right).


Photo 11, 12 Thread-crushed U shaped part (Left) and broken peg of low strength (Right)


Photo 13, 14 Broken cage (Left) and frame bent by strong shock at striking (Right)


Photo 15, 16 Pressure gauge with coupler joint, broken by strong shock at striking (Left) and pressure gauge removable at striking not to receive shock (Right)

2. Strengthening the dissemination and sales of and enlightenment about popped cereal products

- Demonstration sales and presentations at agricultural exhibitions and workshops to add values to agricultural products and study the sales of health foods

(1) Dissemination and enlightenment activity in Kenya

According to the survey of the last fiscal year, many people did not know about popped cereals. Some people mistook popped rice products as large grains of rice. Therefore, we strengthened demonstration sales using pressure popping machine at agricultural shows and seminars in this fiscal year to raise the social awareness of popped cereal products in this fiscal year. We conducted dissemination and enlightenment activities widely to governmental organizations and private companies as well as the general public. We showed the production processes directly to consumers by expecting the effect of expanding the awareness of popped cereals. We participated in agricultural shows and other events and organized two expert sales teams from eight members for demonstration sales. At the same time, the project members worked in cooperation with rural organizations also to support the three groups (Syokinili women group, Okonyo Migori group, Gichangi Cereals and Spices) that we trained in the last fiscal year. We participated in agricultural shows with the cooperation of such partners as the Micro and Small Enterprise Authority (MSEA), the Ministry of Agriculture (MOA), and the Jomo Kenyatta University Agriculture and Technology (JKUAT). We borrowed spaces within their exhibition booths to reduce expenses and also worked together as their members for enlightenment.

As a result, we made presentations at agricultural shows and seminars and demonstration sales a total of 25 times during the period of about 10 months from May 2017 until late February 2018. We conducted dissemination and enlightenment activities on people exceeding 20,000 in total (Table 3). According to a trial calculation, the number of visitors per exhibition was about 15,000 to 25,000 and about 10% of them, about 1,500 to 2,000 people, dropped by at the booths of this project. Thus, we were awarded 37 prizes in total at agricultural shows. We won the first prize 26 times, the second prize 9 times, and the third prize twice. We were awarded most the prizes of Best innovation and invention stand and Best small trade stand, commercial and industrial stand. We won each prize at five different agricultural shows (Table 4). Since about 100 to 150 organizations participate in each agricultural show, many awards that we won may indicate great interests and concerns about this project. Since we exhibited products within the booths of our partners, we cannot say that our activities contributed 100% to

awarding. Considering other exhibits (Table 5), however, we are sure that our efforts in this project contributed to the acquisition of such prizes as innovation. At the Nyeri Agricultural Show held in September 2017, President Uhuru Kenyatta visited the venue and tasted popped cereals made from pearl millet. JKUAT that hosted the show received the Presisdent Prize (Photo 17). MSEA endorsed contribution of this project by declaring booth charge reduction at participation in the next fiscal year to acknowledge our achievement and support project continuation.

At demonstration sales, merchandise of about 20 Ksh were very popular (Table 6) and the main customer bracket was children not aged higher than 20. Therefore, sales increased remarkably on days when schools participated. Processed foods sold at exhibitions and popular among children were ice creams, candies, and biscuits. Compared with general merchandise, popped cereals were not known well and tasting was often requested. After tasting or purchase, however, not a small number of children brought their friends. Thus, we could confirm great demand. We made the greatest sales at the Meru Agricultural Show among the agricultural shows where we participated. By 4-day demonstration sales, we achieved the total sales of 207,135 Ksh (about 27,000 yen).

We also confirmed it necessary to vary flavor and processing form and further devise package and label designs. Children did not have particularly favorite products (merchandise) but tended to prefer sugar, honey, and other sweet tastes. To the contrary, salty seasoning was not popular. Rice ball (balling up rice popped cereal by suger), kashata (solidifying popped cereal by syrup) and other products made by the secondary processing of popped cereals ranked high also because they are easy to use, sell, and buy (Table 7). As to differences between grains, adults strongly prefer millet and sorghum while children prefer sweet seasoning. We could confirm people's tendency of preferring low-price products rather than specific grains.

Agricultural shows were also participated in by many participants who were interested in the machine structure, the principle of pressure processing, purchasers, and prices. We received 50 to 100 inquiries per participation in an agricultural show. We also received many inquiries about expiration date. We heard various ideas about machine improvements and packages. As to the purchase of machine, many people said it difficult to make decision now (wait and see) because popped cereals are not well known, and the marketability is not clear. A few individuals or organizations seriously considered purchase at each exhibition. We could identify potential customers contacting each other.

Table 3 Schedule of agricultural shows and seminars participated in by the project

	Type	Schedule	Place	Subject	Demonstrator	Sales (Ksh)	Award
1	Agricultural show	May 25 to 27	Nyanyuki	General public	Project team, Embu Group	12,900	First prize in three fields
2	Agricultural show	June 7 to 10	Meru	General public	Project team, Embu Group	27,135	First prize in three fields Second prize in three fields Third prize in one field
3	School event	12-Jun	Embu-ACK St Joseph college Manyatta		Embu Group	4,300	
4	Agricultural show	June15 to 17	Kakamega	General public	Project team, Migori Group	9,430	First prize in three fields Second prize in two fields
5	Agricultural show	June 28 to July 1	Machakos	General public	Project team, Kitui Group	12,300	First prize in two fields Second prize in one field
6	Workshop	June 10 and 12	Kilifi, Kware	participants	Project team		
7	Agricultural show	July 4 to 8	Nakuru	General public	Project team, Embu Group	23,730	First prize in one field Second prize in one field Third prize in one field
8	Kisumu workshop by Australian Centre for International Agricultural Research (ACIAR)	July 3 to 7	Kisumu / Busia	Governmental organization, CGIAR, NGO, and Australian Government	Project team		
9	Agricultural show	July 13 to 15	Kisii	General public	Project team, Migori Group	14,030	First prize in three fields
10	Agricultural show	July 20 to 22	Kabarnet	General public	Project team, Migori Group	9,440	First prize in four fields Second prize in two fields
11	Agricultural show	July 20 to 22	Kitui	General public	Kitui Group	10,490	First prize in one field
12	Local event	July 28 to 29	Nyeri Wambugu farm		Embu Group	22,000	
13	Agricultural show	July 25 to 29	Kisumu	General public	Project team, Kitui Group	18,840	First prize in one field Second prize in one field Third prize in one field
14	Local event	24-Aug	Manyatta stakeholders forum (mashf) kairuri, Embu		Embu Group	2,000	
15	Agricultural show	September 14 to 17	Nyeri National show	General public	Embu Group	20,150	Partnership with JKUAT First prize in five fields Second prize in three fields
16	Interaction festival by Japanese school	16-Sep	Nairobi	Japnese Association and Japanese school staff	Project team	6,000	At the request of PTA of Japense school
17	School event	22-Sep	Bonanza School Embu		Embu Group	820	
18	Agricultural show	October 3 to 10	Kampara, UGANDA	General public	DK engineers, Project team, Embu Group		
19	Agricultural show	October 12 to 14	Migori	General public	Migori Group		
20	Workshop	November 21 and 22	National Agri-Nutrition Conference, Nairobi	Participants and US-AID staff	Project team	No sell	
21	Fureai Festivel by the Japanese Association	9-Dec	Japanese Embassy Nairobi	Participants	Project team	No sell	At the request of the Japanese Association, Kenya
22	Agricultural show	December 3 to 10	Bujumbura, BURUNDI	General public	Migori Group		With the support of Migori County
23	Workshop	23-Jan	Final Workshop of JAICAF-Bioversity project	Project staff (inc. general public)	Project team		
24	Community seminar	21-Feb	Itumbu Community, Vihiga County	Local participants	Project team		Bioversity
25	Exhibition	March 7 and 8	Kenya National Nutrition Week (5-11 March)	General public	Project team		

Table 4 Fields of commendation and places of agricultural show

	Field of Commendation	Ranking, and Place of Agricultural Show		
		First	Second	Third
	Total prizes	26	9	2
1	Best innovation and invention stand	Nyanyuki 、 Kakamega 、 Kisii 、 Nieri、Meru		Nakuru
2	Best small trade stand, commercial and industrial	Machakos 、 Meru 、 Kisii 、 Nakuru、Kisumu		
3	Best regulatory authority and cooperation stand, Best organization/association in community projects/services stand	Nyanyuki、Machakos、Kabarnet		
4	Best agricultural based statutory board stand	Meru、Kabarnet、Nieri		
5	Best show theme interpretation	Kisii、Kabarnet、Nieri		
6	Best local manufacturing stand, Non-consumables	Nyanuki	Nakuru	Kisumu
7	Best youth activities empowerment capacity building	Kakamega	Kisumu	
8	Best stand demonstrating the application of environmental quality standards	Kabarnet		
9	Best stand exhibiting agricultural and Erath moving equipment	Nieri		
10	Best government ministry stand (Baringo county)	Kabarnet		
11	Best Traditional foods stand (Kitui County)	Kitui		
12	President Award the best university trophy	Nieri		
13	Best local stand in strategic of international trade and exports		Meru	
14	Best stand that promote national cohesion and integration development		Machakos	
15	The best government social functions stand		Kabarnet	
16	The most striking display (demonstration of locally manufactured products		Kabarnet	
17	Best stand research and development		Nieri	
18	The most striking display (promotion of local manufactured products)		Nieri	
19	The best agro-processing stand		Nieri	

Table 5 Main agricultural processed foods exibited at the Kitui County Agricultural Show

Food	**Feature of Merchandise**
Pilaf	Using sorghum instead of rice
Chapati	Mixing wheat powder with millet, mung bean, carrot, sweet potato, and pumpkin
Mandazi (Doughnut)	Mixing wheat powder with sweet potato and cassava
Chips	Using banana and yam
Dried vegetable	Basil
Dried fruit	Mango, papaya, pineapple, and lemon peeling
Dried or smoked fish	Omena, tilapia, and catfish
Juice	Passion fruit, mango, and pineapple
Fish bait	Insect powder
Cake	Cake containing soybean and cake containing rice powder
Tomato sauce	Tomato
Yoghurt	Home-made
Popcorn	Popcorn machine
Coffee	Home-roasted
Chia seed	Health food

Table 6 Bagged popped cereal products manufactured by Gichangi Cereals and Spices and sold at the Nyanyuki Agricultural Show

Merchandise	Weight (g)	Price (Ksh)	Manufactured Quantity	Sold Quantity
Maize	25	20	123	75
Sorghum	25	20	418	147
Pearl millet	25	20	418	169
Wheat	25	20	217	188
Maize	50	40	23	8
Sorghum	50	40	33	13
Pearl millet	50	40	50	27
Wheat	50	40	20	20

Table 7 Merchandise sold most at different events

Agricultural Show Site	Ranking and Merchandise Name			
	First	Second	Third	Fourth
Nyanyuki	Maize	Pearl millet	Sorghum	Maize
Maru	Pearl millet	Sorghum	Maize	Wheat
Kakamega	Rice (Ball)	Maize	Wheat	Soybean
Machakos	Sorghum	Maize	Rice (Kashata)	Pearl millet
Kisii	Rice(Ball)	Sorghum	Soybean	Maize
Nakuru	Sorghum	Pearl millet	Wheat	Maize
Kabarnet	Sorghum	Rice	Pearl millet	Maize
Kisumu	Rice(Ball)	Sorghum	Maize	Soybean

Photo 17 Mr. Gichangi (Representative of Gichangi Cereal and Spices) (rightmost end) explaining popped cereal products made from pearl millet to Mr. Uhuru Kenyatta, President of Kenya (Source: http://www.jkuat.ac.ke; 16 September 2017). Considering agriculture as the most important industry, the Kenya Government supports development in the agricultural business field by developing agricultural technologies. In particular, the government launched the strengthening of support particularly on small-scale farmers, women, and young people.

Photo 18, 19 Mr. Charles, Representative of the Okonyo Migori Group that won five prizes at the Kakamega Agricultural Show held from June 20 to 22, 2017 (Left)
Ms. Peniennah and Ms. Dorocy from the Syokinili Women Group showing trophies awarded at the Machakos Agricultural Show held from July 4 to 8, 2017 (Right)


Photo 20, 21 Member of the Syokinili Women group selling popped cereals to children who visited the Machakos Agricultural Show (July 4 to 8) by school trip (Left)
Member of the Syokinili Women Group explaining the handling of a cereal popping machine to members of the evaluation committee (Right)


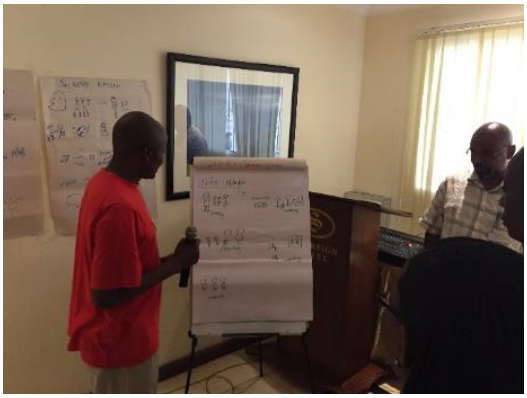

Photo 22, 23 Mr. Francis Oundo introducing activities in this project to participants at an international workshop hosted by the Australian Center for International Agricultural. Research (ACIAR) (July 3 to 7, 2017) (Left and right)


Photo 24, 25 Demonstration of popped cereals at Busia County Mundika High School (Left) and the Agricultural Training Center (Right) (July 7, 2017). Demonstration to 480 students at Mundika High School (Left)

(2) Dissemination and Enlightenment Activities in Surrounding Countries

The demonstration survey in this project was not limited to Kenya but expanded to neighboring countries.

(a) Tanzania

Participation in the international commercial festival Saba Saba held in Dodoma, Tanzania held on July 7, 2017 was planned for popped cereal demonstration sales. Since Kenyan presidential election result was also to be announced on the day, however, this plan was abandoned because of concerns about insecurity and border blockade. Meanwhile, Kikkoman Corp. is considering the implementation of pressure popping machine in cooperation with Matoborwa Ltd.[2] based in Dodoma County, Tanzania. Kikkoman Corp. is considering merchandise development through test marketing with Yoshimura-type pressure popping machine, and survey on favorite flavors of residents. If this starts turning a business cycle, we will disseminate pop processing for social contribution, such as business launch and promotion of using traditional foods in local areas by using profits distributed to the company as funds. From the technical perspective, we are now developing a trial popped soybean snack. It is difficult to season the snack because the surface is smoother than those of grains. Since the snack should also be crunchy, we need to overcome a technical hurdle in commercializing the snack. As to processing, we are now considering cooperation with Ikeda Seika based in Aichi Prefecture, Japan.

In addition, we received inquiries about the implementation of Kenyan-made cereal popping machine from several NGOs based in Tanzania organization. Purchase is now under consideration by visiting DK Engineering.

(b) Uganda

With the cooperation of Gichangi Cereals and Spices and DK Engineering, the project team participated in the Uganda International Trade Fair (UGITF) held in Kampala, Uganda for popped cereal demonstration sales from October 3 to 10, 2017. DK Engineering exhibited many in-house juicing machines as well as cereal popping machines.

This trade fair was participated in not only by the team of this project but also Crystal Field Investment Ltd. (Zimbabwe capital) selling popped cereal products

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[2] Matoborwa Ltd.: Local company manufacturing and selling dried potatoes and fruits in Tanzania (http://57631919.at.webry.info/201511/article_2.html)

(Maputi). The company has a large 6 kg cereal popping machine made in China and is now manufacturing products mainly from Ugandan maize. The seasonings were red pepper and honey coating. In Nairobi, Yalika Ltd. used to manufacture and sell maize products (Business Daily 2014). However, the Zimbabwe-capitalized popped cereal manufacturer withdrew from the market about 2015. Relationships between Crystal Field Investment Ltd. and Yalika Ltd. are unknown. However, the companies are very similar to each other because they are both Zimbabwe-capitalized and manufacture and sell maize-only products.

At other processed food fairs, banana powder, banana biscuits, and nutrition-adjusted porridge mixes using soybean powder and banana powder were exhibited under the Banana Industrial Development Project supported by the Ugandan Government. The exhibits included dried bamboo shoots, amaranths cereal bars and biscuits, and nutrition-adjusted porridge mixes manufactured and sold by Natural Limited under the supervision of the Makerere University. The Islamic University exhibited hibiscus juice, tamarind juice, soursop juice, and date jam and syrup. Participants from neighboring Rwanda were Africa Improved Foods Ltd. and Sosoma Industries Ltd. Africa Improved Foods Ltd. exhibited nutrition-adjusted porridge mixes and cassava powder. Sosoma Industries Ltd. exhibited soybean powder, organically grown coffee and tea, and other products, including passion fruit juice and banana wine. They featured many products processed from local agricultural products and nutrition-considered processed products.

Photo 26 Processed product in UGITF

Photo 27 Popped cereal was displayed in UGITF

Many participants in the field of food processing machines were agencies importing and selling products made in China and India. Their exhibits were grain mills, vegetables, fruit juicers & mixers, vegetable and fruit peelers, waffle irons, and pancake machines. Judging from these exhibits, the cereal popping machines and processed products

manufactured from sorghum and millet under this project were considered unique and attracted participants.

Photo 28 Processing machine in UGITF

Photo 29 Pressure popping machine in UGITF

In October 2016, a meeting was held with agricultural staff at the Ugandan Office of JICA. At the meeting, a rice producing area in the east was taken up as a candidate for the implementation of cereal popping machine. In Uganda, JICA specialists from Japan implemented one Yoshimura-type pressure popping machine made in Japan. A local newspaper introduced activities of local cooperation staff by using this machine. According to the newspaper, however, the activities are limited to demonstrations by cooperation staff at events because there are no human resources or parts for repairing available in Uganda and import will cost very high.

(c) Burundi

The 18th East Africa *Jua Kari/Nguvu Kazi* Expo was held in Bujumbura, the capital of Burundi, from December 3 to 10, 2017. Mr. Charles Mogeni from the Okonyo Migori Group participated in this exposition and demonstrated a pressure popping machine and sold popped cereals. This exposition is held once a year, in five East African countries by turns. Burundi was not included in the target countries of this project in the fiscal year. However, Burundi was included at the request of Enterprise Development Support Personnel of the Kusumu County Government (Kusumu County, Siaya County, and Kisii County) and governmental organization Micro & Small Enterprise Authority and to support participation by the Okonyo Migori Group totally. JUAKARI is a word coined from "jua" meaning the sun and "kali" meaning sharp in Swahili. This refers to the manufacturing business (tinsmith, blacksmith, woodworking, sewing, printing, etc.) or repairing business (repairing electric products, bicycles, shoes, etc.) belonging to an

informal sector and requiring technology and skills.

(d) Ethiopia

A JICA specialist at the Project for Functional Enhancement of the National Rice Research and Training Center (EthioRice) made an inquiry about pressure popping machine for value addition to rice. They seem to be considering the implementation of Kenyan-made cereal popping machines also because part procurement and technical training are easy.

(e) Cambodia・Indonesia

Su-Re Coffee Ltd. based in Bali, Indonesia is directly devoted to sustainable development and environment-resilient activities. Mr. Takeshi Takama, president of the company, studied the project activities and visited DK Engineering. By taking these opportunities, Su-Re Coffee Ltd. started manufacturing an experimental cereal popping machine based on a design drawing provided from Bioversity. The company worked out a project to improve the agricultural income and cultivate human resources by implementing Kenyan-made cereal popping machines. At the same time, they created a written proposal to improve the agricultural income of Bali with DK Engineering and Stockholm Environment Institute by using DK Engineering developed technology. With this proposal, they made an application to the Small Grants Programme of the Global Environment Facility (GEF) for funding.

Photo 30 Mr. Takeshi Takama, representative of Su-Re Coffee Ltd. in Indonesia and Mr. Daniel Kirori from DK Engineering

(f) International organizations

In the latter half of the last fiscal year, UN-HABITAT was considering the

implementation of pressure popping machine as measures of assisting residents at a refugee camp in Turkana County located in the north of Kenya. However, no substantial progress was made in this fiscal year. Meanwhile, WFP is also considering the implementation of cereal popping machine and specific coordination in activities in Makueni County located in the east of Kenya. Our continuous enlightenment activities by demonstration sales at many shows listed in Table 3 seem to be making pressure popping machines and popped products known to domestic and international partners organizations visiting the shows.

(g) Japanese school

We made popped cereal demonstration sales at "Fureai Festival" held on September 16, 2017 under the auspices of the Japanese Association Nairobi. With the cooperation of PTA of the Japanese school in Nairobi, we devised original products by applying various seasonings to sorghum-based cereals. On the day, we sold nine kinds of products of eight flavor types. The basic flavor was sugar (plain) and the other flavors were curry, sauce, cocoa, green tea milk, sweet soy sauce glaze (sugar, soy sauce, and mixture of seven spices), chocolate coating (Right-hand photo: white and black chocolate), and kashata (kashata: syrup and roasted soybean flour). We received cooperation from PTA and children and donated the profit to the PTA of the Japanese school.


Photo 31, 32 Popped cereal demonstration sales by PTA of Japanese school (September 16)

(3) Provision of Training

In this fiscal year, we held two-day trainings by visiting individual and organizational entrepreneurs and business operators who voluntarily purchased pressure popping machines. Through the trainings, we provided information and technology acquired through the project activities.

So far, we have conducted the training on three organizations as detailed in Table 8.

Table 8. Places and periods of training and purchasing organization names

	Place	Period	Purchasing Organization	Attribute
1	Bomet	September 25 to 27	John Koech	Individual entrepreneur
2	Nairobi	December 6 and 13	Nissin Foods Group	Company
3	Bukura	February 23 and 24	Affective Action, Women Represent office, Kakamega County.	Local governmental organization

We explained the background and purpose of this project, the section names of cereal popping machines, and the handling, management, material preparation, and adjustment methods. We also explained the processing, seasoning, labeling, packaging, and sales methods, including the acquisition of food sanitation certificate and nutrition analysis result.

We could verify the great effect of providing a training at the same as machine purchase because of high awareness of the purchasers. From participants, we receive a great many inquiries about continuous training after the project, about troubleshooting or support concerning parts, operation, and management, and the like. They expect us to keep providing trainings. Therefore, Bioversity International is planning continuous support (information provision) about machine repairing, management, and cereal popping even after the project, in cooperation with DK Engineering. If part procurement or on-site repairing is not possible, the machine needs to be taken to DK Engineering and an extra charge becomes necessary for personnel dispatch.

In cooperation with KIRDI, the Government is promoting the implementation of food processing machines for peanut butter, sunflower oil, and mango juice to promote the local industries and support rural organizations. DK Engineering manufactures various food processing machines to meet such governmental demands, but their support is not enough about post-implementation management and demonstration sales using the machines. Since KIRDI engineers do not necessarily have enough knowledge about each machine, they cannot make full use of the machines. There were found many machines not used or even tested by actual running in the KIRDI warehouse. Continuous training on machine purchasers is important also for progress of this project.

For continuous training activities (machine manufacturing, quality management, operation, management, popped cereal manufacturing, product management, etc.), it is considered good to establish a local corporation or NGO by using local human resources cultivated in this project, nurture local expert trainers, and make the dispatch service independent. However, further verification may be necessary about

sustainability.


Photo 33, 34 Peanut butter making machine provided by DK Engineering at the request of Kagamega County Government (Left) Staff from DK Engineering is explaining the handling of a sunflower oil machine to representatives of local organizations in Kagamega County, government officials of the county, and KIRDI staff. It is necessary to continue training about the method of using and managing an implemented machine and about processes from production to sales.


Photo 35, 36 Training on a rural organization in Bulura Village, Kagamega County located in the west of Kenya. Project team explaining the handling of a cereal popping machine to the representative of rural organization and local government officials (Left). Demonstration of kashata processing and tasting (Right). Continuous follow-up activities are expected.


Photo 37, 38 Training on the family of Mr. John Koech, an individual investor in Bomet County (Left), Mr. and Mrs. Koech (Right). Mr. Koech is public servant working for Kisii County. He decided to purchase a cereal popping machines for a new business after retirement. He knew the existence of cereal popping machine at the agricultural shows held in Nakuru County and Kabarnet County.


Photo 39, 40 Demonstration to employees of Nissin Foods Co., Ltd., including machine training

(4) Issues about Organizational Activities

Last year, this project was started with three business operators. Among them, the individual entrepreneur Gichangi Cereals and Spices increased income steadily by expanding business. This was sharp contrast with the other two business operators, Syokinili Women Group and Okonyo Migori Group, who tackled the business by organizational activities. Thus, several issues were highlighted about organizational activities. The issues affected even exhibition activities at agricultural shows.

- Business experiences are not sufficient. They cannot handle many customers because of their unfamiliarity with customer attendance. However, they are showing signs of improvement.
- There is not enough merchandise and preparation is not satisfactory. They are not

proficient in money management, and lacking in the habit of booking, transparency, and leadership. Under a complete role sharing system, the specialties and responsibilities of individual members are respected but they cannot do work assigned to other members. In addition, they do not share work possibly because they respect individual roles each other, do not have enough experiences, and are lacking in experiences of cooperation. Therefore, if one member cannot participate in group activities, the entire work stops. There are not many people who can do all the work.

- They have limited skills and inadequate experiences. Labels and packages are not improved. Bags are torn, and merchandise is not uniform because of eyeballing or eyeballing with a cup.
- Merchandise cannot be developed. They do not have confidence in tastes and sell even merchandise not finished well.
- Flavors are not selected well. Products of salty favor to not sell to children.
- They do not have enough business experiences. This explains everything.
- Unlike merry-go-round or table bank, this business requires experiences in fund management and operation. Without transparency, the group will lose reliance and collapse because of stagnant group activities.

(5) Governmental and other support systems to diffuse local production for local consumption

About subsidies and financing systems available for farmer groups to promote implementation by purchase, we already conducted a survey in Kitui County in the last fiscal year. In the case of Kitui, several banks were investigated for financing about 1,000 dollars. Based on the Youth Enterprise Development Fund by the Kenyan Government, various packages are provided for the financial support and individuals and organizations and for agri-business support[3]. Since the maximum amount and characteristics of support differ between the packages, an optimum package can be selected according to the characteristics and purpose of business operator.

However, since the interest rate of bank financing is as high as 15% and fund access is complicated, many organizations feel it more effective and easier to use table banking and other personal loans or to raise funds among rural group members.

In addition, local governments have sections supporting Affirmative Action and women organization activities. They are promoting active machine implementation as measures of increasing income in rural areas and promote the use of local resources.

[3] http://www.youthfund.go.ke/

(6) Creation of Various Snacks by Using Popped Grains

On June 13, Mr. Gichangi visited Kenya Fruit Solutions and held a meeting with Mr. Yamamoto and Mr. Jeseph (production manager). The following merchandise can be sold.

-Pineapple grade B

-Mango grade B

-Coconut grade B and C

The water contents of the merchandise can be adjusted to 5% or less for shredding or milling to mix into popped cereals. The proposed price was 150Ksh per 250 g. This is not bad for testing at the initial stage of implementation. However, high cost may make sustainable use impossible. The remaining issue was how nonstandard products of high quality, but low merchandise value could be procured.

We hear that Fruit Solutions disposes of mango peels. We will appreciate it if we can have opportunities of developing new merchandise by drying the disposed peels into chips or by using other means.

Mr. Gichangi *et. al.* visited macadamia nut and cashew nut processing companies and investigated materials available as flavors. However, they found merchandise for products too expensive to use. They found crushed dregs but were told that the dregs are for feedstuff and cannot be sold as foods. It will be important to acquire materials for mixing into popped cereals. Therefore, we should keep investigating good merchandise and vendors.

Cereal popping not only raises the agricultural income but also vitalizes rural areas by increasing employment opportunities. According to a survey, this processing also reduces the cooking time and does not change nutrients. Therefore, contribution to nutrition improvement can also expected from popped cereals. Even grains that fail to swell are milled and used as porridges selling as popular merchandise. We can contribute to sustainable agricultural production and the conservation of Satoyama environment by increasing the demand for the conventional agricultural produces and developing a new market. Popped cereals will also improve nutrition (the main consumer bracket is children in the local areas) and contribute to the conservation of local agricultural resources and production environment (Satoyama) and the restoration of traditional food culture.

3. Results of the activities by the group and incidental survey

(1) Syokinili Group of Kitsui County

- The Syokinili Group split in March 2017. Since the split, the popped cereal production

activities have been stagnant as they overlap with the busy farming season.

- The Group had an opportunity to participate in the Machakos and Cabalnet Agricultural Shows that were held in June and July, 2017 respectively. The Group exhibited and sold popped cereals made of rice, maize, sorghum, and pearl millet, achieving the sales amounting to 22,310 Ksh in total at two venues.
- The Group was requested to display and sell traditional cuisines and popped cereals from the County Government and African Harvest (NGO) that participated in the Kitui Agricultural Show at the end of July in 2017. In response to this invitation, the Group prepared a total of 1505 bags of popped cereals made of rice, maize, sorghum, and pearl millet.
- The participation in the agricultural show triggered revitalization of the activities of the Group. However at that time, on the second day of the Kitui Agricultural Show, a cholera pandemic occurred in Nairobi and Kisumu County, and seven other counties, and the Ministry of Health prohibited the sales of foods on the streets. At the same time, they prohibited the sales of foods even in the hall of the agricultural show, resulting in that two thirds of the 1505 bags, which is 981 bags, of popped cereals that were prepared were left unsold.
- The unsold products were divided and stored in the home of each group member and were sold slowly in the areas around the houses of the members. However, only around 10 bags were sold per day.
- At the beginning of August, when two young members (male) of the Group were arranging the leftover products in small plastic bags on a stall in the Kato Rani regular market, they were arrested by an official of NEMA (National Environment Management Authority) and a government official of the County Office for selling products by using plastic bags.
- In February 2017, prohibition of the use, manufacturing, and importing of plastic bags was notified. Although it was widely known that the notice would be effective from August, which is six months from the date of the notice, no one expected the degree of the strictness of the control response.
- One of the members who were arrested was released as a result of the negotiation and informed the situation to the leader of the Group immediately. The leader immediately visited the office and started the negotiation. The other member was released by paying a penalty of 3,000 Ksh, although it was 30,000 Ksh officially.
- The amount of 3,000 Ksh was a significant expenditure for the Group, causing a trauma within the Group. Discouraged members could not devise an alternative packaging method to the plastic bags and the activity became stagnant.
- None of the popped cereals were produced for the period from September to the beginning of December due to the external factors such as the pandemic of cholera and the prohibition of the use of plastic bags.
- When we visited the Group at the beginning of December, the members asked us about the popped cereal packaging method. We introduced to the members of the Group the

packaging method and the sales method that were being applied by Mr. Gichangi of Embu County.

Photo 41 Packed in funnel shape

Photo 42 Printed A4 paper

Photo 43 Paper and paper bags for wrapping kashatas

Photo 44 Plastic cups and containers

- Kashatas are stored in a transparent plastic bucket to make them visible to customers and are sold to customers by wrapping them with paper (Photo 41, 42). For a customer who buys five or more kashatas, they are put in a paper bag (Photo 43). Kashatas were initially produced by the Syokinili Group and the members re-recognized that kashatas can be sold without using plastic bags. Then they noticed that the products can be sold with a simple method by using a packaging material that can be obtained locally and as a result, the activities were resumed.

Photo 45 Preparing the paper for wrapping kashatas

Photo 46 Kashata wrapped by paper

- This concludes the monitoring. We heard that the machine broke afterward. However, it is not known whether they repaired the machine by themselves.

(2) Okonyo Group of Migori County

- Since March 2017, the number of members who are engaged in the popped cereal production has become two in the Okonyo Group. They managed to continue their small activities in the unstable condition while securing labor forces temporarily at the production stage only.
- Under such circumstances, the Group had opportunities for participating in the Kakamega, Kishii, and Kitsui Agricultural Shows over the period from June to July. They exhibited and sold maize, sorghum, rice (ball), and soybeans, and sales amounted to 42,300 Ksh across the three venues.
- When the activities were beginning to become vitalized as a result of the participation in the Agricultural Shows, the campaigns for the Presidency started heating up towards the election on August 8. In Migori County, near Kisumu, which was the base of Mr. Odinga, who was a Presidential candidate in the opposition alliance, the public order started to become unstable. During this time, the members halted production of popped cereals as it produced a loud noise.
- After the defeat of Mr. Odinga became clear as a result of the election results, Mr. Odinga lodged a protest to the High Court for possible fraud in the counting operation. On September 1, the High Court approved the protest from NASA, invalidated the election result, and ordered re-election within 60 days.
- Given this situation, participation in the Agricultural Show that was to be held at Migori in August 23 was requested from the County Government, and the Group produced popped cereals from 5 kg of maize, 9 kg of rice, and 1 kg of sorghum. During this process, the pressure gauge started to have a problem, so the maize and sorghum could not be processed properly and the maize and sorghum were sold before the Agricultural Show. Consequently, only the rice was exhibited and sold at the Agricultural Show. Although products amounting to 10,275 Ksh were prepared, about only a half, that is products amounting to 5,475 Ksh, were actually sold.
- Even after having sold all the products that were left unsold at the Agricultural show, they avoided any production that produced a loud noise.
- Although the re-election date was determined to be on October 26, in Migori, which is one of the support bases for the opposition alliance, violent protest activities were frequent up to the re-election. With the deterioration of the public order, popped cereal production activities became difficult under the increased number of police for the maintenance of public order. Although the voting rate of the re-election was low due to the boycott by the NASA camp, Mr. Kenyatta, the current President, won gaining 98% for the percentage of votes obtained and was formally appointed as the President

on November 28. After all, the turmoil of the political situation started to become more stable.

- The corporate development officer of the County Government indicated participation of the Group, representing Migori, in the "East Africa *JUAKALI/NGUVU KAZI* Exhibition Bujumbura Burundi", which was held in Burundi for the period from December 3 to 10. In response to this request, the leader of the Okonyo Group prepared popped cereals from 4 kg of rice, 4 kg of sorghum, 5 kg of maize, and 2 kg of soybeans and shipped them through a truck that was prepared by MSEA together with raw grains, 25 kg, 40 kg, 6 kg, and 2 kg respectively and also 1 kg of wheat as well as a pressure popping machine. At the venue, the Group demonstrated the pressure popping process for 2 kg of rice, 2 kg of sorghum, and 2 kg of soybeans over 3 days. The sales of the products were poor and only snacks equivalent to 1400 Ksh were sold throughout the period.
- While the political situation has become comparatively stable, future activities of the Okonyo Group were anticipated. However, since they were not as enthusiastic as they were for participation in these events, we decided to listen to the customers' opinions.
- The leader of the Okonyo Group has been conducting a small business by selling soy drink (powder), roasted soybean flower, tea, and spice at a kiosk at kiosks by packing them in small bags since before he started the pressure popping process business. Through the business that has been continued by the leader, the Group has already established the method of selling the products to customers such as kiosks, mini super-markets, and shops within the markets, thereby establishing a sales network.
- This time, we had a chance to listen to the shop owners by visiting a total of 41 kiosks and mini super-markets and recognized again the size of this network and the significance of the popped cereal market.
- No popped cereals were left in any of the shops that we visited this time and all the shop owners were hoping for the next delivery of the products. In all the shops, they asked, "When can you deliver the products?" and even said, "We will lose the customers unless the products are made available soon."
- In Migori, since the sales network that was built by the leader of the Okonyo Group is already established, the only remaining task is efficient production and no concern is necessary regarding the sales method.

Photo 47 Owner of the kiosk

Photo 48 Owner of the mini super-market

(3) Gichangi Cereals and Spices in Embu County

- Of the 12 months from February 2017, the monthly sales over 9 months by Mr. Gichangi were about 48,000 Ksh, excluding the sales of August, for which sales records were unavailable, and the sales of October, during which Mr. Gichangi visited Uganda and Japan. Based on this result, both the production/processing and sales are assumed to be operating well. August was the month of the Presidency election and the introduction of the prohibition of plastic bags.
- As the countermeasure for the prohibition of the use of plastic bags, Mr. Gichangi created containers by wrapping A4 paper into a funnel shape (Photo 41). Paper of a different color is used for each grain and after the paper is formed as a container, the printed letters are placed at the front (Photo 42). For the cost for the paper container, the printing of one sheet costs 3 Ksh, a white paper including printing (for wheat) costs 3.8 Ksh/sheet, a colored paper (for sorghum and millet) costs 4 Ksh/sheet. Currently, the products that use the paper containers are sold for 20 Ksh. Since snacks of 25 g in a container were sold at 20 Ksh, the volume was reduced by 5 g (20%), which means the consumer bears the cost of the paper container of about 4 Ksh. For a container of 500 ml plastic cup (container fee 6 Ksh) and a 1000 ml plastic container (container fee 13.5 Ksh/container), the container fees are borne by the customer based on the price setting.
- Mr. Gichangi participated in the training program in Japan that was implemented by Ieda Seika Corporation for the period from October 21 to November 1, 2017. He introduced, in the production site in Kenya, many of the production methods of a snack called Okoshi (kashata in Kenya), machine management, and hygiene management of the processing factory that he learned during the training.

(a) For the kashata production, he used the recipes of Ieda Seika without change and also introduced an originality by using baobab, honey, soy sauce, cinnamon, ginger, turmeric, and red pepper.

(b) For the molding process also, he created a mold frame of the same size and changed the size that allows the making of 216 (average 11 g/piece) kashata each time. The

production cost per piece was 3.4 Ksh. He sells this product at 10 Ksh per piece. However, the sales cost and machine depreciation were not included in the production cost.

Photo 49 Kashata molding processing (levelling)

Photo 50 Cutting kashata

(c) The pressure popping machine was improved by connecting the main unit and the pressure gauge with a coupler socket to allow disconnection of the pressure gauge at decompression in order to reduce the load to the pressure gauge at decompression by instantly opening the cover of the pressure popping machine.

Photo 51 The pressure gauge is connected

Photo 52 The pressure gauge is removed

Photo 53 Uniform in the processing factory

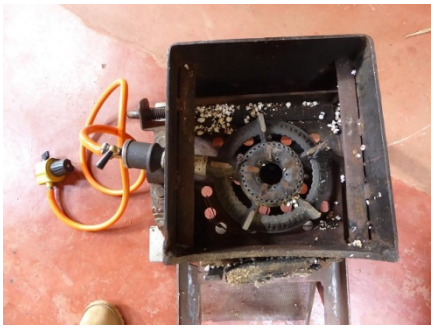


Photo 54 The heat source is changed from firewood to a gas stove

(d) The hygiene management in the processing factory has also been improved. Each worker wears rubber boots, a coat, and a hat (Photo 53). When touching a product, a worker uses disposable gloves.

(e) The heat source of the pressure popping machine was changed from firewood to a gas stove (Photo 54). Although the gas stove was purchased during his visit to Japan for training, Mr. Gichangi improved and installed it immediately after returning home. The cost of the gas required for one popped cereal production is 3.4 Ksh. Since the firewood costed 5 Ksh per time, the introduction of the gas stove is more effective in terms of cost as well as the elimination of smoke.

- Since kashatas over a large varieties of flavors are produced, they cannot be discriminated simply by color coding. Therefore, Mr. Gichangi colors the face of the kashata for identification by placing thinly roasted soybean flour or powder of dried stinging nettle leaves on the table when producing kashata (Photo 55 and 56).
- The current problem for Mr. Gichangi is humidity. In Japan, a dryer is used and silica gel is also placed in a bag. Although Mr. Gichangi searched for silica gel within Kenya, he found out that silica gel is not available and he is currently searching for some alternative. We informed him that, in Japan, limestone (calcium oxide) is used as a food drying agent as well as silica gel. Since limestone may be available in Kenya also, we hope that he will try it soon.

Photo 55 Kashata colored with roasted soybean flour

Photo 56 Kashata colored with Nettle

(4) Koech Family of Bomet County

- The popped cereal business that was started by Mr. John involves four young male members comprising his son and relatives. Mr. John and the members received training from the project team, operated for 7 days for the period of about 50 days from October 16 to December 4, and produced popped cereals of honey flavor from the grains including 58 kg of maize, 18 kg of rice, 15 kg of sorghum, and 5 kg of wheat. The sales amount for this period was 24,980 Ksh.
- The reason that the production volume of maize was far higher stems from the traditional popcorn that is made with hot charcoal in mound of a burnt field called Mugero, and maize is the most familiar product for the local consumers.
- Although Mr. John purchased all the tools, ingredients, and equipment for producing kashata as he had learned in Japan, he had not practiced the production until we visited for monitoring on December 12, as if he was not confident to teach the other members by himself.
- On the day when we visited, all the tools, equipment, pressure popped rice as the main ingredient and supplementary ingredients such as starch syrup and sugar were prepared (Photo 57). Initially, the size of a single kashata was decided to be 3 cm x 7 cm and the scales were marked on the table (Photo 58) according to the mold of 63 cm x 63 cm. One hundred eighty-nine kashatas can be produced at one production run based on the calculation.

Photo 57 Supplementary ingredients for kashata

Photo 58 Tools and marking the scale

- Young members were in charge of the pressure popping process and sought advice on the problem of many losses such as burnt finish of rice and the failure of puffing properly. At the checking of the production site, initially, we noticed that the fire was not strong enough, so we provided advice to add more firewood. Since the machine was also rotated extremely quickly, we advised to rotate at 40 to 70 revolutions per minute. If the machine is rotated too quickly, only the cylinder rotates and the grains remains in the one place, resulting in firing only some section of the ingredients. The machine must be rotated slowly to spread the grains inside of the cylinder. The main cause of a failure of popping rice grains is the water content of the rice grains. If the rice grains are too dry, a suitable amount of water must be added to make a proper water content, which is around 15%, and then the rice must be left to stand overnight. This advice was also provided to Koech and other members.
- For the flavoring of kashata, brown sugar flavor and a soya sauce flavor were applied according to the request from Mr. John. Although the proper temperature of toffee was supposed to be 120°C, the temperature did not rise easily from around 110°C due to the high altitude of the site. Therefore, the toffee was removed from the fire when the temperature reached 115°C and it was mixed with the ingredients. It then became coagulated without any serious problem.
- With this, Mr. John and the other four members seem to have mastered the basic operations for producing popped cereals and kashatas.
- Koech family produced kashatas by operating for the period of 4 days during a one-month period from December 12 to January 14. Kashatas were stored in transparent buckets and were sold by explaining the products face to face while moving around the market. Although kashatas of popped cereals are not well known in this region, the sales for the period amounted to 28,700 Ksh.

(5) Result of customer survey

- This survey was conducted to understand the age groups of the consumers and the consumer trend towards popped cereals.
- At the Embu, Runyejes, and Kabati markets, the products were exhibited when the markets were held and surveys were conducted while selling the products. At the

Embu market, basically, products were sold at a street stall and at Runyejes and Kabati markets, mobile sales were also used for several hours in the afternoon. The mobile sales produced more sales results as the method gave more opportunities for direct contact with customers. At the Embu market, the survey over 6 days for the period of 8 days was outsourced to Mr. Gichangi.

- Bomet is a region of Mungungo location, where tea plantations are found and the survey was conducted during the mobile sales. The survey was outsourced to the sales staff.

(a) Customer genders

- As shown in the table below, at the Embu and Kabati market, there are no significant differences between consumer genders. However, in both markets, the numbers of female customers are slightly higher. This seems to be based on the fact that most of the shoppers are females and this factor is shown in the result.
- The assumed reason for the higher number of male customers in the Runyejes market is that drivers of motorbike taxis purchased many kashatas during the mobile road sales.
- At the survey site of Bomet, the reason for a higher proportion of males seems to be the reflection of the male to female ratio of the workers at the farms.

(b) Customer age group

- For the Embu, Runyejes, and Kabati markets, the high proportion of the young generation and the middle age group who use the markets seemed to have been directly reflected in the result.
- For the Runyejes market, the proportion of the young generation was comparatively high as many drivers of motorbike taxis purchased the products.
- In Bomet, many children who were picking tea leaves purchased the products and this seems to the reason for the high proportion of children.

(c) Products that were purchased by the customers

- As kashata had not been produced at that time, it is not yet possible to provide a comparison yet. However, based on the result of other three markets, consumers seem to be overwhelmingly in favor of kashata over popped cereals. According to the table below, popped cereals are accepted by all the age groups.
- In terms of grain type, since the overwhelming popularity of kashata is accepted, naturally the proportion of rice, which is the main ingredient of kashata, is high.
- According to the figures that are shown in the table below, sales of pearl millet and sorghum, which are also cereals, have not necessarily become stagnant. Kashata, which is made of rice, gained more customers and in the actual situation, the number of customers of popped cereals that are made of pearl millet and sorghum still remains

high.

- Mr. Gichangi uses a low-priced ground rice for kashata instead of actual rice. Recently, he has produced kashata by mixing popped rice and pearl millet in the ratio of 8:2.
- Some customers started to request a specific flavor although the number of customers is still low. This seems to be a sign of the increasing awareness towards the products. As shown in the table below, seeing that in the Embu market, about 10% of customers purchased the products over multiple flavors, the offering of a variety of flavors seems to lead to an increase of consumption.
- For the quantity of products purchased per customer, the result of the surveys at four locations indicates that almost 60% of customers purchased only one piece.
- In the Embu market, nearly 40% of the customers purchased several pieces. Customers of the age group older than the middle age and late middle age groups purchased the products as the souvenirs for the family (children).
- In the Embu market, 23 customers purchased 24 kashatas or more although the proportion is only 2.5%. While the price of one kashata is 10 Ksh, a pack containing 24 kashatas is sold at 180 Ksh. A set of 10 packs is sold at 1700 Ksh, which is even lower per pack. Recently, the owners of kiosks and hawkers conducting mobile road sales purchase the products in packs and sell them individually. This situation is increasing. An increase of such cases is the proof of the increase of acceptance of popped cereals by customers.
- During this survey, two wholesalers purchased 10 packs each.

Table 9 Results of customer survey

Location County			Embu market Embu		Runyejes Market Embu		Bomet (around tea plantations) Bomet		Kabati Market Kitwii	
Date of survey			December 6, 2017 to January 16, 2018 (8 days)		December 7, 2017 (1 day)		December 12 and 13, 2017 (2 days)		December 21, 2017 (1 day)	
			(Persons)	(%)	(Persons)	(%)	(Persons)	(%)	(Persons)	(%)
Customer gender		Male	397	43.7	148	63.0	39	67.2	74	43.0
		Female	511	56.3	87	37.0	19	32.8	98	57.0
		Total	908	100.0	235	100.0	58	100.0	172	100.0
Customer age group	Child	4 to 12 years of age	29	3.2	15	6.4	16	27.6	15	8.7
	Juvenile	13 to 19 years of age	76	8.4	30	12.8	7	12.1	28	16.3
	Youth	20 to 34 years of age	204	22.5	81	34.5	15	25.9	44	25.6
	Mature adult	35 to 49 years of age	520	57.3	93	39.6	14	24.1	66	38.4
	Middle age	50 years of age or older	79	8.7	16	6.8	6	10.3	19	11.0
		Total	908	100.0	235	100.0	58	100.0	172	100.0
Products purchased by the customers	Type	Kashata	759	83.6	199	84.7	0	0.0	120	69.8
		Popped cereal	134	14.8	32	13.6	58	100.0	49	28.5
		Both	15	1.7	4	1.7	0	0.0	3	1.7
				100.0		100.0		100.0		100.0
	Grains	Rice	759	83.6	199	84.7	26	44.8	120	69.8
		Millet	97	10.7	29	12.3	0	0.0	38	22.1
		Sorghum	31	3.4	0	0.0	2	3.4	9	5.2
		Wheat	1	0.1	0	0.0	0	0.0	0	0.0
		Maize	0	0.0	0	0.0	20	34.5	1	0.6
		2 types or more	20	2.2	7	3.0	10	17.2	4	2.3
				100.0		100.0		100.0		100.0
	Flavors	Baobab	307	33.8	199	84.7				
		Honey	229	25.2	32	13.6	58	100.0	48	27.9
		Soy sauce	51	5.6						
		Cinnamon	45	5.0						
		Ginger	116	12.8						
		Turmeric	11	1.2						
		Red pepper	54	5.9						
		Brown sugar							106	61.6
		Brown sugar + baobab							14	8.1
		Salt							1	0.6
		Multiple	95	10.5	4	1.7			3	1.7
				100.0		100.0		100.0		100.0
	Quantity	1 piece	537	59.1	195	83.0	34	58.6	140	81.4
		2 to 5 pieces	324	35.7	33	14.0	23	39.7	32	18.6
		6 to 10 pieces	22	2.4	0	0.0	1	1.7	0	0.0
		11 to 23 pieces	2	0.2	0	0.0	0	0.0	0	0.0
		24 pieces or more	23	2.5	7	3.0	0	0.0	0	0.0
			908	100.0	235	100.0	58	100.0	172	100.0

(6) Results of incidental survey

(a) Matters to be surveyed as governments supports to diffuse local production for local consumption

(i) Support of training on local production for local consumption

From the government of Kitui County, we have already acquired information about assistance to the Self Help Group. Independence support to youth and female groups is a nation-level priority issue. Since the activities are consistent, we also surveyed other counties.

(ii) Introduction of local production for local consumption at agricultural exhibitions and other events

We have ever participated in agricultural shows which Agricultural Society of Kenya (ASK) hosted in 10 areas. We exhibited popped cereals, demonstrated manufacturing, and made sales at the booths of MSEA and MOA. What is noteworthy is that the Syokinili Group of Kitui was invited by the Ministry of Culture, Youth, Sports, Gender and Social Services and the Africa Harvest (NGO to diffuse improved seeds of pearl millet and sorghum) to an agricultural show hosted by Kitui County and exhibited and sold popped cereals and porridges at their booths. Tables 10, 11, and 12 show past participations in agricultural shows. The booths of MSEA and MOA booths won various prizes in many areas as shown in Table 11. It is a fact patent to the public that this project contributed to these commendations.

Table 10 Participations in agricultural shows hosted by ASK

Schedule	Place	Paticipant Team	Commendation	Sales (Ksh)
March 2 to 4, 2017	Embu	Gichangi Cereals and Spices (Embu)		15,040
May 25 to 27, 2017	Nanyuki	Gichangi Cereals and Spices (Embu)	First prize in three fields	14,000
June 6 to 10, 2017	Meru	Gichangi Cereals and Spices (Embu)	First prize in three fields Second prize in three fields Third prize in one field	27,135
June 15 to 17, 2017	Kagamega	Okonyo Group (Migori)	First prize in three fields Second prize in two fields	9,430
June 28 to July 1, 2017	Machakos	Syokinili Group (Kitui)	First prize in two fields Second prize in one field	12,300
July 4 to 8 2017	Nakuru	Gichangi Cereals and Spices (Embu)		26,000
July 13 to 15, 2017	Kisii	Okonyo Group (Migori)	First prize in three fields	14,030
July 20 to 22, 2017	Kabarnet	Syokinili Group (Kitui)		9,500
July 20 to 22, 2017	Kitui *	Syokinili Group (Kitui)	First prize を in one field	10,490
July 25 to 29, 2017	Kusumu	Okonyo Group (Migori)		

Table 11 Commendations of MSEA and MOA booths at agricultural shows hosted ASK

Field of Commendation	Ranking		
	First	Second	Third
Best Innovation and Invention Stand	Nanyuki Kagamega Kisii Kisii	Kagamega Meru	Meru
Best Local Manufacturing Stand, Non-consumables	Nanyuki	Kagamega Meru	
Best Regulatory Authority and Cooperation Stand	Nanyuki Machakos		
Best Regulatory Authority Stand	Kagamega Meru	Meru	
Best Youth Activities and Empowerment Capacity Building	Kagamega		
Best Agricultural Based Statutory Board Stand	Meru		
Best Small Trade Stand, Commercial and Industrial	Machakos Meru Kisii Kisii	Kagamega	
Best Show Theme Interpretation	Kisii		
Best Local Stand in Strategies of International Trade and Exports		Meru	
Best Stand that Promote National Cohesion and Integration Development		Machakos	
Traditional Foods *	Kitui		

Table 12 Grain popularity ranking by agricultural show site

Agricultural Show Site	Ranking			
	First	Second	Third	Fourth
Nanyuki Meru	Wheat millet*	Millet*, sorghum	Sorghum, maize	Maize, wheat
Kagamega	Rice (ball)	Maize	Wheat	Soybean
Machakos	Sorghum	Maize	Rice (kashata)	Millet*
Kisii	Rice (ball)	Sorghum	Soybean	
		Maize		

*Pearl millet

(iii) Aid or financing system for implementing processing materials and equipment

Loans from major banks have already been surveyed. We will acquire information from MSEA about Microfinance, SACCOS (Saving and Credit Co-operative Societies), Cooperative Society, and governmental funds like Youth Enterprise Fund, Woman Enterprise Fund, and Uwezo Fund.

Photo 59 Awards at Kagamega Agricultural Show Photo 60 Awards at Machakos Agricultural Show

Photo 61 Explanation of manufacturing at Kisii Agricultural Show, Photo 62 Sales at Kisii Agricultural Show

(b) Matters to be surveyed about regulations concerning agricultural product processing and sales

(i) Regulations concerning food sanitation

The popped cereals meet the food standards of KEBS (Kenya Bureau of Standards), but manufacturing staff must receive medical certificates from the public health office of the county. However, only Mr. Gichangi from Embu has this certificate. Manufacturing facilities require a sanitary certificate from the county.

(ii) Regulations concerning food quality

Since the food standards of KEBS are satisfied as mentioned above, quality can be guaranteed if only business operators acquire a certificate about their products. Mr. Gichangi from Embu already has a certificate. The Okonyo Group in Migori (manufacturing within KIRDI) is also making preparation for application. At this survey, we visited the KEBS office in Isebania and confirmed the application proceedings.

(iii) Regulations concerning food processing

Because of a KEBS certificate from Embu, there is no problem about the popped cereal processing technology.

(iv) Regulations concerning food packaging and labeling

For sales at major markets, products must bear a KEBS mark, a table of ingredients, and a barcode and be registered for Electricity Tax Register. There are no packaging or labeling standards for sales at kiosks or in markets. However, the products are labeled as shown in Photo 63-65. Meanwhile, the littering of plastic bags is impairing the townscape. Also for environmental protection, the use of plastic bags may be prohibited in future.

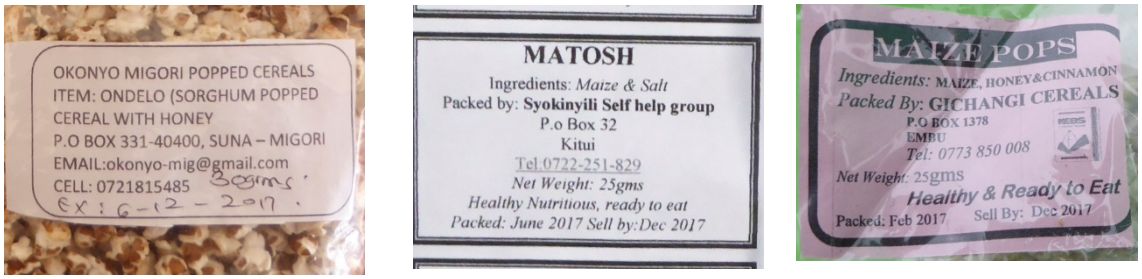


Photo 63-65 Commodity labels (Okonyo Group, Syokinili Group, and Gichangi Cereals and Spices from left)

(v) Regulations concerning the sales of agricultural product processing machines

DK Engineering producing pressure popping machines is taking procedures for KEBS certification themselves.

(vi) About business license

Mr. Gichangi from Embu has a business permit for his store in the market. According to him, people are supposed to pay a trading tax to the municipality when doing sales in a

market or mobile sales. The trading tax is 50 shilling per day for a city or 30 shilling per day for a town.

(c) Other matters to be surveyed

(i) Organization or individual capable of implementing local production for local consumption

One large-scale rice mill in Mwea is interested in popped cereal manufacturing. These days, many primary school students visit the rice mill by field trip. The milling company expects to introduce grain processing for value addition as part of the activities. At the same time, they will sell popped cereals. Since the activities lead to dietary education about local production for local consumption, we will conduct activities including a training once machine implementation has been determined.

(d) Outline of entities operating local production for local consumption

(i) Kitui County

Since a money problem broke human relations, the Syokinili Group split in March this year. The group suspended their activities during the farming season after the split, but 10 members (used to be 23 members) restarted activities by taking an opportunity of participating in an agricultural show. The main raw materials are maize, sorghum, rice, and pearl millet. The female leader of the group has strong connection to the county government and the group activities are highly evaluated by the county government. The group may have been invited in the current fiscal year because of great achievements at the agricultural show of the last fiscal year hosted by the county government. The Syokinili Group is now indispensable for enlightenment about and restoration of the food culture.

(ii) Migori County

The Okonyo Group was initiated by seven members from the Table Banking Group who started popped cereal production. Then the group members decreased to four. Despite brisk activities, however, two members left due to a money problem. Since late March this year, the remaining two members have been continuing production & sales by employing a few part-time workers on days of activities. Their main products are rice ball, soy & nut, and maize. This group features a route established for transactions with nine kiosks as shown in Table 13 attached.

Table 13 Sales by the Okonyo Group at kiosks by using customers (as of July 2017)

Store	Place	Weekly Del.i very Frequency	Merchandise	Delivery Quantity / Dozen / Week	Cost / Dozen (Shilling)	Sales (Shilling)
1	Mavela Market	Twice (Thu & Sun)	Rice ball	4	100	400
			Soy & peanut	2	100	200
2	Mavela Market	Twice (Thu & Sun)	Maize	4	100	400
3	Mavela Market	Twice (Thu & Sun)	Rice ball	2	100	200
			Maize	2	100	200
4	Mavela Market	Twice (Thu & Sun)	Maize	4	100	400
5	Mavela Market	Twice (Thu & Sun)	Soy & peanut	2	100	200
6	Midoti Center	Twice	Rice ball	2	100	200
			Maize	2	50	100
			Soy & peanut	2	100	200
7	Angolo	Once	Soy & peanut	1	100	100
			Maize	2	50	100
8	Migori Marke	Twice	Maize	1	100	100
9	Migori Juakali	Once	Soy & peanut	3	100	300
			Maize	1	100	100
					Total	3200

(iii) Embu County

An entrepreneur selling grains and spices started popped cereal production as a new business. His venture business was to handle soybean drinks and roasted soybean flour. A harmful rumor about an increase cancer incidence rate that eating soybeans raises the cancer incidence rate caused a decline in soybean product sales. He says now he mainly handles popped cereals made from pearl millet, sorghum, maize, and wheat. The entrepreneur participates in fair and events and hawks merchandise in a unique style with bundles of merchandise hanging from the neck as shown in Photo 68. The unique sales method attracted the attention of a newspaper reporter and the Daily Nation posted an article about popped cereals on March 11 and 18. He was also introduced by a local radio station.

Photo 66, 67 Booths and exhibition at an agricultural show hosted by Kitui County

Photo 68 Mr. Gichangi in his store

Photo 69 Embu Market open

(e) Matters to be grasped and checked by demonstration

(i) Project soundness of Kitui County

As shown in Table 14, the group did not make any activities from one in March until participation in an agricultural show in June. Therefore, it is difficult to judge the dependency and sustainability of management. Judging from their activities in July, the roles of members became clear because the organization became compact. This seems to have smoothened the processes from raw material preparation to production, seasoning, (molding), and bagging. Continuing these activities seems to establish independent management.

Table 14 Production by the Syokinili Group

Month	Production Frequency	Production Amount (Raw Materials in kg)				Sales	Porridge	Event
	(Number of Days)	Rice	Maize / Millet* / Sorghum		Total	Shilling		
March	1	0	5	2	2	9	2,814		
June	2	10	10	4	13	37	9,690	2,610	Machakos Agricultural Show
July	4	15	19	12	14	60	13,720	5,250	Kabarnet Agricultural Show Kitui Agricultural Show
Total	7	25	34	18	29	106	26,224	7,860	

*Pearl millet

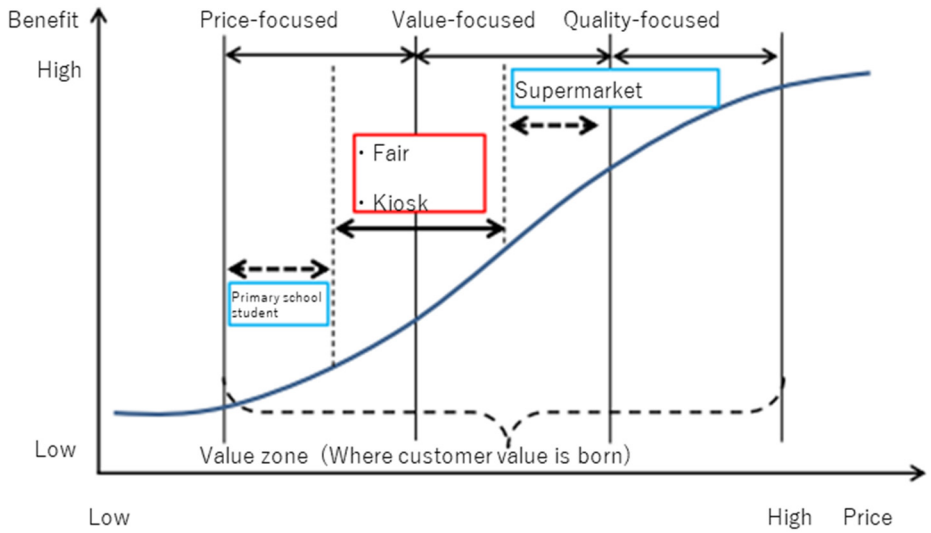
(ii) Issues concerning sales and income expansion of Kitui County

The group has a weak point that they are lacking in human resources of great sales power. At the visit this time, we introduced the case of Embu (fair traveling sales in Table 15) and the case of Migori (establishment of sales network linking kiosks as customers). He made a call early after that. He seemed to have confidence about sales at fairs. We hope this continuation will make him confident. The prices of pearl millet and other grains are soaring, as well as brown sugar. Therefore, price setting based on cost calculation and volume adjustment per bag are necessary.

The efforts shown in Figure 1 are necessary for price-focused marketing targeted at students. For example, it is necessary to reduce the amount per bag and improve lower-priced merchandise quickly.

Table 15 Sales by Gichangi Cereals and Spices

Month	Place	Event	County	Number of days	(Sales shilling)
January February	Embu Market	Fair, demonstration	Embu	15	54,113
	Manyata Market	Fair	Embu	1	3,950
	Ishiara Market	Fair	Embu	1	2,200
	Kiritiri Market	Fair	Embu	1	2,245
	Mwea Market	Fair	Kirinyaga	1	2,470
			Total	19	64,978
March	Waboga Farm	Farmers festival	Nyeri	1	9,065
	Kiajokoma Market	Fair	Embu	1	4,880
	Embu Market	Fair	Embu	5	16,955
	Kisumu Market	Farmers festival	Embu	1	4,965
	Manyata Market	Fair	Embu	1	3,700
	Siacago Market	Fair	Embu	2	12,370
	Chuka Market	Fair	Thakanis	1	3,950
			Total	12	55,885
April	Embu Market	Fair	Embu	3	9,590
	Kianjukuma Market	Fair	Embu	1	4,060
	Gitari Market	Daily	Kiambu	3	9,430
	Leneges Market	Fair	Embu	2	16,000
	Manyata Market	Fair	Embu	1	3,000
	Siacago Market	Fair	Embu	2	6,000
	Kiritiri Market	Fair	Embu	1	3,200
	Kagumo Market	Fair	Kirinyaga	1	4,250
	Kagio Market	Farmers festival, Fair	Kirinyaga	2	8,970
			Total	16	64,500
May	Embu Market	Fair	Embu	7	24,960
	Leneges Market	Fair	Embu	1	4,000
	Nyeri Market	Fair	Nyeri	1	3,000
	Kagio Market	Fair	Kirinyaga	1	2,700
	Manyata Market	Fair	Embu	1	2,350
			Total	11	37,010
June	Leneges Market	Fair	Embu	3	8,110
	Embu Market	Fair	Embu	2	2,895
	Manyata Market	Fair	Embu	1	1,800
	Kagio Market	Fair	Kirinyaga	1	2,645
	Meru Market	Fair	Meru	1	3,630
			Total	8	19,080
July	Ishiara Market	Fair	Embu	1	2,200
	Embu Market	Fair	Embu	3	4,600
	Manyata Market	Fair	Embu	1	3,470
	Leneges Market	Fair	Embu	1	2,430
	Kabutyri College	Farmers festival	Embu	1	4,000
	Waboga Farm	Farmers festival	Nyeri	2	22,000
			Total	9	38,700



Source: Takaho Ueda (2004) "Figure 6 Finding of value zones"

Price-focused market: Price is an effective choice for demand expansion and benefit improvement strategy is not efficient.
Value-focused market: Standard benefit is produced at low price. Strategy for producing highly beneficial products at standard price is effective.
Quality-focused market: The effect of value increase is small even when price is lowered. However, the effect of benefit expansion is great.

Figure 1 Value zone and market expansion strategy

(iii) Use of local food materials, and new products of Kitui County

The group produces popped cereals from local maize, sorghum, and pearl millet as major raw materials. They manufacture products meeting the preferences of local residents by grinding these raw materials with millstones. They also make traditional foods, such as porridges. They developed a new tasty product by mixing popped sorghum with sour milk and adding sugar or honey according to preferences of people likes. This way of eating utilizing local tastes will produce local dishes that have new values.

(iv) Project soundness of Migori County

As Table 16 shows, production twice or more has been continued despite a member decrease or machine faults. More frequent production will enable shift to sustainable management permitting machine depreciation and maintenance cost raising. Since the business is based on part-time worker employment, there is a concern about the settlement of manufacturing technology and stable production.

Table 16 Production by the Okonyo Group

Month	Production Frequency	Production Amount (Raw Material in kg)						Sales		Brought-in Raw Materials (kg)		
	(Number of Days)	Rice	Maize	Soybean	Wheat	Peanut	Sorghum	Total	Ksh	Rice	Maize	Income Ksh
February	1	10	2.5	1				13.5	1,500	3	2.5	180
March	4	49	13	6	3	2		73	12,875		3	90
April	2	17.5	4	2		0.25		23.75	5,440			
May	3	12	8	5				25	7,240	5		150
June	3	36	11	6	4		3	60	14,690			
July	1	15	6	3			7	31	14,030			
Total	14	139.5	44.5	23	7	2.25	10	226.25	55,775	8	5.5	420

*The center bearing broke on May 24 and was replaced at Juakali. (Bearing charge: 350 Ksh, wage: 600 Ksh, transportation expenses: 130 Ksh)
*The center bearing broke again on May 31 and was replaced with a bearing one size smaller. Then there has been no problem.

(v) Issues concerning sales and income expansion

We could judge that close telephone communications with kiosks as important customers would promote sales. Although the group leader was at an agricultural show this time, we surveyed three kiosks making transactions with the group. Merchandise was sold out at all the three kiosks (Photo 70). They say that merchandise may be sold out on the day of arrival.

Also for Migori, it seems an urgent matter to improve packaging for price-focused marketing shown in Figure 1, with a single bag or piece priced at about 5 shilling. It is also necessary to create merchandise meeting consumer needs.

Photo 70, 71 Kiosk in the Mavela Market (The merchandise shown in the left-hand photo is hung in the store for sales.)

(vi) Use of local food materials, and new products

Migori is a soybean producing center where soybean popped products are being manufactured. Seasoning is not more than coating with a small amount of salt. The products have a plain taste that contrasts soybean sweetness. The soybeans were finished soft and moist without losing their original shapes. Soybean finishing is said to differ between varieties. They say that Squire variety shows the best finishing.

(vii) Project soundness of Embu County

As Table 17 shows, the income by sales at fairs amounted to 215,998 shilling in the six months from February, the next month after the start of production, until July. If the profit rate is 54%, the net income is 116,639 Ksh. Even if the interest on the loan is added, the machines charge (100,000 Ksh) can be repaid in six months. If the income at agricultural shows is added, repayment can be completed in not longer than four months. The venture business started by an entrepreneur can become independent in terms of management.

Table 17 Production by Gichangi Cereals and Spices

Month	Production Frequency	Production Amount (Raw Materials in kg)						Sales		Brought-in Raw Materials (kg)		
	(Number of Days)	Millet*	Maize	Sorghum	Wheat	Brown Rice	Soybean	Total	Periodic ①	No. of Sales Days	Agricultural Show	Total
February	6	39	38	10	14	12	2	115	22,823	7		22,823
March	7	40	29	24	25	5	0	123	55,885	12	15,040	70,925
April	5	60	35	19	18	0	0	132	64,500	16		64,500
May	1	21	0	21	15	0	0	57	37,010	11	14,000	51,010
June	3	60	11	24	34	0	0	129	19,080	8	27,135	46,215
July	1	24	0	0	0	0	0	24	16,700	7	26,000	42,700
Total	22	244	113	98	106	17	2	580	215,998	61	82,175	298,173

*Pearl millet

(viii) Issues concerning sales and income expansion of Embu County

Merchandise of about 20 g per bag is sold at 10 Ksh in Migori and Kitui but 25 g per bag in Embu. As mentioned above, Gichangi Cereals and Spices has a KEBS certificate. For market expansion, merchandise development shown in Figure 1 will be necessary for quality-focused marketing targeted at customers aware of safety, security, and health.

(ix) Use of local food materials, and new products of Embu County

Since the price of brown rice soared, production is now suspended. Local maize, sorghum, and pearl millet are used for production. Although new products have not been developed yet, the current products seem to have been devised by adding cinnamon to seasoning.

4. Training in Japan

(1) Purpose of the training

The purpose is to contribute to the improvement of the quality and diversification of the products by providing skill training for the members who started their own businesses. For this purpose, the training that satisfies the following three themes is implemented.

Theme 1: The trainees from Kenya understand the approach of Ieda Seika Corporation towards production and sales of popped cereals and master the new cooking and flavoring skills and techniques before they return home.
Theme 2: The trainees from Kenya have a deeper understanding regarding the local production for local consumption in the country and can improve the awareness towards dissemination of this business within Kenya.
Theme 3: By using these training activities as the trigger, the results that leads to the profit of Ieda Seika Corporation are produced.

(2) Trainees

Two entrepreneurs were selected as trainees from the 4 regions that were targeted by this project. This time, priority was given to the applicants with a higher awareness towards business such as entrepreneurs for the selection rather than the members of groups who were participating in group activities.
Mr. Mahinda Elizaphan Gichangi (Embu County)
Mr. Koech John Joseph Kimutai (Bomet County)

(3) Training schedule

Table 18 Training schedule

Schedule	Date	Training details	Location
Day 1	October 21	14:05 Depart from Nairobi Airport	
Day 2	October 22	13:55 Arrive at Chubu International Airport 15:20 Airport→Toyooka, Minamichita-cho (transfer) 16:30 Orientation and fitting uniform and shoes 19:00 Reception (home of Ieda)	Office of Ieda Seika
Day 3	October 23	08:20 Morning greeting and factory visit 13:00 to 13:40 Visit the direct sales store “Pon Café”. 14:00 to 15:00 Courtesy visit to Minamichita-cho town	Main factory Pon Café

Schedule	Date	Training details	Location
		mayor 15:30 to 18:00 Popped cereal production 19:00 Procurement of the disk type kashata mold and ruler	Minamichita-cho town office New factory
Day 4	October 24	08:30 Production of disk type kashatas mold and ruler 10:00 Popped cereal production 13:00 Popped cereal production and kashata production (sugar flavor and sweet and salty soy sauce flavor)	Main factory New factory New factory
Day 5	October 25	08:30 Popped cereal production and shredding dry fruits 13:00 Production of kashatas of baobab flavor with dry fruits and peanut-containing kashatas of brown sugar flavor, and Chunichi Shimbun press interview	New factory New factory
Day 6	October 26	08:30 Production of popped rice of baobab flavor and popped rice of baobab and honey flavor 13:00 Production of kashata of curry flavor with black sesame 18:30 Discussion of packaging labels	New factory New factory Office
Day 7	October 27	08:30 Maintenance of popped cereals and greasing the bearing 13:00 Transfer of products from the new factory to the main factory, attaching labels, and packing	New factory Main factory
Day 8	October 28	9:00 Preparation of the venue for the event “4th Flower and Food Marche” and direct sales store “Pon Café”, sales, demonstration, and Chunichi Shimbun press interview 15:00 Cleanup 19:00 Farewell party (Gyo Gyo) 21:00 Toyooka Minamichita→Handa city (transfer)	Toyohan Yanashi factory Pon Cafe New factory and office
Day 9	October 29	Handa City→Nagoya station→Shimbaba (transfer)	
Day 10	October 30	11:00 Courtesy visit to the Embassy of the Republic of Kenya 14:00 Nihon Nogyo Shimbun press interview	Embassy of the Republic of Kenya Super Hotel
Day 11	October 31	13:00 Visit to the innovation sites of small and medium-sized businesses in Ota-ku	Technofront Morikasaki (2 companies), and others
Day 12	November 1	12:00 Shinagawa→Narita airport (transfer) 14:30 Check in 17:30 Depart from Narita Airport	
Day 13	November 2	13:05 Arrive at Nairobi Airport	

(4) Instructors for the training

Mr. Tamotsu Ieda (President and founder): Instruction on the production and processing techniques that have been inherited from the time of the company foundation
Ms. Kaoruko Ieda (Managing Director): Training plan and sales (expansion of sales channels)
Mr. Ikuaki Ieda: Factory guide and maintenance of the pressure popping machine

(5) Overview of the training

(a) Hygiene management of food processing factories (Theme 1)

The trainees learned the proper hygiene management to prevent contaminations during the routine work. Initially, they were to change their clothes to the uniform, wear a hair net, cap, and a mask, change the shoes to work shoes, and check the outfit carefully in front of a mirror. Then, the entire body was rolled thoroughly with a rubber roller to remove dust and hairs and the hands were to be washed. At the production site before packaging, they were to change the shoes to rubber boots, tack the hems of the trousers inside of the boots to prevent any rubbish dropping from the hems of the trousers. (Photo 72)

Inside of the factory, a special wagon is provided to prevent any items from being placed on the floor. Basically, the bringing of any private properties into the factory is prohibited; however, when ballpoint pens are required, only the knocked type without cap is allowed. In this way, thorough measures are taken.

The trainees also learned the importance of attaching information labels on the primary products (products after pressure popping) that are packed in bags indicating the contents and the date manufactured prior to completion of the products,

Photo 72 After rolling through a gum roller, change the shoes with rubber boots.

Photo 73 Cleaning after the operation (New factory)

(b) Production technology of high-value added popped cereal (Theme 1)

- Ingredient quality control: The main products of Ieda Seika are “kashata” and “puff-rice” that are made of rice. For the rice, which is the main ingredient, brown rice is purchased from the wholesaler and is stored. Brown rice is used as it is not so easily

oxidized as white rice and it is refined through a stone extracting machine before the pressure popping process for the purpose of quality control.
"Kashata": Produced by coating popped rice with starch syrup or sugar and molding it
"Puff-rice": Produced by flavoring popped rice

- Pressure popping process: Training was conducted by using the Issho-pot pressure popping machine that was used by Ieda Seika at the time of establishment, which is the same size as the pressure popping machine that is currently used in Kenya. The pressure popping machine is installed on the bench that was built at the L angle. This structure not only enhances the work efficiency of the operator, but also reduces the loss by spill-over as the pressure popped products can be easily caught in a plastic tub.

- Flavoring: The trainees learned the basic method of making syrup for producing "kashata" and techniques for mixing the ingredients of different textures and tastes with flavoring spices. The details of the products that were developed during the training are described later. However, the recipes are omitted from this report as they contain some business secrets.

- Molding: Since this process has been automated, the "kashata" production techniques at the time of establishment were reproduced. The trainees learned a series of techniques based on this experience, ranging from the method of making tools such as molding form and trowels for pressing and levelling, the method of mixing popped cereals and syrup, and the method of stretching and cutting evenly inside of the frame. For "kashata", a square rod type of 75 mm × 30 mm × 25 mm and a disc type of 60 mm in diameter were produced.

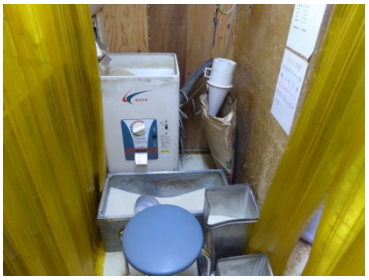


Photo 74
Refined rice before pressure popping

Photo 75
Training for pressure popping technology

Photo 76
Pressure popping machine installed on the work bench

Photo 77
Catching the products in the tub after pressure popping process.

Photo 78
Cooking syrup

Photo 79
Stirring grains after the pressure popping process

Photo 80
Pressing and leveling in the frame

Photo 81
Cutting kashata into pieces

Photo 82
Tools for producing kashata
Trowels for pressing and leveling, cutting rule, stirring rod, disc type kashata mold, and spatula for leveling

(c) Sales (Theme 1)

- Approach at direct sales stores: By visiting the direct sales store “Pon Café”, the trainees learned various products that are produced by Ieda Seika, packaging form, display method, and products that were made by using popped cereals (sweets) and offered in the store. On the last day, products of African taste that were made by the trainees were also displayed for sale.

- Customer acquisition by demonstrations and events: By participating in the "4th Flower and Food Marche", the trainees themselves engaged in the sales of the four types of products for the African taste. At the same time, demonstrations of the production of popped cereals were provided in "Pon Café". In spite of such a bad condition as a rainy day, all the products that were prepared were sold out by 2:00 pm. The trainees experienced both the power of events for customer acquisition and customer support from the face-to-face sales such as events and the demonstration.

Photo 83
Packing operation

Photo 84
Sales site of the four types of products for the African taste

Photo 85
Sample tasting of freshly popped cereals after demonstration

(d) Observing the approach by small to medium-sized businesses (Theme 2)

Although the trainees did not have the opportunity for visiting the site of local production for local consumption due to the constraint of the schedule, they observed the approaches of the small and medium-sized business in Ota-ku as organized by Mr. Junichi Nakayama of the Ota-ku Industry Promotion Association to increase the experiences and understanding of the manufacturing in Japan. Cooperation of Ms. Masako Yamamoto of Mizuho Information & Research Institute was obtained for the interpreting.

Although the business fields that were observed by them were not directly related to this training, the trainees showed a keen interest on the venture businesses in Japan and innovations of small and medium-sized businesses. They were also impressed by the courteous and attentive manners that were extended towards the overseas guests.

The profiles of the companies that were observed are as follows.

- Top Water Systems Co., Ltd. (Mr. Takeda, Managing Director) Techno Front Morigasaki 202

This company is engaged in designing, production, and maintenance management of water treatment systems as the main businesses and supplies the most suitable water treatment systems to various industries. This time, an explanation was provided for the

emergency water purification system that was developed by the company last year (2016). This water purification system is equipped with a solar battery and can be used for 12 hours continuously even at a power failure or at the site without a power source. The system is capable of processing 300 liters of domestic water per hour and 120 liters of drinking water per hour. In spite of its mobile compact design, treated water can be stored in the built-in tank. Through the main purification system, the water that is supplied by a pump is filtered by the pre-filters in two stages (bobbin type filter and carbon filter) and drinking water is produced by treating with the reverse osmosis membrane filter twice. By treating the water that was treated by the reverse osmosis membrane filter with the ultraviolet filter, sterilized water that can be used for medical purposes is produced.

Q: The trainee asked a question regarding the filter replacement frequency.

A: Although the frequency varies significantly depending on the condition of the water to be purified, a prefilter needs to be replaced once a year for the drinking water used in Japan. When drinking water in Kenya is used, the prefilters may need to be replaced once in 3 to 6 months. This system must be activated every day since water inside of the prefilter will deteriorate if the system becomes stagnant for a long time. A reverse osmosis membrane filter can be used for a comparatively long time as there is a system that separates prefiltered water into proper water and waste water.

Q: There was a question regarding desalination of salt water.

A: Filtration of salt water needs purification under a high-pressure condition. Since this system operates at a low pressure, salt water cannot be converted to drinking water.

- iMott Tokyo Research Institute (Mr. Matsuo, Managing Director) Techno Front Morigasaki 402

This joint venture business was established by Tokyo Institute of Technology and Chairman Matsuo is engaged in the research and development of the technology for filming metals, rubber, and resin with diamond like carbon (DLC).

DLC is one of the most desired materials in each manufacturing field for its features of high degree of hardness, low friction, biocompatibility, gas barrier property, adhesion resistance, and corrosion resistance. Film forming of DLC with inconsistent films of grid: “segment structure S-DLC” is the patent technology of this company. This company is engaged in the S-DLC coating service, design, manufacturing, and sales of the film formation equipment.

Q: There was a question from the trainee regarding the coating cost.

A: Although the cost varies according to the size, the coating of one side costs around 10,000 yen. For instance, the coating of the scissors used by a professional hair stylist costs 40,000 yen. The price of the scissors is around 80,000 yen. Since the sharpness of scissors can be maintained and the durability can be improved to up 20 times by coating them, expensive products can be used for a long period of time.

In this respect, the coating is not expensive at all. By coating one side of a flat washer and tightening by placing the coated side, the screw is tightened well and will not become loose.

Q: There was a question regarding the time spent for the development.

A: The research took 10 years and this is the 6th year of the business.

Q: There was a question regarding the application in the food industry.

A: The product is used for plastic packages of the contents that can be oxidized easily. For instance, this filming technology is used for packages of Miso and plastic bottles for hot drinks.

- Rakuten Socio Business, Inc. (Artificial light type plant factory) Techno Front Morigasaki 103

Since a permission for entering inside of the factory as visitors had not been received, we looked inside of the factory through the glass window at the entrance of the factory while Mr. Nakayama explained the company profile. This company is a subsidiary of Rakuten and was producing frilled lettuces in a hydroponics method by using the LED lighting. All the frilled lettuces that are produced here are supplied to the canteen of Rakuten Head Office.

Photo 86
Top Waters Systems
Explanation of the emergency water purification system

Photo 87
iMott Explanation of the S-DLC film forming equipment

Photo 88
Toshin Seisakusho Co., Ltd.
Explanation of the equipment that quickly reduces the temperature of the tires of airplanes

- Toshin Seisakusho Co., Ltd., Main factory (Mr. Takahashi, Production Engineering Department) Omori Minami 4-10-29, Ota-ku (near Techno Front Morigasaki)

They are proud to be a metal processing company that has the technology capable of consistent handling from design and development to prototyping and verification and is capable of transforming a request from a client to the reality. Since its establishment in 1976, the company has been engaged in plate welding, sheet metal, and vent bending process as their specialty technologies and also is specialized in welding of products of a high hygiene standard that are used for medical and food processing fields.

Among the many products that have been designed, developed, and commercialized, we observed the manufacturing site of the equipment that quickly reduces the temperature of the tires of airplanes and the equipment that nests tires (tire doubling machine).

Since an airplane cannot take off unless the temperature of the tires that increased at landing is reduced, the equipment for quickly reducing the temperature of tires are currently used by JAL at Haneda Airport. The tire nesting equipment can nest tires in double for the tires of the same size and triple for the tires of different sizes, thereby enabling doubling or tripling the transportation capacity of tires.

This company has a factory in Vietnam also and several technical interns who were sent from Vietnam were working at this site.

Q: There was a question regarding the training system for technical interns to master the technology.

A: Since technical interns from Vietnam learn the basic Japanese before they come to Japan and have studied the technology to some extent in a vocational school and so on, there is no specific training system and the technology guidance is provided under OJT.

Q: There was a question regarding their intention of accepting technical interns from countries other than Vietnam.

A: Since the interns spend some time under the different culture and customs after arriving in Japan and they are able to adopt to the society and living environment more quickly if they have predecessors of the same country with the same language and customs, there is no plan to accept interns from any other countries.

Q: There was a question regarding the price of the tire doubling machine.

A: The price is between 2.4 million yen and 3 million yen.

(6) Useful technologies (Themes 1 and 3)

(a) Improvements of the pressure popping machine

- Through this training, the trainees understood the significance of operating a pressure popping machine on a bench at L angle in terms of the work efficiency, product hygiene management, and improvement of the yield.
- A pressure gauge of a pressure popping machine is an important and expensive component. To prevent the impact on the pressure gauge when the cover is opened, a method of attaching a valve in front of the pressure gauge was applied in Kenya also. However, in some cases, the pressure gauge was broken due to the malfunctioning of the valve. In Ieda Seika, a coupling (quick joint) is installed between the pressure gauge and the cover to facilitate the attaching and removal of the pressure gauge and the cover is opened after removing the pressure gauge. In this way, the pressure gauge is maintained for a long period of time.

(b) Tools for producing kashata

- The method of fixing a table and a molding frame with metal pins and the method of marking scales for cutting after pressing the ingredients uniformly can be applied in Kenya also.
- To mix the popped cereals and syrup for kashata quickly and uniformly, the stirring rod is rotated by lifting from the center to the outer position, which requires a plastic container of around 50 cm in depth. This stirring method requires a proficient skill. By removing a stirring rod while rotating it, the rod can be removed easily without the syrup and cereals being attached.
- As the tools suitable for pouring the mixed ingredients into the mold and stretching them to the four corners and the outside from the center while pressing them, the trowel and spatula that are shown in Photo 82 are useful as they enable application of pressure uniformly in a rectangular frame. A plastic sheet is attached to the levelling side of the trowel to prevent the kashata from sticking.
- The size and form of the ruler for cutting kashata in sheet form cleanly after removing the mold were also useful pieces of advice.
- A mold plate for producing disk type kashata was created. Although this was the first attempt, kashata of a clean disk shape was produced.

All these tools can be created in Kenya also.

(c) Passing the technology to employees

The trainees wished to use this training program as the opportunity for passing, to their junior employees, the useful techniques (traditional production methods) based on the experiences that have been accumulated by Ieda Seika since its establishment.

(7) Product development (Themes 1 and 3)

By using the ingredients that are available in Kenya, the following high value-added products of four different flavors were created as a result of the exchange of opinions with the trainees based on the empirical knowledge of Ieda Seika.

Popped cereals that are currently produced in Kenya are in grain form with seasoning after popping and popped cereal pieces are sold by packing them in plastic bags. However, the use of plastic bags was prohibited by the law, which was enforced from August 2017. A plastic cup as a substitute for the plastic bag is not viable in terms of the cost and a paper bag is used as the alternative. One of the measures that is conserved is to produce “kashata” by molding it into an easy-to-take form and sell it in a transparent plastic container.

Table 19 Details of the product created in the training

Flavor	Combination (mix)	Shape
Baobab	• Dry fruits (mixture of mango and pineapple) • Honey • None	• Square bar/disc type kashata • Granular popped cereal (hops) • Granular popped cereal
Cinnamon	• Dry fruit (banana) • Dry fruit (banana) and wheat (popped)	• Square bar/disc type kashata • Square bar type kashata
Brown sugar	• Peanuts	• Square bar type kashata
Curry	• Black sesame • Black sesame and sorghum (pressure popped)	• Square bar/disc type kashata

As the evaluation of the new products of Ieda Seika that has the experiences of the development of a variety of products, the peanut-containing kashata of brown sugar flavor lacks in its originality. However, the product is savory and delicious. The kashata of baobab flavor enhanced the flavors of mango and pineapple and the synergy effects by the combination were received favorably. This product can be commercialized immediately for its originality. For the kashata with a combination of cinnamon and banana flavors also, the synergy effects and originality were received favorably and the possibility for commercialization was suggested. For the kashata with a combination of curry and black sesame flavors, the mixing ratio and the combination of ingredients need to be reviewed since the aroma of sesame is lost due to the strong curry flavor.

(8) Overview of the exchange of opinions at the places visited

(a) Minamichita-cho (Interviewees: Mr. Ishiguro: Town Mayor, Mr. Kawabata: Manager of the Industrial Promotion Section, Mr. Aikawa: Deputy Manager, Commerce and Tourism Department)

Mr. Gichangi, one of the trainees, brought popped cereals of sorghum and millet that were produced by him in Kenya as the souvenir. Everyone present sampled the souvenir and commented that it was delicious although it needed a little stronger seasoning. At the beginning, the trainees explained the overview of the project of local production for local consumption and the history of being accepted by Ieda Seika as the trainees.

Initially, the town mayor asked them about the impression of Japan and also asked each trainee, regarding the family, occupation in Kenya, and the income by the popped cereal business. He also asked what they were intending to learn from Ieda Seika that provided the training. The trainees answered each question, indicating that they wished to master the techniques from production to sales of high value-added products to develop further the popped cereal business that they are currently conducting in Kenya.

The staff sincerely welcomed the trainees from Kenya and both parties

exchanged pleasant conversations in a relaxed environment. The Town Mayor presented, as the souvenir, liqueur made of mandarin, which is the specialty of Minamichita. The liqueur has been produced for revitalization of the town.

Photo 89 Courtesy visit to the Town Mayor of Minamichita (Mayor: Middle on the right row)

Photo 90 Liqueur presented from the Town Mayor (right end) and Kyoko Ieda (left end)

(b) Embassy of the Republic of Kenya (Interviewees: Paul M. Kaliih: Minister-counselor, Ms. Yagi: Executive Assistant)

At the beginning, the Minister mentioned that the Ambassador could not attend the meeting since he is currently in Kyushu on a business trip. JAICAF explained the overview of the project of local production for local consumption that is deployed by JAICAF in Kenya and the history of the traineeship that was accepted by Ieda Seika. Each trainee introduced himself and reported the details of the training and the techniques that they mastered in this training. Mr. Gichangi introduced and presented the popped cereals made of sorghum and millet that were produced in Kenya and four types of kashatas that were produced by the trainees during this training program as the achievements. The Minister showed a keen interest in the fact that rice, sorghum, and millet are used as the main ingredients of the products; that baobab, cinnamon, brown sugar, and curry, which are familiar items in Kenya, are also used for flavoring the products (snack); and that sweets are produced by mixing dry fruits, honey, peanuts, and black sesame, which are produced locally. Most of the cash crops in Kenya including coffee, tea, and macadamia nuts are produced in large farms generally under favorable weather conditions, and most of the cereals that are used by the project as the main ingredients are produced by small farmers in semi-dry lands. This factor attracted his attention. The Minister was from Kitui County, which is a semi-dry land, and hoped that the expansion of this project leads to the increase of consumption of sorghum and millet. Since the activities for adding value by processing contribute to the increase of income of the producer and the creation of employment, and snacks using cereals improves the nutrition of children, the Minister requested the development of the project. Recently,

while the dietary intake of meat is increasing in the diet among the middle class and the patients of life-style diseases are increasing, the Minister indicated the importance of the use of cereals as his advice.

Asked about his business in Kenya by the Minister, Mr. Gichangi explained the details of the business of Gichangi Cereals & Spices and also indicated, as supplementary, the issue of the product packaging method due to the prohibition of the use of plastic bags from August. The Minister commented whether paper bags can be used instead of plastic bags. Thereafter, some more questions were asked by the Minister. He asked:

Q: Whether such a project has been implemented in countries other than Kenya
A: Such a project has not been implemented in any other countries except Kenya.
Q: Where a pressure popping machine can be purchased
A: Place your order, and DK Engineering in Nairobi will manufacture a pressure popping machine in around two months.
Q: Whether the training in Japan is to be continued
A: It cannot be answered as it depends on the budget of the Ministry of Agriculture, Forestry, and Fisheries.
A: Ieda Seika is able to accept the training such as this training for about one week.
Q: Whether dissemination activities are still continued in Kenya
A: The dissemination activities are still continued.

The Minister is interested in green tourism and indicated his wish for planning farm experience tours in Kenya targeting tourism. He provided his contact address in Kenya, extending an invitation to his house as he will return home for a holiday during the whole period of January next year (2018).

Finally, he also extended an invitation for participation in the Independence Memorial Event on December 12. He also ordered kashata for 400 persons from Ieda Seika to introduce kashata of African flavor (baobab flavor with dry fruits) to the invited guests.

Photo 91 Courtesy visit to the Embassy of the Republic of Kenya (left: Minister and Yagi, Executive Assistant)

Photo 92 Minister and members of JAICAF

(9) Public relations (News interview)

(1) Chunichi Shimbun (Handa office　Reporter: Miyako Otsuki)
The article regarding the training program was inserted in the Chita issue of October 29 (Sunday)

(ii) Nippon Nogyo Shimbun (Agricultural Policy and Economy:　Reporter Tetsushu Kin)
The article regarding the training program was inserted on November 12 (Sunday).

(10) Follow-up of the training in Japan

To confirm whether the techniques that were mastered by the two trainees from Kenya through the training program that was conducted in Japan during October 2017 are being implemented properly, we conducted a follow-up field survey by visiting the activity regions of the trainees during January 2018. The employees of Ieda Seika Corporation also participated in this survey as the technical experts.

(a) Mr. Gichangi of Embu County

- We confirmed that he has mastered the techniques for the operation of the pressure popping machine and production of kashata (made of popped cereals), each with a high level.
- The wooden frame for producing kashata was designed so that it can be disassembled to facilitate the cutting of kashata.
- To enhance the productivity further, additional mechanization in the processing is required, such as introducing a mixer.
- There was a problem in the rice expansion process as some grains do not expand. The

expansion rate was improved by adjusting the water content of the rice, which was the main ingredient. The water content of rice was about 10% and by increasing the content to 15%, the expansion rate can be improved.

- Although Mr. Gichangi has already tested 10 or more flavors, more flavors were tested. The seasoning of baobab and cinnamon flavors that were initially bland was increased and also the combination of flavors were tested including baobab and mango, cinnamon and banana, and soy sauce and chili powder, and good results were obtained.
- He aims at the acquisition of the KEBS certificate so as to sell the products in super markets and so on. Although plastic bags can no longer be used due to the legislation in Kenya, the problem was solved by using paper bags and plastic containers. The future issue is labeling.

(b) Mr. John of Bomet County

- He has mastered the techniques for the operation of the pressure popping machine and production of kashata to some extent. However, too many members are involved in the work and the work was carried out in a clumsy manner due to the lack of housekeeping. Therefore, substantial improvements were necessary to enhance the workability and productivity.
- Under the instruction of the members of Ieda Seika, thorough housekeeping and speed-up of the work process were attempted. As a result of the instruction, the workability and productivity were improved although further improvements are necessary.
- In the same way as the case of Mr. Gichangi, the ingredient expansion rate was improved by adjusting the water content (increase) of the ingredients including rice, wheat, and sorghum.
- Since the workplace of Mr. John is located in the region at over 2000 m in altitude, the temperature of the syrup for setting kashata does not reach the target temperature (120°C). Therefore, the recipes were changed to reduce the target temperature.
- As the new flavors, cinnamon, milk powder, and charcoals of a medicinal plant were introduced. In particular, the charcoal of a medicinal plant deserves a special mention as the utilization of an ingredient specifically available in the region.
- We observed that Mr. John in a white uniform sold kashatas loose in the market. This is an appropriate sales method at this stage as popped cereals are low-profile products in the market. When the popularity of popped cereals increases, selling them in stores or supplying them to stores in the market would be appropriate.
- Because of the lack of initiative in his sales method, we provided some guidance on the sales techniques such as making more effort in product explanation during sales, giving more thoughts to the promotion, setting a sales target, and so on.

5. Proposal of new popped cereal processing techniques

(1) Examination of new food processing techniques as the startup techniques

As a result of the survey, it became clear that although many operators are interested in the production and sales of popped cereals, they cannot make up their mind on the purchase of a machine due to the reasons listed below. To respond to such requests, in this project, we focused on two food processing techniques, a puff-cracker machine and a hand-baked rice cracker mold. These techniques are similar to the popped cereal processing technique and the businesses can be started as a private business due to the smaller investment capital and management expenses that are required than those of the popped cereal production and sales. The effectiveness of the startup techniques was examined.

The following evidences were obtained as the obstacle factors of the purchase of a pressure popping machine.

- The price of a pressure popping machine is too high (sale price about 1000 dollars). Mainly the machine is installed as a private investment and the concept of contributing a fund for the purchase of a machine as a member of a group is hardly practiced. A motor bike (around 1000 dollars) manufactured in China is a useful comparison of the investment.
- Nobody knows, have seen, or have eaten popped cereals. Therefore, the market needs and the scale are unclear. On the other hand, the needs for motor bikes manufactured in China are clear.
- Pressure popping processing generates a loud popping noise. It is therefore difficult to introduce such a machine in urban or residential areas.
- Popped cereal business activities including production, processing and sales require involvement of many processes such as flavoring, mold processing, packing, and labeling. Such business activities require basic business skills and experiences as the essential factors, such as ledger entry, management, and sharing of information relating to a series of revenues and expenditures in addition to the employment of a labor force.

At the same time, according to the operators who installed a pressure popping machine last year, there are advantage in the installation, such as the higher profit rate than that of motor bike, large market needs mainly from children and youth, and no competition in the popped cereal market.

(2) Development of puff-cracker machine

We focused on a puff-cracker machine and a hand-baked cracker mold as the attempt to start a business in a low investment capital since they are cheaper than a pressure

popping machine and can be easily introduced to a farmer as a private investment or a group with minimal business experience. Based on the results of the survey that was conducted last year, a puff-cracker machine is easily accessible in terms of the production techniques and cost, and does not generate a large noise during cooking, which are the advantages over a pressure popping machine with known obstacles. A puff-cracker machine will be useful for reinforcement of the development of new products for local production for local consumption, which is a different aspect from popped cereals.

For manufacturing the machine locally, we received technical support from Puff Cereal Manufacturing and Sales Limited in Ota-ku, Tokyo and for the cooking plate, which is the core technique, we received technical guidance regarding the size and processing. We also purchased a set of adjustment plates manufactured by Yoshimura and prototypes of the authentic reproduction were produced by Numerical Engineering by using the NC lathe technology (material cost 1773Ksh, processing cost 3600Ksh). For the main press unit, based on the information obtained through the Internet, we comprehensively evaluated machine production suitable for the mass production of the machines by using volume sales materials and second-hand materials that are available locally and produced a prototype by using a puff-cracker machine of DK by adopting a hydraulic jack used for automobiles.

DK sold and delivered one puff-cracker machine to an organization in Bukura, West of Kenya by the end of the project (February 28, 2018), in the same way as a pressure popping machine.

In the product development, technical support was provided by Ieda Seika Corporation of Chita-gun, Aichi Prefecture.

Photo 93, 94 Iron plates for producing puff crackers, manufactured by Numerical Engineering (left), and prototyping of puff-cracker machine (right) from DK Engineering. A gas cooker with a hole at the center and a second-hand hydraulic jack for automobiles are used.

(2) Basic cooking method of puff cracker and evaluation of taste

Ingredient: 100 g
Water: 30 g (30% water content)
Salt: Around 1.5 g (Stir the whole while spraying with a sprayer. Avoid forming lump of flour)
Plate temperature: Male type (180°C), Female type (200°C)
Addition of sugar is recommended (10%).

Table 20 Evaluation of puff cracker taste

	Ingredient (powder)	Evaluation	Point
1	Wheat	Good if sesame seeds included No peculiarity Expands well	+ +
2	Sorghum	There is an after taste	+
3	Pearl millet	Difficult to expand Iron like odor? Dusty	
4	Amaranthus	Delicious. No peculiarity Does not expand Cracks easily	+ + +
5	Cassava	Burnt. Difficult to cook, but delicious	
6	Finger millet	No peculiar taste Good appearance Expands	+ +
7	Maize	Hard Aromatic Tacos	+
8	Rice (refined rice)	Strong rice taste Taste of puffed rice	+
9			

Table 21 Evaluation of taste of puff cracker using various material

	Cost per 1 kg	Test subject 1	Test subject 2	Test subject 3	Test subject 4	Test subject 5	Test subject 6	Total marks
Maize	55	1	3	1	2	3	1	11
Sorghum	60	3	3	3	3	1	1	14
Finger millet	100	2	3	3	2	3	2	15
Cassava	80	1	1	3	3	1	2	11
Pearl millet	60	1	2	2	3	2	2	12
Rice	80	2	3	3	1	2	2	13
Amaranth	700	3	2	3	3	1	3	15
Wheat	70	2	1	3	2	3	2	13

Reduce water gradually from the sugar-based (sugar 300 g + water 150 g) solution. Boil the water. Reduce the water level until the content becomes sticky. Then, a small amount of honey can be added for flavoring.

Table 22 Evaluation of flavor using syrup

	Topping ingredients	
○	Roasted soybean powder	+ + +
4	Cocoa powder	
5	Cinnamon	+
○	Masala	+ + +
	Ginger	
	Sweet soy glaze (sugar-containing soy sauce)	
	Sweet soy glaze (sugar-containing soy sauce + chili)	+ +
	Chili powder	
	Caramel source	Needs more sweet. Not compatible with sorghum.
	Royco (chicken) + olive oil	Like junk food
	Instant coffee	+ +
	Chocolate	+ + + Needs to be stored in a refrigerator
○	Coconut	+ + +
	Cocoa powder	+ +

Table 23 Evaluation of flavor added by mixing dough

	Ingredient	Evaluation
○	Coconut	Burnt. Because of too much sugar?
	Peanut	Oil seeped out. Not good enough.
	Masala	+ +
1	Kumbi Kumbi (termite)	+ (No taste). Unique taste. Interesting.
2	Sesame (white)	++ +
	Royco	
	Chili + Royco	
	Dried fruit	

(3) Result and review

- Processing for puff-crackers was enabled for all the ingredients that were used.
- Cassava is more easily burnt than any other ingredients. As the countermeasures, bake by reducing the temperature by 20 degrees or coat the plate with oil.
- A salt intake of 1.5 g may be too high. About 1 g of salt may be preferable if it is flavored later.
- Although sweet topping is popular amongst children, a puff-cracker will be burnt if sugar is directly mixed with the ingredients.
- Roasted soybean powder and cocoa powder add flavors to the ingredients.
- There is an opinion that the suitable price may be around 10 Ksh per sheet.

Basically, the dough should be a mixture of an approximate ratio of powder 100 g, water 30 g, salt 2g. Mix salt in the water in advance and mix the salt water with a sprayer carefully to avoid forming lumps of flour. Mix by moving hands in the way of cutting for about 20 minutes.

As the additive, use of Kumbi Kumbi (termite as an ingredient) or a cooking spice enhances the taste and flavor. Sesame seeds are found to be particularly useful for enhancing taste and flavor. Sugar causes burning of ingredients. Cocoa was not favorable due to the lack of sweetness. A small amount of roasted soybean powder is favorable to enhance the flavor. If too much is added, the dough does not expand.

Regarding the temperature management, the temperature around 180ºC to 200ºC is suitable. A non-contact type thermometer is desirable for conducting proper temperature management. If a thermometer is not available, drop a water droplet on to the plate. If the water forms a sphere, the plate is hot enough. To avoid a problem of locking the plates, the temperature of the male plate should be lower. A slightly lower temperature (150ºC to 170ºC) is desirable for cassava and maize to avoid a failure as they have a high starch content. When puff-crackers are cooked continuously, the male and female plates gradually cool down. This does not seem to cause much of a problem.

However, an inadequate temperature results in a flour-like texture. A high temperature is desirable for rice.

At the actual cooking, coat the male and female plates with cooking oil in advance, place around 1.5 tablespoon of the dough on the female plate, shake the plate to spread the dough evenly, overlay the male plate in parallel (do not tilt it to avoid a failure), place the plates on the heating bench, consolidate with a hydraulic cylinder, and open it after counting around 5. Open slowly initially and decompress quickly at the end to produce a clean shape (For rice, it seems counting 10 will do).

If the male and female plates are locked as a result of tilting them, cool the male plate with wet cloth and remove it.

For puff-crackers made of rice, a higher water content is the key to the success. The content seems to be around 17%.

Regarding the tastes, wheat, pearl millet, cassava, and maize are bland in taste. They can also be used as the base of an additive. Sorghum has a powdery texture, but has a good aroma. Amaranthus and finger millet have moderate aroma. Although no change is necessary for the taste for Japanese consumers, flavoring after making puff-crackers seems to be crucial if local children are targeted as the customers.

Photo 95 Puff-crackers that were made by using 8 types of ingredients


Photo 96, 97 Baked puff-crackers (left). Ingredients of puff-crackers made by mixing dried white ants (Kumbi Kumbi) with maize (powder) (right).


Photo 98, 99 Cooking puff-crackers by using different ingredients and examining topping ingredients (Action Research)

(4) Dissemination demonstration experiment

As a part of the project, we provided training for the procedure for using the machine and product prototypes with the Bukura Group that had purchased a puff-cracker machine. This group also purchased a pressure popping machine. Therefore, the impressions of the two machines by the participants were compared.

The result of the comparison showed that the participants had a strong interest in the pressure popping machine and had a low interest in the puff-cracker machine although the machine overcame the obstacle factors of the pressure popping machine.

The following reasons were indicated for their low interest in the puff-cracker machine.

(a) The work efficiency and productivity are low since crackers need to be cooked one by one. The preparation such as mixing ingredients in powder form is time-consuming. Therefore, the profit rate is low (in comparison to that of the pressure popping

machine). These are their strong impressions.

(b) The process requires skillful techniques such as temperature management.

(c) Since gas is used, the machine may be more readily used in urban areas.

(d) Puff-crackers are similar to Malondo (burnt rice created at the bottom of the pot) for local people and there is a concern as to whether puff-cracker is a sellable product. In the local region, Malondo is considered to be an emergency food that is consumed when no other foods are available. Besides, eating such food tends to give an impression of not eating Ugali adequately. This means that such food has no value for money. Even if small fishes and white ants are mixed, can they find any value for money? The market value is low.

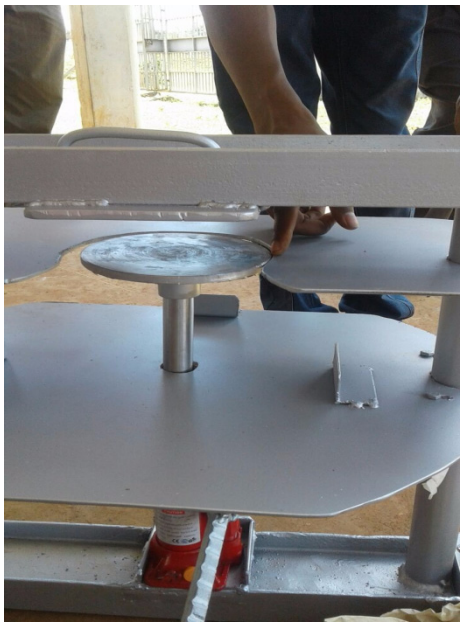


Photo 100, 101 Demonstration of a puff cracker machine in Itumbu rural group in Vihiga Country at the West of Kenya (left). Puff-cracker machine delivered by DK Company. (right). The space between the disc at the center and the iron bench is not even, requiring adjustments.

(5) Trial of Hand-baked cracker

As a cheaper technique than using a puff-cracker machine, we purchased a second-hand cracker baking mold through Yahoo Auction and attempted mass production of baking molds using the mold that was purchased as a model of the template.

- Disseminate the method of using local agricultural products by involving children.
- Collect nutritional evidence and establish the product as a health food.
- The establishment of the synergy effects by involving researchers and developers has a strong impact.
- The cost must be the lowest and affordable for the local people. If the cost is too high, the business does not spread.
- The technique has been established. The key factor for the future is continuation of

promotion activities.

- It is important to show a concrete business model that can increase the income of the community.



Photo 102-104 Trial of a product sample by using a baking mold.

Chapter 3 Direction of Future Activity Deployment

1. Result of the project activity

(1) Expansion of production of pressure popping machine

One of the achievements by activities in this project is the expansion of pressure popping machine production. A trial Kenyan machine modeled from a Japanese machine trial could be manufactured successfully in the last fiscal year. We also organized issues identified by field activities and worked out their solutions to establish a new technology for mass machine production. As a result, we have manufactured and sold five machines in total and are now more machines by expecting orders. We have received orders from semi-governmental organs and Japanese private companies, as well as local agricultural groups. Technical inquiries are not only from within the country but also from neighboring countries. They indicate strong interest in and concerns about this project.

(2) Dissemination of popped cereal products

Another achievement is the dissemination and sales of popped cereals, including the strengthening of their enlightenment. To raise of the social awareness of popped cereals, we made demonstrations using pressure popping machines at agricultural shows in various places and widely conducted diffusion and enlightenment activities. Consequently, we conducted activities a total of 25 times at agricultural shows in this project. Popped cereals were highly evaluated and awarded 37 prizes. Particularly at an agricultural show held in September 2017, President Uhuru Kenyatta came to our booth and tasted popped cereals. Many visitors to agricultural shows had interest and concerns. We received about 50 to 100 inquiries at each agricultural show. The activities were not limited to Kenya but also conducted in neighboring Uganda and Burundi.

(3) Activity result of groups introducing pressure popping machine

The number of farmer organizations and entrepreneurs who implemented pressure popping machines increased one to four in total in this fiscal year. The activities were scaled down in Kitui County and Migori County because of such group issues as a money problem but are continuing. Difficulty in securing a sales network is also an issue. In Migori County, kiosks and other stores were secured as targets of sales. Our activities in this fiscal year were affected particularly by the prohibition of plastic bags that started in August 2017. The purchasers of cereal popping machines were expected to change their means of packaging. An entrepreneur in Embu County solved this issue well and promoted sales by using not only paper packages and containers but also plastic cups and containers. The entrepreneur in Embu County is turning the cycle of kashata (called

"okoshi" in Japan) production, processing, and sales very efficiently. Since the average monthly sales in a 10-month period became about 47,000 Ksh, the machine charge could be paid back in about 5 months. The entrepreneur is very enthusiastic about mastering techniques and active in sales activities. This may be the reason for the success.

(4) Training in Japan

We conducted a training in Japan to help trainees master Japanese technologies of producing, processing, and selling popped cereals. The trainees were entrepreneurs of seemingly high business mind from Embu County and Bomet County. The training was held at Ieda Seika, one of the major manufacturers of popped cereal in Japan. The trainees learned through sanitation management at food processing factory, an appropriate method of using a pressure popping machine, seasoning and molding as processing technologies, and sales activities at direct sales stores. We also developed new merchandise by using *baobab* and other African tastes, with an emphasis on kashata seasoning and molding technologies important for adding values to popped cereals. We confirmed that the entrepreneurs in Embu County and Bomet County mastered technologies acquired in the training by follow-up survey after the training. Particularly the entrepreneur in Embu County was found producing kashata rather efficiently. During the follow-up survey, the entrepreneur made efforts to add high values to merchandise also by developing new flavors.

(5) New agricultural processing technology

In the last phase of this project, we developed puff-cracker machine as new agricultural product processing technology replacing pressure popping machine. Puff-cracker machine was verified expectable as a means of solving several issues at the implementation of pressure popping machine.

2. Direction of future activity deployment

It was proven that, through the activities that have been implemented so far, an introduction of a pressure popping machine increases the opportunities of local agricultural products and contributes to the improvement of income and livelihood of the community. As a result, it led to voluntary purchase and installation by individuals and groups. For the future, the following deployment and direction of the activities are anticipated.

- Continuation of steady demonstration sales through public events and business fairs. Increase of the sales through enhanced recognition of popped cereals within the community and stabilization of the business will lead to enthusiastic investments in

the private sector.

- Continuous training support for the popped cereal operators. Operation management of the machine and guidance of processing techniques (promote the use of natural ingredients and local agricultural products for seasoning and flavor). In particular, various innovations are necessary to stimulate the demand; that is, innovations such as reinforcement of heath-oriented new product development using local agricultural products specific to the region, labelling, packaging technique, determination of optimum price and sales volume, adjustments of the ingredients to the suppliers, certification by the KEBS, and supply to the local super markets and schools are necessary. Since it is confirmed that subsidy and loan systems from the public support (Youth Enterprise Development Fund, etc.) are available to entrepreneurs for installation of machines, policy suggestions to the related governmental organizations are necessary as well as a continuous supply of information to the target groups.
- Support for technical training to engineers of the DK Company as well as encouragement of subsequent machine processing manufacturers. For the DK Company, sustained quality and improvements are necessary for the mass production.
- Evaluation of the health contribution of popped cereal processed foods. In this project, the nutritional values of typical grains that are used for puff processing were analyzed. It is necessary to compare and examine with general products that are currently available as to how nutrition-sensitive the popped cereal products that were developed are. For the ingredients whose health contribution were confirmed through the examination of such scientific evidences, the possibility of sales including export as well as local sales is assumed.
- To provide such training and information as mentioned above, the human resource development of expert staff and the improvement and reinforcement of a system that enables individual consultation for private entrepreneurs are necessary. To achieve this, it is necessary to utilize, to the maximum, the human resources of the project team, including the individuals and groups that started the businesses through this project.

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Final Workshop Report on;

Feasibility Survey on Local Production and Local Consumption (Chisan-Chisho) Activity and Extension in Kenya: -"Pop cereal project"

Date: 23rd January 2018
Venue: Yoeligen Guest House, Embu County, Kenya.

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Summary

This report summarized the proceedings of the final workshop of the project, 'Feasibility Survey on Local Production and Local Consumption (Chisan-Chisho) Activity and Extension in Kenya: - "Pop cereal project" held on 23rd January 2018 at Yoeligen Guest House, Embu County, Kenya. The workshop was organized by the Japan Association for International Collaboration of Agriculture and Forestry (JAICAF) and Bioversity International. This end-of-project workshop aimed to provide an opportunity for participants to share their experiences and lessons learnt and to develop key recommendations. Participants were drawn from community groups and individual entrepreneurs who benefitted from the project including Okonyo Migori Self-help Group, Syokinyili Self-help Group, Bomet Popping, Gichangi Cereals and Spices and DK engineering Ltd as well as representatives from the National Government (Ministry of Culture, Ministry of Health), County Government, Japanese Embassy, and self-sponsored entrepreneurs from different parts of the country. In total of 25 participants was participated.

The workshop featured among others presentations from partners, beneficiaries and stakeholders; a display of products from participating groups; discussions on future prospects and practical puffing demonstrations by Gichangi Cereals and Spices and Bioversity.

Presentations focused on experiences, successes and failures. These were followed by a long discussion during which participants made some key recommendations. Participants acknowledged that (i) the project was overwhelmingly successful as it was providing income to entrepreneurs and groups and also providing a variety of healthy snacks; (ii) interest in the machines and puffing as a business was growing immensely both in Kenya and neighboring countries as a result of the project, (iii) the pressure popping machine had gone through a number of modifications and now many of its original problems had been addressed; (iv) although lucrative, the business had lately been affected adversely by the government ban on plastics.

The increased interest in puffing as a business has however brought about an increased need for new actions, among them: training new rural groups that need to start generating income through pressure puffing; mentoring new machine suppliers; further improvement of the popping machine; demonstrations of the new cracker machine and addressing the problem of packaging.

As a result, the workshop participants came up with a number of key recommendations:

(i) To form a team to advice on an alternative packaging in the wake of the government ban on plastics,

(ii) Owners of popping machines to link directly with DK Engineers in case of machine problems;

(iii) Financial and technical support to be sought to address the emerging needs and particularly supporting new rural groups to acquire the machine and train them on its use.

At the end of the discussion session, the team organized a demonstration of the puff-cracker machine, as a complementary to the popping machine. During the demonstration, a few comparative advantages of the puff-cracker technology were explained to the participants including its relatively lower cost, simple structure, ease of operation and lack of a large sound during puffing.

In the afternoon, the group visited the production factory of Gichangi Spices and Cereals to see the practical processing of 'Pongdoreka' (kashata). This visit gave local entrepreneurs an opportunity to see the popping machine, adding value to the products and tasting.

Workshop proceedings

1. Welcome remarks (Mr. Shinichiro Nishino from JAICAF)

Mr. Shinichiro Nishino of JAICAF gave a brief background of the project. He mentioned the fact that in African communities, local cereals such as sorghum and millets are locally produced but do not gain sufficient economic value. This is mainly due to lack of value adding as well as negativity associated with local foods. The situation can however be improved by value-adding to encourage local consumption and income generation. The term, 'Chisan-Chisho' means local production local consumption. Under this concept, the Japanese worked towards encouraging local food production and consumption.

The Japan Ministry of Agriculture, Forestry and Fisheries (MAFF), promotes nutrition-sensitive processing methods of agricultural products. Value addition of local cereals through popping has proved effective. The project started by first identifying a local partner to duplicate the popping machine. It then identified various self-help groups to train them on use of the machine and finally capacity built them on various flavoring and processing of the cereals. This project has so far managed to do value addition to locally grown products to encourage the locals to consume them. So far, various products have come out of this creativity. New and interesting flavoring methods have also been identified like flavoring the cereal products with honey instead of sugar, or with tamarinds or even dried fruits like mangoes.

2. Overview and rational of the project (Mr. Dominic Tumbo, facilitator of the workshop)

Mr Tumbo noted that the current project had built on the achievements of the first project implemented 2016 till February 2017. The first project introduced the pop-cereal machine, training local groups on how to use it and mobilized groups to pop and sell cereal products. The second project started in May 2017. Its main purpose was capacity building of groups in marketing skills and strategies including developing various flavoring methods of the popped cereals.

This project has supported the groups to go to over 20 fairs organized for small and medium enterprises, winning several awards e.g. 'Best innovations on Food and Nutrition'. The groups have participated in fairs in neighboring countries of Uganda, Rwanda and Burundi. The group also participated in the Japanese Cultural Day at a Japanese School in Nairobi and various agricultural shows around the country. The machine and the products have been of great interest in all the fairs attended. Following these fairs, several entrepreneurs and agencies have invested in this machine. These companies include Nissin Noodles Company, Kenya Industrial Research Instituted (KIRDI) Kisumu and Kisii and individual, Mr. John Koech of Bomet County.

The project supported two Kenyan entrepreneurs to attend a 2 week programme on processing of popped cereals in Japan. Mr. Elizaphan Gichangi and Mr. John Koech received extensive training on machine use and various flavoring methods. From the training received, Mr. Gichangi has been able to modify his machine for ease of use and better results and to include new flavoring techniques. An expert from JAICAF also came over for monitoring. He gave positive reviews on their work after the training.

During the fairs, various set backs were noted. The huge popping sound was sometimes mistaken for an explosion and security agencies were particularly wary about it especially at the time of

the national elections of 2017. The noise however had the advantage of being a crowd puller during fairs. The high cost of the machine was another concern. The current cost of a Ksh 100,000 per unit was still out of reach for many interested local groups.
As a result of these two main concerns, DK Engineering has be tasked with fabricating a new machine, the puff-cracker machine which has the advantage of puffing flours, has no noise and is relatively cheaper (at Ksh 40,000). The end of the project comes at a time when many new entrepreneurs including community groups are beginning to learn about the machine with some expressing interest to purchase it.

3. Opening remarks (Ms. Yui Takashima, the secretary of Embassy of Japan)

Ms. Takashima interacts with various groups that deal in cultures and food diversity. She encouraged the groups to take the pop-cereal business seriously and to use it to improve their livelihoods. She explained that this was an innovative business idea and if done right, it would be helpful the society especially women and children.

4. Group presentations.

4.1 Syokinilyi Self Help Group

This group has been with this project since its inception. It is headed by Ms. Peninah Mwangangi. Under her guidance, the group has managed to get the machine, do some popping, go to various shows in and around Kitui County and sell some products. The group is famous for their *Kashatas* production.
The following are some of their success:

- Won first position for the Most Innovative Idea during Kitui County Agricultural Show.
- Visited Machakos Agricultural shows and managed to sell some popped cereals. This event earned the group a cool Ksh9100.
- Managed to go as far as Nakuru County in Kabarnet to showcase their products.
- Developed various unique flavoring methods. They realized that Tamarind and Baobab were great for flavoring the cereals. When tried, the products really sold in the local markets.
- The group also decided to cut on costs of the raw materials. They did this by planting sorghum in their own farms and used the products to pop.
- To this effect, job creation was done to women and the youth of the area.

The group is also undergoing some major challenges including:

- Their machine is having big problems. It needs some major servicing.
- Some parts of the machine need to be replaced. This is both costly and time consuming
- Another major issue the group is facing is packaging and labelling. This group had an escaped with the authorities over the same and it backtracked them.
- Lack of a KEBS stamp. The group can't sell in major outlets without this stamp as required by the Government.
- Scarcity of Raw Materials. The County has faced some major drought episodes that has hurt agricultural farming in the area. This has led to increase in prices of the major raw materials like Millet and Sorghum.
- Internal wrangles. This group is having problems amongst its memebrs with some not

being a part of the project.

Despite these challenges, the group has some major future plans to ensure growth and prosperity of the project.

- The group has developed a time plan of the markets to visit within the coming year. This include Mwingi Agricultural Show.
- The County Minister of Health has plans to sit down with the group and develop ways on how the county could help grow the team.

4.2 Okonyo Migori Self Help Group

This group is based in Migori County. It was represented by Mr. Charles Mogeni and Ms. Lorna Akinyi. Just like Syokinilyi Group, this group has been with the project since the beginning. The idea of rice balls came from this group. They managed to package their rice in sizeable rice balls and sell locally. This proved to be more marketable to the locals.

The following are some of their success:

- Visited various Agricultural Shows including Kisii, Kisumu, Migori and Kakamega Shows. In all these shows, they managed to showcase their product processing and sold to the locals.
- They have also manage to get major awards in Innovative Food Security machine Category. This showed that the locals and the government authorities deem this machine as a possible measure to improve food security in the area.
- Managed to secure invitation through the Micro and Small Enterprises Department to go to Burundi to show case the machine. This group managed to transport the machine to and from the country. This experience served as an eye opener to the team as it had teams from Kenya, Uganda, and Tanzania to the event. The group still managed to win an award despite the tough competition.
- Major sales. The group has managed to do major sales in the various shows and events that they have managed to attend. This has improved their incomes level as a group.
- Local Impact. Over time the group has managed to get some specific outlets through which they sell their products. These shops and market centeres have provided a steady source of income to the group as long as they keep producing.
- The group has also managed to get people interested in buying the machine. Various private entities like Mr. Koech have bought the machine after seeing it during one of the shows.

The group has also encountered some major challenges including:

- Machine breakdown. The gauge and bearing of this group's machine need replacing
- Machine also needs intensive and continuous servicing
- Lack of proper packaging techniques. After the plastic bag ban, this team is stuck on what to use now to package their products.
- Lack of proper labelling techniques
- Elections. The election period was quite a tense time in various parts of the country. In Migori County, the situation was a bit intense. This affected popping by the group and derailed their production.
- Noise pollution. This group has experienced major complaints in regards to the popping sound made by the machine. It has affected production is commercial places, restricted them to specific places and times.

- Lack of KEBS stamp.

The group has some future plans despite the challenges:

- Continued production to keep up with the market demands
- Visit more shows
- Complete payment of the machine as stipulated before
- Get the KEBS mark.
- Identify a packaging and labelling technique,

4.3 Bomet Group.

This is one of the groups that bought the machine after having have seen it during one of the events. It's a classic definition of the need and value of this machine. It shows that more people may be interested if it could be made available to them.

Mr. Koech has been a busy entrepreneur. When he saw the machine, he bought it, underwent training with his son and started immediate production. He even got a chance to go with Mr. Gichangi to Japan to learn on production and flavoring techniques. With the knowledge gained, Mr. Koech has managed to create jobs for two young men and earn some extra income for himself too.

Mr. Koech appreciates that this is a good innovation and it can really help in reducing malnutrition in children of his area.

These are this success so far:

- Job creation for his son and his family in general
- Has brought in some income to the household
- Has managed to secure some markets for selling his products. These include Bomet, Kisiket and Kapkoron Markets.
- Machine is still in good shape.
- Introduction of a new nutrition sensitive product to the local market.

The challenges encountered so far include:

- Marketing. This technology is fairly new in Kenya. Most people do not know of it. Hence marketing has been quite challenging for this entrepreneur. Massive advertising id needed to help the product pick in the market.
- Due to the same, profits are a bit low for him.

He plans to tackle these problems by the following future plans:

- Keep advertising to introduce the product.
- Collaborate with other members who have the machine to share ideas on the machine and production of the popped cereals.
- Involve more young men to help with the production and in return get a source of income from the project.

4.4 Gichangi Spices and Cereals

Mr. Gichangi is a real success story of this project. Having been an entrepreneur dealing with spices and cereals, this project fitted just fine with him. He was introduced to it by Mr. Kirori of DK Engineering during one of his visits to the shop. It got his attention, and he decided to buy a machine. That was when the project was just starting. He underwent training and started production. Over the duration of the project, he has managed to pay off some of his loan, kept

his family afloat and grown to expand.
The following are some of his successes:

- Managed to buy a machine. He has also developed the machine over time to solve some of the problems encountered from continuous use of the machine.
- Increased source of income
- Improved standards of living
- His trip locally and internationally has enabled him meet different people and learn various kinds of culture
- Job creation for his young men.

The project also came with its share of challenges.

- Marketing. Mr. Gichangi had to start by hawking off his products while trying to educate the cereals on the popped products. This took a lot of time and resources.
- Cost of packaging. After the plastic paper ban, he had to get into other packaging methods. Some of them are quite costly. They led to increase in cost of production.

According to him, this is a new technology. It could be used by locals to increase consumption of cereals. He urged the other members to not give up and keep producing even after the project has ended.
He hopes to collaborate with the members to share ideas and educate one another on various new flavoring techniques. He informed them that the IEDA Company has a variety of flavors that attracts various consumers.
He welcomed the new entrants to come and learn from his business. He urged them to join the project as it was a viable business.
After that, he thanked the project team coordinators for the opportunity and the training he received.

4.5 DK Engineering

DK Engineering has been part of this project since it as inception. It was tasked with the main duty of fabricating the popping machine. The first machine really took a lot of hard work and sweat. Finding materials that were compatible and could work well was a real issue. Under Mr. Yasu's guidance and trust, the team was able to produce the first two machines.
As with any new technology, these two machines had their fair share of technological defects. But they did not lose hope. Instead they kept finding new ways to improve the machine. They ended up making a number of new and slightly cheaper machines.
Over time, DK has been involved in creating a manual for the machine. This manual was finally done and presented to the team coordinators.
The main successes of this team were:

- Fabrication of the first machine
- Modifying and rectifying some problems of the first machine
- Had an Expo on the machines they had. Pop cereal machine was one of the machines showcased.
- Fabrication of the puff cracker machine
- Development of the user guide manual.
- Availability to team members for repairs and consultation on the machine.
- After the Uganda Expo, the Ministry of Agriculture Uganda has been in talks with them to

find ways to improve the machine and hence buy the machine in the long run.

The challenges were:

- Costly and rare raw materials
- Not many people were buying the machines. They could show interest but they didn't purchase it in the long run.
- Some of the members accused them for being slow in giving feedback when approached by clients.

The lady suggested some of the plans DK Engineering would be willing to undertake to ensure that the project continues with minimal problems. These were:

- A promise to improve in their after sale customer service to the clients
- A documentary to be produced on the machine use and maintenance
- Training new entrants on proper usage and maintenance of machine. Since most problems that the groups faced was due to poor maintenance, it was necessary to train the client on servicing as well as oiling of the machine.

Syokinilyi Self Help Group

Okonyo Migori Self Help Group

Bomet Group

Gichangi Sprices and Cereals


DK Engineering

5. Question and answer session

After tea break, the group came together to discuss some of the common issues that affected them. The floor was open for questions as well as possible solutions. Those who were trained in japan also got an opportunity to share some of the lessons they had learnt.

5.1 Machine Parts Breakdown and servicing

One of the major challenge across the board was frequent breaking down of the machine. In Kitui, the machine was currently not working and needed major servicing. In Migori, the situation is similar. However, Mr. Gichangi has managed several ways to maintain and fix his machine at low cost.

Like every machine, this one experienced wear and tear after continuous use. The team was asked to prepare and be ready for such problems. However, some parts could be gotten locally without involving DK engineering. But if the problem was big enough, DK Engineering could be brought into the picture and assist. Mr. Gichangi proved that it was possible to modify the machine to suit his local demands.

Servicing was also mentioned. As noted, none of the groups had planned for servicing of the machine. As a result frequent breaking down of the machine was experienced. They were asked to have a strategic plan that would cover the same on a frequent basis.

Another problem of the machine was the pressure gauge issues. After much popping, the pressure gauge would sometimes start working inefficiently. This would be due to the pressure while hitting of the cylinder to open it. Gichangi learnt from his trip that there could be removable pressure gauges. He modified his machine to make his pressure gauge removable through local materials and knowledge acquired. This has helped him save his pressure gauge from immediate problems.

In this case, as in many other cases, DK Engineers asked the group members to feel free to approach them in case they noted any machine defectiveness. They were asked not to stay long till the problem worsened before they would contact the engineers. The engineers, in return, would work swiftly to help the group fix whatever problem would be ailing their machines.

5.2 Marketing Strategies.

A business is a cycle that involves production as well as marketing of the products. If marketing is ignored, that business is doomed to fail. Thus marketing of any product is crucial. To ensure growth of business, some business set up a marketing department that focuses wholeheartedly to selling and marketing of its product.

The Pop cereal project was developed as a business strategy. So, not only is production of the pops important but also marketing of the products. Since the beginning, this groups have been having major problems penetrating the market.

Mr. Gichangi went an extra mile hawking the products around Embu market centres. He used the platform to explain his products to locals, provide some samples to taste and hence hook new customers. He took advantage of market days to reach many customers. Hawking enabled him free advertising from one of the media houses that featured him in their print media. He encouraged the groups to consider this form of free advertising and marketing to reach new customers. Sampling of specific well prepared products was also discussed as a method of advertising.

The groups were also asked to be innovative and come up with their own marketing strategies to ensure sales of the products. They were asked to use the sound as a way arousing curiosity on potential buyers.

Another way of marketing is through talking to potential buyers. Groups were asked to know and understand their products well, then go round informing locals of what it is that they do. They are then to ask for customer feedback on what better ways to improve their products. This is what Gichangi does presently. He is focused on flavoring and packaging to ensure maximum consumer satisfaction.

Another group of people to market to be middlemen. These are people who could get products from the groups and go resell the products at a small profit margin. The groups were encouraged to get hold of such people to help reach majority of consumers.

5.3 Packaging and Labelling

Another major problem across the board was difficulty in proper packaging and labelling techniques. Since the plastic bag ban in Kenya, various industries have been faced with a major challenge in packaging of their products. The pop cereal project is no different.

Initially, groups used small, clear plastic paper to package their products. These papers we easy to acquire and were relatively cheap. Since the products were new to the market, the clear bags enabled consumers to see the contents of what they were buying.

However, since the ban, the groups have been tasked to come up with different methods of packaging. They still need clear, small, properly sealed and affordable bags. Mr. Gichangi has found the small clear food containers to package his products. However, this container is only viable for large quantities of kashatas. Putting small quantities in it is not economical. For small quantities, the brown mafuko bags were suggested.

The brown bags are consumer friendly and are accepted by the authorities. However, they pose a challenge in that consumers can't see what they are buying once the bag is sealed. This has led to decline in sales since people want to buy what the can see. Another bag suggested by the government is a clear plastic bag that meets the threshold. However, after much search, this bags were found to be very expensive to the groups. The cost of this packaging bag is Ksh300000 for

100k pieces each of 50g. This led to increase in prices of the products, something that wasn't well taken by the consumers.
After much deliberations, a team of 5 people was formed to look into the matter. They are to look at the government suggested bags and see how they can be modified to work in our favor. They are also to look at the various regulations regarding nutrition and health standards of our products. The rest of the members were tasked with going round various supermarkets to find out what other industries were using for packaging their products and see what they could copy. The specific tasks of this team include:

: going round to various supermarkets to find other suitable methods.

: Compare the various cost effectiveness of each type

: Keep the entrepreneurs informed on the progress so far.

: Have discussions with NEMA, DK Engineers, KEBS, MoH, MoA to find the alternative packaging techniques and any plans by the government towards the same.

The team is to be chaired by Mr. Dominic Tumbo. Ms. Rose Wambu, Mr. Patrick Maundu, Mr. Daniel Kirori, Mr. Elizaphan Gichangi are the proposed members of the team.
Another major issue in labelling is the KEBS mark. Most of these groups do not have this mark. Hence limiting them on where to sell. Gichangi got the mark but on some specific products. The rice pops did not qualify for the mark. At the time of this report, he was awaiting feedback on the kashatas quality. The team selected was also to look into this issue and where possible help the groups acquire this mark.

5.4 Flavoring

Since the beginning of the project, different people have come up with various flavoring techniques. At the start, rice balls were quite unique and interesting. They used to be sold very fast. However, due to the high sugar content used to make them, this flavoring technique had to be abandoned. After this came kashatas that are health conscious. This have become the highest selling products in this project.
Various mixtures were identified then to ensure variety in a pack in terms of nutritional content. Additives were also used that had to be nutrition sensitive.
The group was asked also think of various marketable flavors that are still nutrition sensitive. Include fruit additives for great taste as well as some coloring matter that are health conscious.

5.5 Machine Improvement.

The machine has been improved over time. However more is still to be done.
One major change is to have various machines using various sources of heat. From gas to charcoal to firewood, these are the varieties that we have locally. DK Engineering were tasked to provide various machines that use each of the sources named above. That way, a new customer could choose what best suites their need at home instead of buying just one type of machine. On the question of which one of the sources would be better, it was decided that this would vary from one consumer to another depending on their locality, and social status among many things. For example, Mr. Gichangi preferred gas as opposed to Mr. Koech who preferred firewood for now.
The current machine has a cylinder that holds a maximum of 1kg of raw materials. For personal use, this seems sufficient. However, for commercial use, 1kg is quite a small quantities if one

intents to pop over 20kg of a certain product. Thus the engineers were asked to consider making big cylinders to help reduce the time it would take to pop the cereals.
For the old machines, the engineers agreed to try and upgrade their machines to suit their current needs. However, this would be done at a fee met by the consumers. The groups were asked to start with what they have and it would be upgraded as they went forward. They were asked to first focus on generating income and then they could use this income to upgrade their machines. Mr. Gichangi has managed to upgrade his own machine and now focuses on production and flavoring to provide quality products to his consumers.

5.6. Raw materials.

In each of the groups, the products to be sold varied due to the various cultures. In Migori, for example, Sorghum is the most marketable product. In Embu, the rice kashatas and Sorghum are very marketable.
Kitui County has a foreseen drought nightmare. This means that the locally available raw materials won't be in plenty. Thus the prices of these commodities may go high hence affecting production costs. The team had decided to plant some of the raw materials to cut on cost. However, we just hope that they will be able to use that which they have for production.
In Migori County, the group noted that the local rice did not pop well due to low moisture content. It had to diverse to the rice from Tanzania which served the purpose well. However, this had its own implications on the cost of production which relatively went up.

5.7 Others

Noise pollution. One item that was discussed extensively is the advantages or disadvantages of the noise produced while popping. While some groups felt that the noise could be used as a way of attracting curious onlookers, another one felt that the noise limited their production level. Thus DK Engineering together with the team coordinators came up with the puff cracker machine that doesn't produce any sound.
For new buyers, the engineers would not only sell them the machine but would also provide after sale customer service that included training on the machine use and maintenance, provide a year warranty on the machine subject to some preset regulations, provide variety on the types of machines etc. The engineers are to make sure that the new buyers felt motivated and well equipped to do business with their new machines.
Communication. The group suggested that it would be in their best interest to share knowledge and experiences even after the project has ended. Both in social media and print media, discussions would be initiated on how best to improve the products. This media would also be used to source for assistance and encourage one another to keep going.
Ms. Faith Mbogo was one of the attendees in the workshop. She is an owner of a small enterprise that deals in making banana crisps and Pumpkin seeds flour. She is a beneficiary of a small project that ended some years back. She has managed to survive and grow on her own even after the project ended. She stated that she had undergone similar problems like packaging and labelling as well as marketing strategies. She encouraged the group to not give up hope once the project ends. She asked them to own their business and do it diligently and that way they would get major returns. She said the main motivation to them should be job creation as well as improve livelihoods through the income received. She then thanked the team for inviting her to the

workshop and expressed interest in including our project in her business.
Another major issue that was brought up is that the project was coming to an end too soon. Most members were feeling as if the end of the project meant the death of the business. However, most coordinators took the opportunities to encourage them not to be too dependent on funding. Instead they should now grow since they have been provided with the basics of the project. An emphasis was made in regards to overdependence on project funding. By the end of the discussion, the group had acquired back the original willingness to pursue with the business on their own.
Cost of machine. Another request was made to the engineers that they reduce the original cost of the machine. This was done while considering both the engineers and the consumers. However, the engineers could not lower the said price at the time citing expensive raw materials and labor. It, however, gave the option of the puff cracker machine which was cheaper than the pop cereal machine. Dr. Yasu suggested that instead of the engineers reducing the cost of machine, the consumers could maybe team up and seek community funding like loans to purchase the machine. He argued that this would help both the engineers and the consumers in the long run. Another idea was to maybe find other cheaper machines. Caution has to be exercised when going down this road because cheaper things may actually be more expensive in the long run. In conclusion, the price of the pop cereal machine could not be reduced, but loans could help consumers acquire the machine cheaply.
The group was also reminded to consider this project as a business project and not a development project. That means that once the project ends, the business should be able to make enough money to sustain itself. That includes replacing or parts, Servicing of machine, paying of employees, buying raw materials and make some bit of profit. And like all business, it may take time to break even hence passion and patience have to be exercised a lot along the way. They were also encouraged to visit the engineers to learn where to buy the spare parts at an affordable rate and hence reduce cost of repairs.
Our government representative encouraged to group to visit various institutions of government, showcase their products, explain how this product could positively impact the community and ask for guidance in maybe marketing or nutritional value determination. She encouraged them to visit the county offices and ask to be considered as one of the institutions that are working hard to reduce malnutrition in children. As this is a nationwide problem, she promised that if they knocked on enough doors enough times, someone would hear them and help them. In other words, she asked them not to stay quiet and not inform the leaders, if they need help then it would be wise to go and ask for it from the relevant personnel.

Discussion for challenge and future plans

Demonstration of puff cracker machine

6. Summary of the group discussions

The following were the summary of the project success, challenges and future plans of the groups as discussed during the meeting.

The major success of this project are:

1) Machine related successes.
   - Many Challenges associated with machine have been addressed
   - The current Pop cereal machine id much more improved through the DK Engineers
   - 2 machines have so far been fabricated
   - Youth have been trained to use machine
   - Modifications done for machines
   - Gas fired machines on the pipeline to be made
   - New machines function better

High demand for the machine in Burundi

   - Interest for the machine Uganda

2) Good family business
3) Makes profit from sales
4) Adding baobab flavors
5) Use of local materials
6) Puff cracker machine introduced
7) Planted sorghum millet for group
8) Exhibitions and shows.
   - visited many agricultural shows
   - DK showcased Pop machine in the Safari Park Expo and in Uganda. They received more orders from this events
   - exhibition from Uganda was a success
9) JAICAF team very supportive. The group got immense support from the JAICAF team coordinators.
10) More products in the market with new and more appealing flavors
11) Got awards from events
12) Products appealing to buyers

13) Introduction of new nutritious products to consumers
14) New buyers having have seen the machine in the shows
    - Mr. Koech bought the machine
    - The Uganda government is making a request for machine
    - Many people are enquiring of the machines
15) Opportunities to visit other countries like Uganda, Burundi and Japan.
16) Two entrepreneurs trained in japan
17) Alternatives to plastic bags: waxed papers, plastic containers, plastic cups

The major challenges experienced over the course of the project are:

1) Machine Challenges
    - machine defects, i.e. The cylinder and rubber seal
    - Pressure gauge challenge and how to modify it
    - Needs more time to repay the machine
    - Frequent machine breakdowns
    - Pop cereal machine is quite expensive
2) Noise Pollution
    - Sound produced by pressure puffing machine
    - the popping sound can bring problems in places in times of insecurity
    - Sound challenges, people are scared of the noise.
3) Slow response from the DK engineers
4) Project is ending at a time when the interest is gaining momentum
5) Group Internal wrangles
    - Some group members are not interested
    - Some group members are reluctant to sell
    - Divided group: those interested to continue
    - Many people left the group like the case of Okonyo Migori Group
6) Poor quality of local raw materials
    - Rice varieties have different popping characteristics
    - Local rice doesn't pop nicely in the case of the Migori group
7) No KEBS mark
8) Marketing Challenges
    - It takes time and energy for a new product to be accepted into the market
    - Attracting many people but few are buying
    - High millet and sorghum products
    - Lack of awareness of the products
    - Products are new consumers- hence reluctant to buy
9) Plastic bag ban leading to packaging challenges.

The following are the future plans of this project.

1) Sales in market centres, will open new centres for selling
2) Raw material readily available
3) Communication through social media (whatsapp group)
4) Gas may be the way forward for energy

5) There are alternatives for packaging
6) Needs competition on fabricating the machine
7) Research on health benefits and safety standards
8) The Engineers perspective
    - They will act fast on any complaint
    - Cylinder sizes will be adjusted , 3kg machine on pipeline
    - Bring older machines to them for upgrade but at a cost
    - Involve them if any problem with the machine
9) County governments' partnerships.
    - Working in partnership with county
    - MoH and MALF agri-nutrition departments will provide some support (technical, moral etc)
10) Youth and women participants
11) Popping documentary needed
12) Task force to look into packaging issue
    - Follow up issues on KEBS and packaging
    - Team work as partners is needed
    - Keep entrepreneurs informed
    - Have discussions with NEMA, DK, KEBS, government
13) Need for more follow up by the project
    - Extend the project to benefit more people
    - Technical advice still needed in production
    - JAICAF to continue support
14) Need for more training
    - Training for processing
    - Engineers to train machine buyers on how to pop
    - Train engineers staff to pop different products / operate machines
    - Need for training on marketing strategies

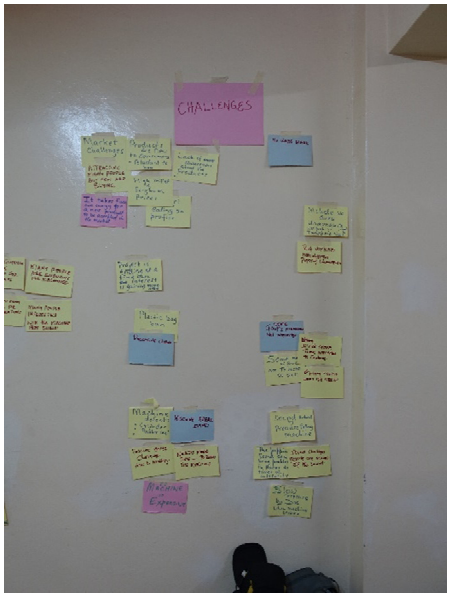
The following was the general advice given to the group:

1) Fortify with natural foods
2) Fortify, color and flavor with food and natural products
3) consider using community funds/ loans to access the machine
4) DK is giving one year warranty for a new machine
5) Whether gas or firewood as a source of energy depends on locality
6) Machine related;
    - Machine must be serviced regularly
    - If the sound could be improved
    - The engineers to advice on machine repairs
    - Oil the machine bearing every 6 months
    - To avoid spoiling the pressure gauge remove it before the pop
7) Marketing strategies;
    - MoH to promote the products as a healthy snack
    - Have a schedule for popping and marketing

- there is a market for products
- New products need aggressive marketing, a passion, strategy, engaging one self
- Make profit to repay machine
- Change attitudes to business positively
- Looking for new flavors
- Need for promotion
- Diversify your products
- Strategies to promote new products: attend shows, give free samples at first, use outstanding nutrients for promotions

Opinion cards for the future plan

Opinion cards for the success



Opinion cards for challenges

Other opinion cards

6. Conclusion

After the group had finished discussion, the following was concluded:

1. [Extension of the project] A request of project extension was made by almost all of participants to provide room for new entrants. The new initiative would:

- (i) form a team to advise on an alternative packaging in the wake of the government ban on plastics,
- (iii) provide financial and technical support to address the emerging needs and particularly supporting new rural groups to acquire the machine and train them on its use.

2. [Exploring new partners] Explore more Engineers like DK Engineering. Competition is meant to enable consumers get the best quality product at the most competitive price. An idea to have more engineers join the project to produce the machine would perhaps bring down the cost of the machine. It may also help the consumers get the best quality machine.
3. [Packaging and Labelling] The problem of packaging was quite evident and widely spread among the groups. A team was set up in place to look into it and return back with its findings and recommendations.
4. [Flavoring] The team was asked to consider more traditional nutrition based flavoring like hibiscus flower for coloring. Innovativeness was really encouraged here.
5. [Communication] Social Media Communication. Communication is a vital part in any process to ensure its success. An idea was brought forward to use social media as a way to communicate and share ideas as well as experiences. A Whatsapp group will be created to facilitate the same.
6. [Capacity development] Training stuff of DK Engineering how to pop so as to train other machine buyers. For the new entrants, DK Engineering was asked to include training of the use of machine as part of their service it offered. In order to do so, they would first require training themselves.
7. [Capacity development] For any project to succeed various stakeholders have to some in place and play their part. In this, the governments was tasked with training the groups on nutritional value of their products. They were asked to join members and act like marketing agent through promoting nutritional education.
8. [Research] [Capacity development] Training on Health Benefits of the products. Members were asked to research on the health benefits of their products. They were also asked to analyze the nutritional impact the products on the consumers.

7. Demonstration of the pop-cereal machine (Gichangi Cereals and Spices)

After lunch, the group was treated to a first-hand production of pop cereals and kashata processing. It was noted that:

- Mr. Gichangi had used the knowledge gained from Japan to make adjustments on his machine. These included changing his source of heat from firewood to gas and having a removable gauge. All these were done without involving the engineering company.

- The changes done suited his need and hence helped in increasing rate of production.
- The sound from the machine was still evident. He, however, did not seem perturbed by it.
- New entrants were really interested in the process. Many even asked to help in timing as well as turning the handle to acquire the right pressure for popping.
- In kashata processing, Mr. Gichangi has a clear recipe that he follows to the dot. It indicates both quantities of the ingredients to be used as well as the procedure to be used.
- He also has a well-marked table to help guide on the sizes of the kashatas.
- Having all these items in place makes the process look simple and flawless.
- kashatas were really tasty. In the area, they are the most demanded by the consumers.

Bursting the pop cereal machine

making the syrup

Smoothing out kashata

Cutting kashata

Selling kashatas in the market


Gichangi uses plastic container for kashatas

8. Annexes

Annex 1: Workshop Program

[Facilitator] Mr. Dominic Tumbo and Dr. Yasu Morimoto (Field coordinator of project)
[Rapporteur and documentation] Ms. Fiona Njagi (Kenya Society of Ethno-Ecology; KSE)
*Presentation title is subject to change.

0830-0900	Registration		
Opening session			
0900-0920	**Welcoming remarks** and the project Background and objectives.	Mr. Shinichiro Nishino and Dr. Yasu Morimoto	JAICAF/Bioversity International
0920-0940	Presentation of achievement and prospects.	Mrs. Peninnah Mwangangi	Syokinilyi Selp Help Group
0940-1000	Presentation of achievement and prospects.	Mr. Charles Mogeni	Okonyo Migori Self Help Group
Tea break (1000-1010) to take tea, snacks and bring them to the conference room.			
1010-1030	Presentation of achievement and prospects.	Mr. John Joseph Kimutai,	Bomet Community Group
1030-1100	Presentation of achievement and prospects.	Mr. Elizaphan Gichangi	Gichangi Spices and Cereals
1100-1120	Achievement and prospects of DK engineering	Mr. Daniel Kiroli	DK engineering LTD
1120-1230	Q and A comments and discussions.	Interaction with other participants. Mr. Dominic Tumbo and Dr. Patrick Maundu	All participants. Cards are used to collect and integrate knowledge from the participants.
1230-1300	Demonstration of puff-cracker machine	Dr. Yasu Morimoto, Mr. Dominic Tumbo	Bioversity International
Lunch Break 1300-1400			
1400-1700	Sharing technique of making and processing popping cereal	Mr. Elizaphan Gichangi	Gichangi Spices and Cereals

Annex 2: Participants List

No	Name	Organization/ group	Email
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8	Rose Wambu	MoH/NDU	
9	Margaret Kienja	DK engineering	
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14	Francis Oundo	JAICAF	
15	Dominic Tumbo	JAICAF	
16	Fiona Njagi	Museums	
17	Patrick Maundu	Museums	
18	Shinichiro Nishino	JAICAF	
19	Isaac Muiruri	JAICAF	
20	Teresia M. Kyalo	Nuu (Mwingi) community	
21	Patricia K. Muthui	Nuu (Mwingi) community	
22	Ruth Kinoti	Meru	
23	Harrison Kairitha	Embu	
24	Yui Takashima	Embassy of Japan	
25	Catherine Nabale	Kenzam Ltd	

JAICAF

Bioversity International

Operation and Processing Manual

Pressure-puffing machine (Yoshimura-Model)

This manual explains the operation and maintenance of your pressure-puffing machine (Yoshimura-Model). Please read it thoroughly and follow the instructions carefully. Doing so will help you enjoy many years of safe and trouble-free operation. Sample of processing puffed cereals also described at the end.

Acknowledgement

Financial Contribution: Japanese Ministry of Agriculture, Forestry and Fishery (MAFF).

This publication was prepared in partnership with the following institutions and individuals. Their valuable contribution is highly appreciated.

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Cover photo:

Pressure-puff cereal machine in Kitui County, Kenya

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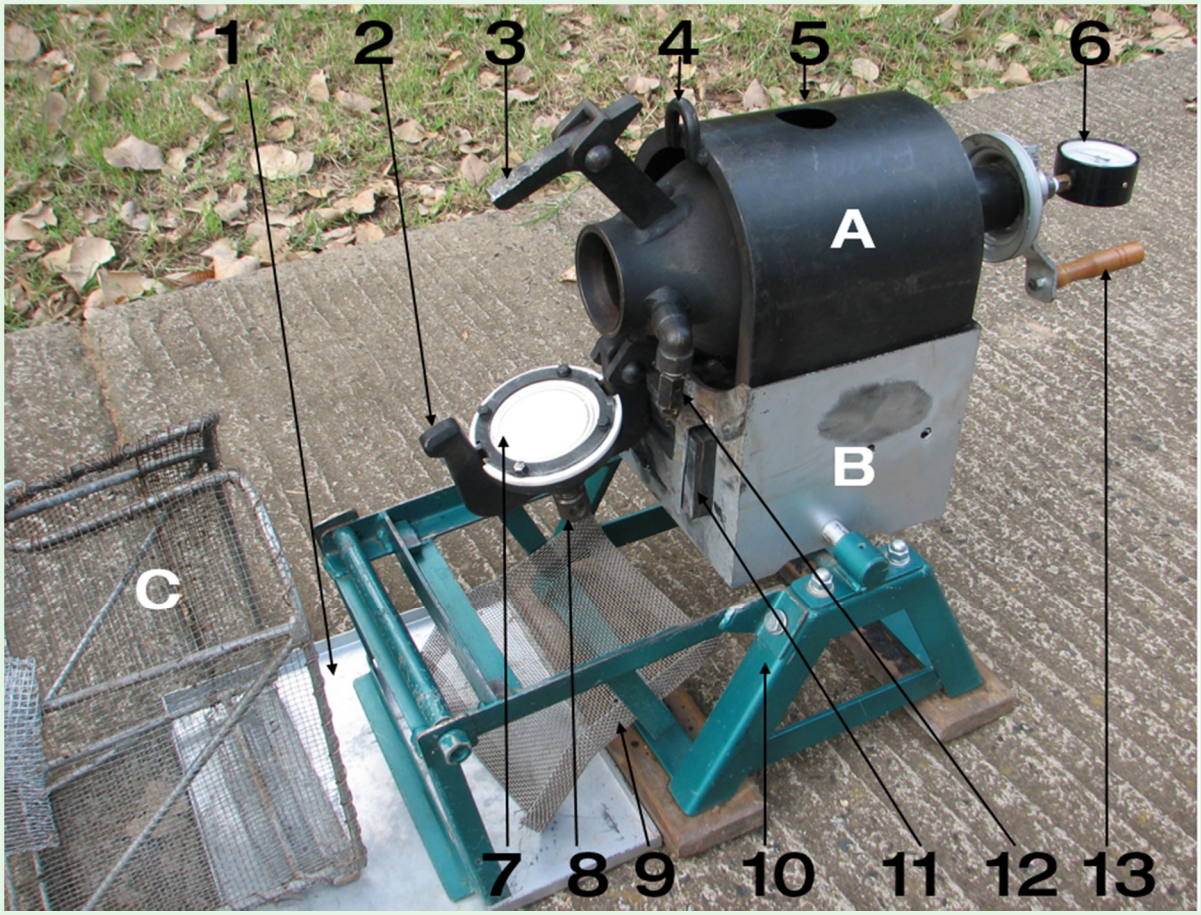
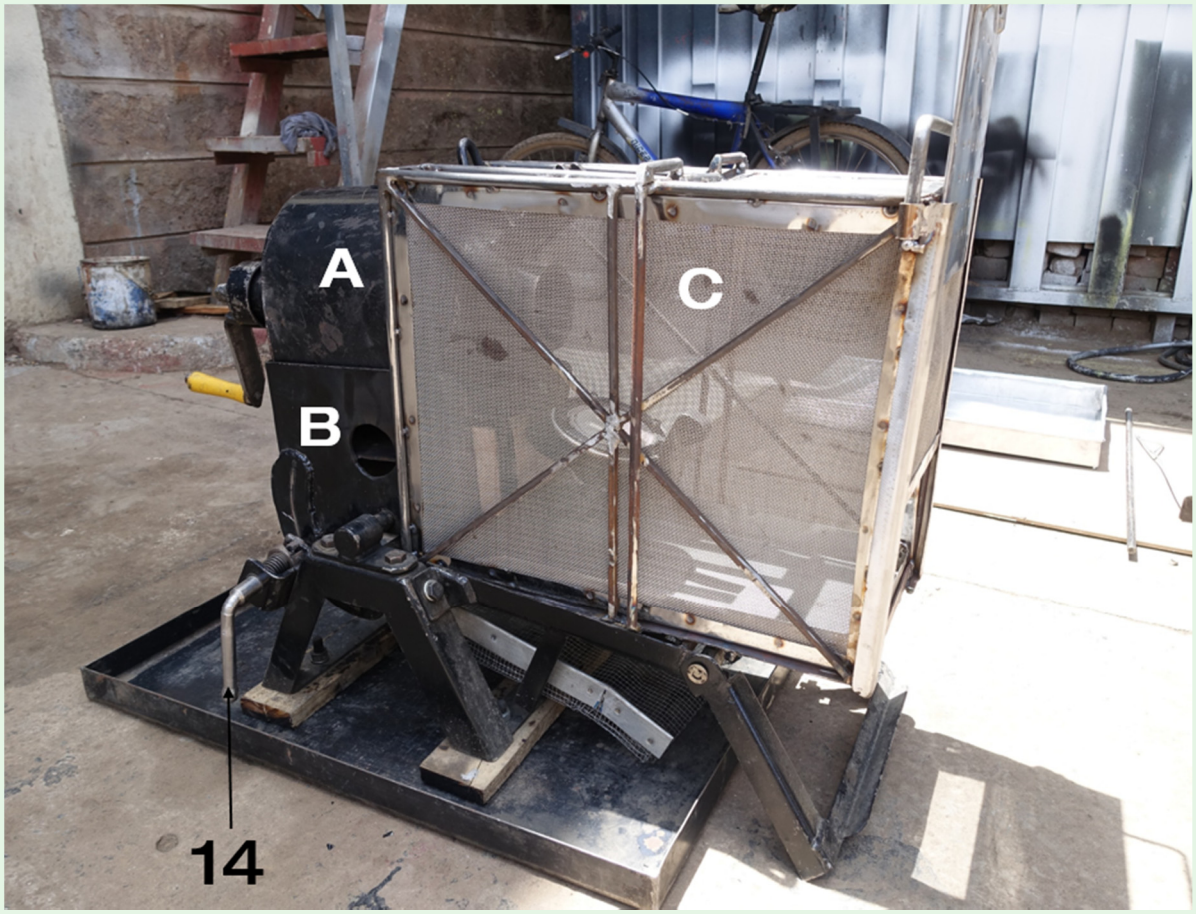
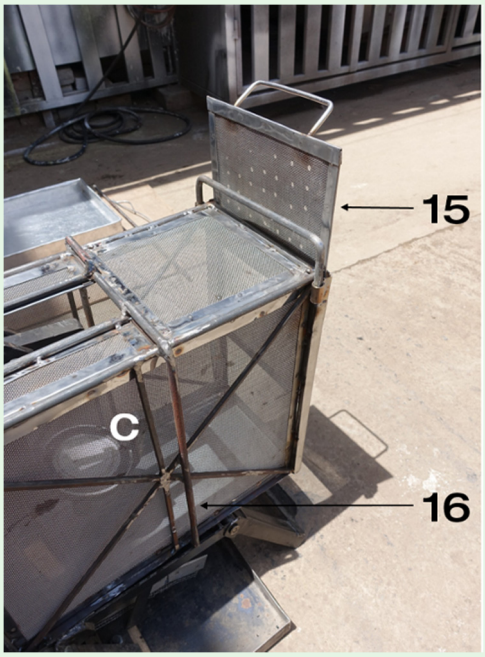
Photo: Local children in Bomet County enjoying the *kashata.*

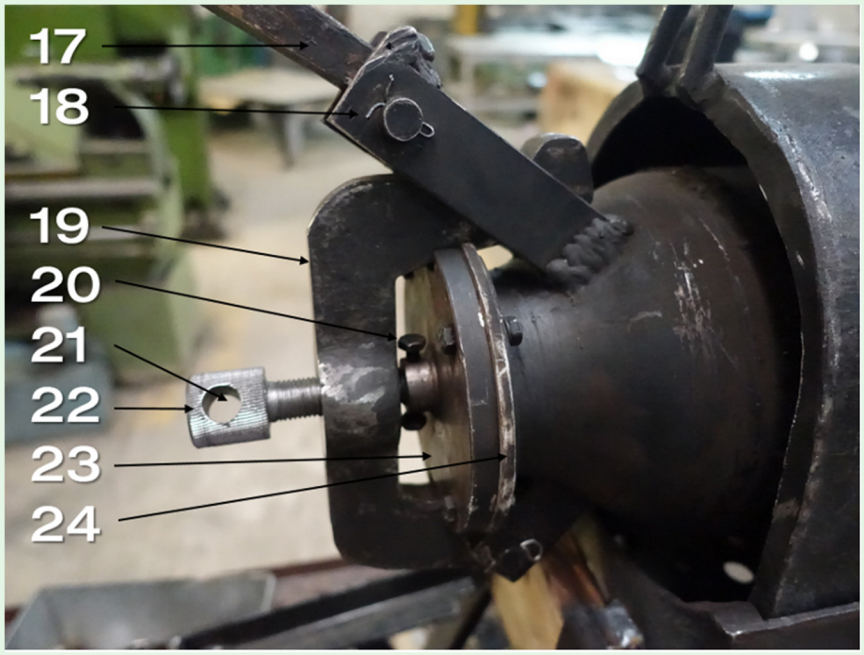
Section 1: Overview of instruments



The machine consisted of three major sections, A: Cylinder, B: Fire place, C: Wire mesh cage.





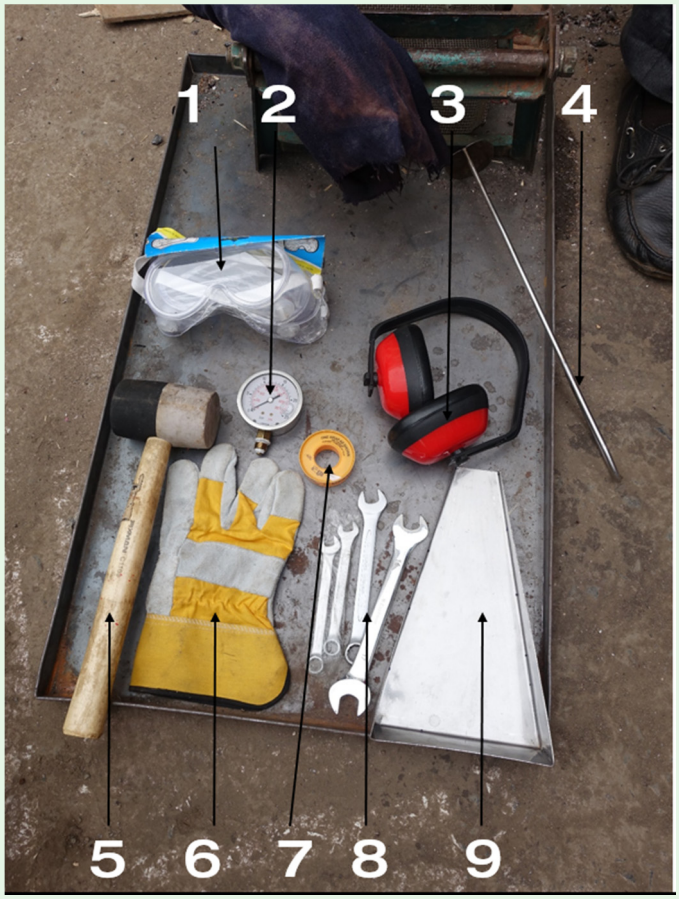


	Name
1	Iron sheet
2	Lid guide
3	Hitting peg
4	Cylinder holder
5	Funnel
6	Pressure gauge
7	Cylinder lid
8	Center bolt
9	Mesh guide
10	Flame stand
11	Shock absorber pad
12	Safety valve
13	Rotating handle
14	Lowering handle
15	Slider
16	Hooks for cotton bag attachment
17	Hitting peg (same as 3)
18	Peg holding pin
19	Lid guide (Same as 2)
20	Center bold rock bolt
21	Hole for iron rod to tighten the cylinder lead
22	Center bolt (same as 8)
23	Cylinder lid (same as 7)
24	Teflon pressure gasket

Section 2: Operation

The pressure popping machine or cereal popper is used to produce the healthiest foods and snacks through accumulated high pressure by heating the cylinder. It can puff or pop many different kind of cereals and grains; e.g. Maize, Sorghum, Wheat, Finger millet, Pearl millet, Rice, Beans and Nuts etc. The machine can use variety of locally available heat sources such as gas, charcoal but this model particularly designed for using firewood.

2.1. Requirements and accessories for operating the machine



	Name
1	Eye protection
2	Pressure gauge
3	Ear mugs- ear protection
4	Scooping rod- used to clean the machine and remove remaining popped cereals from the cylinder.
5	Rubber hammer- used to open the cylinder when the cereal is ready to pop.
6	Skin or woolen gloves
7	Sealing tape
8	Spanners; no; 14, 17, and 19
9	Iron funnel- used to pour the cereals into the cylinder
	Iron rod- used to tighten the cylinder lead
	Clean cloth
	Clean basins and buckets
	Lighter for setting fire
	Firewood
	Serving spoons

2.2. Operating procedure

1. Preparation of the materials
   Wash, clean, remove stones and dry materials under the sun (a day before the operation). The recommended moisture content of the grains is between 15 and 18 % for best puffing. The moisture contents of polished rice and wheat grain sold in common markets in Nairobi is between 8 to 13%. Washing grain therefore important not only for cleaning but also adjusting the moisture contents of the grains. Recommended to add about 60-80g of water for every 1kg of grains (Rice) if not sure the original moisture contents. This water adjustment process makes well puffing the grains. However more than 20% of the moisture contents makes grain (Rice) hard and reduces the success ratio of puffing grains. The grain can be packed, sealed in a plastic bag and stayed overnight after the moisture adjustment.

   Sample calculation formula and answer:
   Adjusting 10% moisture Rice grain 1kg (1,000g) into 18%.
   - Water content of the Rice grain:
     1,000g x (10/100) = 100g
   - Making 18% moisture content Rice grain:
     (100+x)/(1,000+x)=18/100
     10,000+100x=18,000+18x
     100x-18x=18,000-10,000
     82x=8,000
     x=97.56 Adding water: 97.56g

2. Assemble all the requirements e.g. firewood, clean basins, clean cloth, clean cereal, gloves, etc. Cut the firewood into small pieces.

3. Confirm pressure gauge clean and put sealing tape on.

4. Check and tighten all the nuts and bolts.

5. Clean inside the pressure tubes.

6. Put the pressure gauge and make sure it is tight.

7. Put shock absorbing pad (wooden and/or rubber).

8. Light the fire in the fire place.

9. When the fire is ready, carefully place the cylinder on the fire place. NB; the cylinder should be open this time.

10. Wipe the cylinder using the long spoon and a clean wet cloth

11. Wipe the cylinder gasket using a clean wet cloth

12. Rotating the empty cylinder about 7-10 minuets as pre-heating of the cylinder.

13. The cylinder can hold up to 1kg of grains. Weigh 1kg of cereal while the cylinder heats.

14. Lower the cylinder using the lowering bar.

15. Release template inside the cylinder as pour the cereal into the cylinder using the iron funnel

16. Close and lock the lid by hooking the hitting peg. Then tighten the center bolt using the iron rod by holding the peg tightly with the other hand (use the globes).

17. Start rotating the cylinder using the rotating handle (60-70 rotating per minute, or 10-14 rotating per 10 seconds) as continue adding firewood from the side. Rotating too fast or slow makes material burnt. Make sure the fire is well maintained while you operate the machine. Ensure you keep rotating the cylinder.

18. Start preparing the cereal trap, attaching cotton bag and keep it near the machine. Keep checking the pressure gauge. Pressure should start increasing after 2-3 minutes and goes slowly upto around 5 M.pa. It increases rapidly after then. NB. Need special attention requires for monitoring the pressure gauge at this time. Keep the clean basin, rubber hummer.

19. When the pressure reads as per the requirements of the type cereal (See Table 1), stop rotating and set up the cereal trap in its position (hitting peg supposed to be at the top position).

20. Once it reaches at the target pressures, set the position of the trap cage. Advice observers to not stand in front of the direction of releasing pressure. Hand bell can be useful to alert people nearby. Gently but surely hitting the peg with the rubber hummer to release pressure. With large explosion sound, puffed cereal is trapped in the bag.

21. Remove the cereal trap quickly and

22. Harvest the cereals from cylinder using the scooping spoon and also from the trap and bag.

23. When the cereals are in the trap, pour then into the clean basin/bucket.

24. Clean inside the cylinder.

25. Put another cereal into the cylinder to continue processing.

26. Sieve and separate defective materials And put selected materials into the bag for next processing. Defective materials can be grinded into flour for other uses.

27. Enjoy eating puffed cereal or add preferred flavors.

Table 1. Recommended puffing pressures and methods for major grains.

	Materials	Pressures (kg)	Method
1	Rice	10	Puff
2	Wheat	9	Puff
3	Maize	9	Puff
4	Finger millet	11	Puff
5	Sorghum	11	Puff
6	Pearl millet	10	Puff
7	Greengram	8-10	Puff or Cool down
8	Lablab	8-10	Puff or Cool down
9	Beans	6	Puff or Cool down
10	Soya beans	6-7	Puff or Cool down
11	Grand nuts	5-6	Puff or Cool down
12	Cowpea	7	Puff or Cool down
13	Bambarra nuts	6	Puff or Cool down
14	Marama bean (EA type)	6	Puff or Cool down

2.3: Samples of puffed cereals

Some of the grains the project has puffed (top left to bottom right): Maize (*Zea mays*); the volume expands more than 10 times of the original grain size, Maize (*Zea mays*), Rice (*Oryza sativa*), Broken Rice (*Oryza sativa*), Pearl millet (*Pennisetum glaucum*), Finger millet (*Eleusine coracana*), Red sorghum (*Sorghum bicolor*), Bambara nuts (*Vigna subterranean*), Greengram (*Vigna radiata*), and African Marama bean (*Tyloseme fassoglense*).

Section 3: Maintenance

The best kind of maintenance is preventative maintenance. Good service and routine checkups can reduced breakdowns and significantly increase the lifespan of your machine as well as contribute to saving time and money.

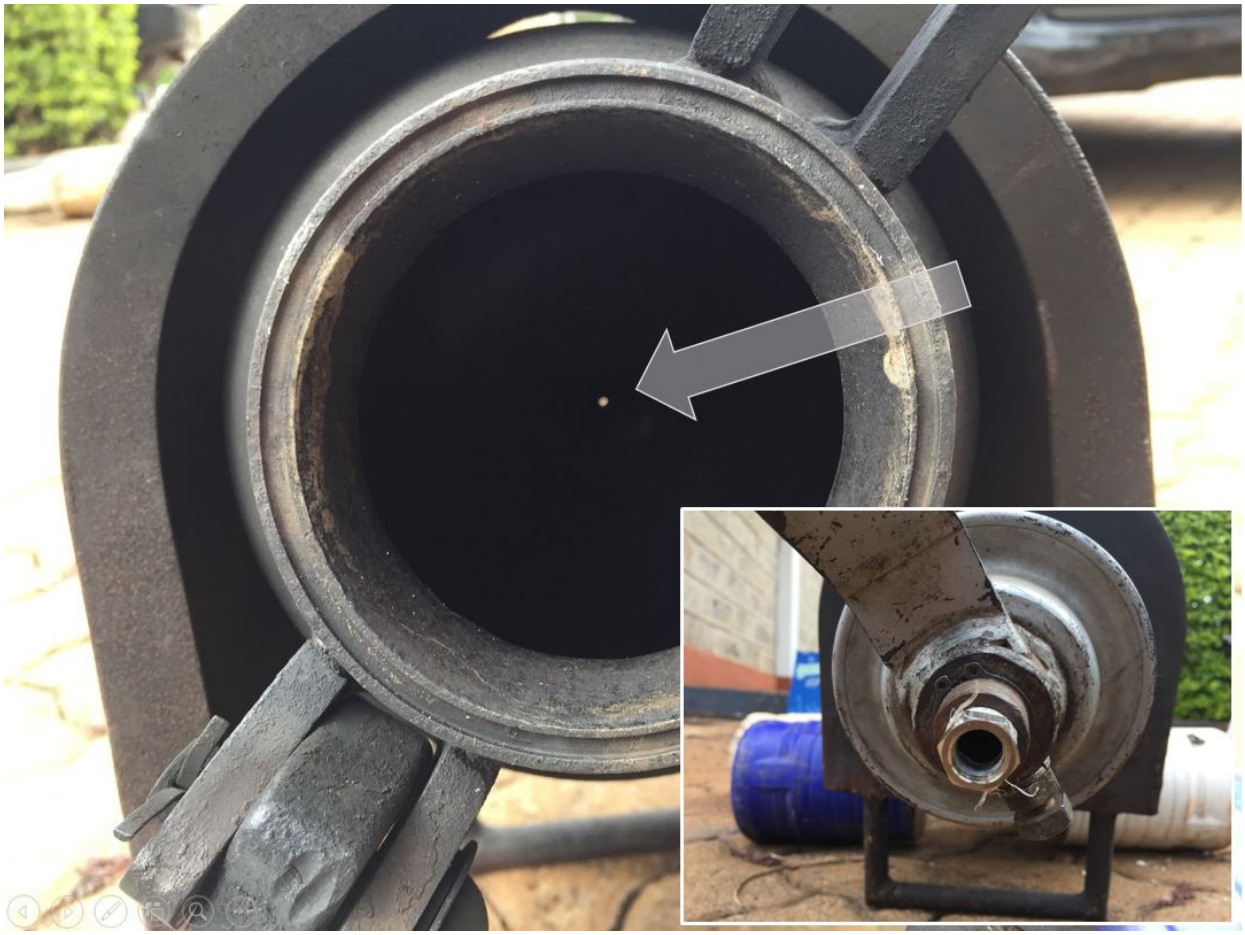
Inside toolbox

	Name
1	Toolbox
2	Ear mugs- ear protection Pressure gauge
3	Rubber hammer
4	Sealing tape
5	Eye protection
6	Skin or woolen gloves
7	Tools; spanners, pipe wrench, priers etc
8	Scissors
9	Knife
10	Spare parts; pressure gauge, center bolt, hitting peg, Teflon gasket etc.

Wipe inside cylinder with clean duster.

Apply cooking oil inside the cylinder to prevent rusting. Remove carbons using iron rod.

Make sure pressure hole is clear.



You can clean other parts using water.

Change wooden damper if it is necessary.

Make sure all bolts, nuts and pins are tighten and fixed right.

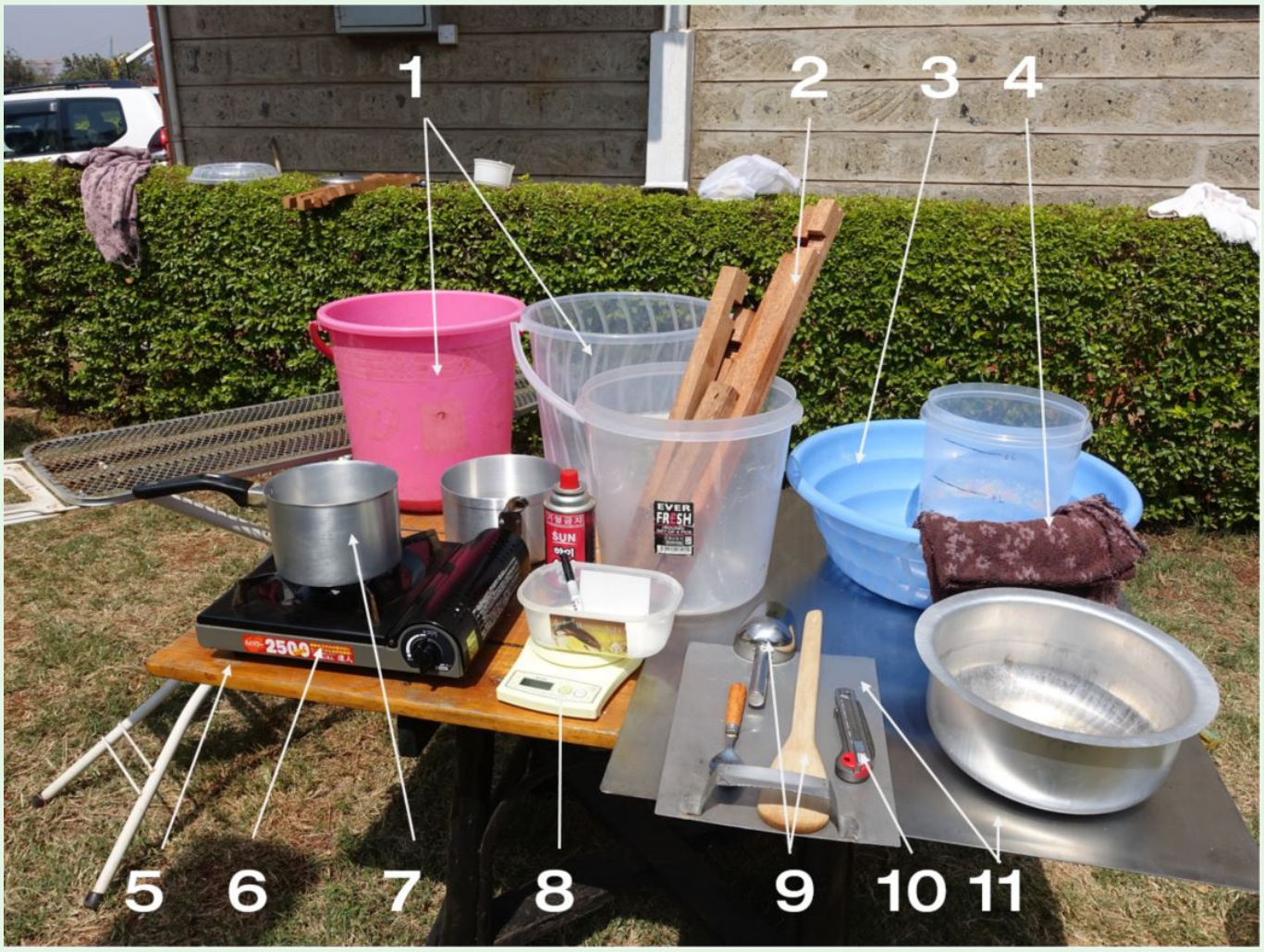
Check thickness and surface of the Teflon gasket. Requires change if it is <than 2mm thickness (standard size is 5-6 mm). To make gasket surface flat using sandpapers.

Section 4. Processing and flavoring of puffed cereals.

* Code of practice of the East African standard, Hygiene in the food and drink manufacturing industry will be applied to all food and drink manufacturing industries irrespective of their size and volume of production.

https://law.resource.org/pub/eac/ibr/eas.39.2001.html

4.1: Utensils



	Name
1	Plastic buckets, different sizes
2	Wooden “kashata” flames
3	Plastic basins, different sizes
4	Clean cloth
5	Table
6	Stove / Cooker
7	Saucepans
8	Weight balance
9	Kitchen and serving spoons
10	Kitchen knife
11	Stainless steel or wooden board

Flavoring of puffed cereals depend on the type of consumers being targeted. Some of them preferred flavors include sugar, honey, blue band (bread spread), chili papers, chocolate, cinnamon, and fruit flavors etc. The puffed cereals are flavored to add tastes and preserve them.

4.2: Flavoring with sugar (standard)

Directions

1) Making a sugar syrup

	Ingredient	**Quantity**
1	Sugar or/and Molasses	350-500 g
2	Salt	2.5 g (one tea spoon)
3	Water	180 mL

- Step 1: Put sugar and salt into the water and stir and boil continuously for 15-20 minutes over large heat. Be careful not to let the sugar burn and do not let it crystallize in the bottom of the saucepan. Never cover the saucepan with a lid.
- Step 2: Never walk away. Continue star to boil over until the mixture begins to thicken and turns into light brownish in color. It produces a lot of small bubbles where it hardly disappears at this stage.
- Step 3: Stop heat and pour the mixture (syrup) over puffed cereals all at once and stir with large wooden spoon for a few minutes to ensure the syrup is well coated and dried.

2) The syrup can be used for most of the products to flavor as follows. Different puffed materials can be mixed.

	Ingredient	**Syrup**
1	1 L of puffed sorghum	1 and ½ serving spoon
2	1 L of puffed white corn (maize)	2 serving spoons
3	1 L of puffed wheat	1 serving spoon
4	1 L of puffed rice	1 serving spoon

NB: One serving spoon is approximately 50g of the syrup.

Making sugar syrup (left). Adding syrup to puffed materials (right).


Stir with large wooden spoon and ensure the syrup is well coated and dried (left). Serving for testing (right).

4.3: potential seasonings

Various spices can be used as seasonings to create new taste and unique additional values for your original puffed cereals. It is recommended to use natural products which easily available and accessible.

Potential spices for favoring

	Spices and favors	**Forms**	**Quantity (g) for 1L puffed materials**
1	Coco, Chocolate drink	Powder	2.5 (one tea spoon)
2	Cinnamon	Powder	2.5
3	Roasted soya bean (soya drink)	Powder	2.5
4	Coffee	Powder	2.5
5	Green tea	Powder	2.5
6	Baobab	Powder	3
7	Chili	Powder	1
8	Black paper	Powder	1
9	Curry	Powder	2
10	Salt	Powder	2
11	Soy sauce	Liquid	Some
12	Honey	Liquid	2.5
13	Dried mango	Small particles	3 to 5
14	Dried grated coconuts	Small particles	3 to 5
15	Dried pineapples	Small particles	3 to 5
16	Roasted ground nuts	Small particles	3 to 5
17	Roasted cashew nuts	Small particles	3 to 5
18	Roasted sesame seeds		Some
19	Roasted amaranth seeds		Some

Directions

- Put puffed materials and spices in a same paper bag and shake until the spices are well sprinkled and mixed with the cereals.
- For salty flavors such as black paper and curry powder, little quantity of olive oil or palm oil is misted over the cereals and then applied spices.
- Different spices and favors can be mixed and create own unique tastes.

Puffed rice with green tea powder (left) and coco drink powder (right).

Recipe and photos: Makiko Naganuma (2017)

4.4: Chocolate cube

Directions


- Engrave cooking chocolate (250g) and melt with a water bath.
- Stir slowly until it melts.

- Put puffed material and adjust the quantities (about 1L). Less material makes it less cube.
- Mix well that chocolate evenly courted around.

- Put it in a mold. This time, a 3cm square ice tray was used.
- Put it in the refrigerator, cool it. It solidifies in about 20 minutes.

Recipe and photos: Yumi Yamane (2017)

4.5: *"kashata"* (cereal bar / biscuit)

A "*kashata*" is a traditional Swahili confectionaly snack popular in East African coast region.

	Ingredient	**Quantity**
1	Puffed materials (mixed in different cereals)	4 L (450-500 g)
2	Sugar	160 g
3	Salt	6 g
4	Water	100 mL
5	Glucose syrup	100 g
6	Other ingredients such as rasted grund nuts, cashew nuts, makademia nuts, grated coconut, dired fruits etc. can be mixed to add exstra fravours of preference.	Some

Directions

Step 1: Mix sugar, salt and water then boil in a saucepan until all the sugar is dissolved (2-3 minutes).
Step 2: Add melted glucose syrup in the pan.
Step 3: Continue star to boil over until the mixture begins to thicken and turns into light brownish in color. It produces a lot of small bubbles where it hardly disappears at this stage.
Step 4: While preparing the syrup, prepare the "*kashata*" board (Stainless steel board) and wooden flames and pour roasted soya powder (also other seasonings) on it.
Step 5: Stop heat and pour the mixture (syrup) over puffed cereals all at once and stir with large wooden spoon to mix the cereal with the prepared syrup in speedy manner.
Step 6: Spreading the materials in the "*kashata*" flame and apply pressures to shape it. Pressing from both sides of the "*kashata*".
Step 7: Cutting the "*kashata*" into favorable sizes and pieces.
Step 8: Remove the flame and ready for packing them.

Note: other additional ingredients such as nuts and dried fruits can be cut into small particles and added in the *kashata.*

"*kashta*" can be served with strong black coffee or tea with ginger.

Weigh ingredient (sugar, salt and water) then boil in a saucepan (Step 1).

Preparing the *kashata* processing board and shaping wooden flame (Step 4).

Pour prepared hot syrup over the puffed cereals all at once and mix well with large wooden spoon (Step 5).


Spreading the materials in the "*kashata*" flame and apply pressures to shape it (Step 6).


Cutting the *kashata* into pieces using a wooden guide stick and remove the flame (Step 7).


Different sizes and shape of *kashata.*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