Catalogue of Japanese Technology

~focusing on the medical and health care field~

August 2021 edition

AFRECO

Association of African Economy and Development

Rocinantes

QUNIE

Qunie Corporation

Tetsuya Fukunaga
Co-Leader
(Development Finance)

Director
Association of African
Economy and Development

Naoyuki Kawahara, MD.
Co-leader
(Medical and Health Care)

President
Rocinantes

Kyoko Hasegawa
Principal Person in Charge

Secretary General
Association of African
Economy and Development

Jun Hirabayashi
Principal Person in Charge

Director
Business Development Support
in Emerging Markets
Qunie Corporation

Contact: project@afreco.jp

Healthcare Projects Catalogue

Table of Contents

R&D Project on preventive and therapeutic drugs for diseases such as COVID-19 using natural products in Africa

Kumamoto University

Provide scientific quality assurance for African traditional medicines, and accessible medical care and prevention

- Develop evidence-based preventive and therapeutic drugs by utilizing traditional medicines of African origin. It would improve access to such evidence-based medicines in terms of price and distribution.
- Aim to improve UHC in Africa by fostering human resources for R&D of science-based medicine and contribute to the establishment of a health care system for self-medication based on evidence.
- Already discovered several Sudanese traditional medicines with antiviral activities against COVID-19 (including mutated viruses).

Goal：Improve UHC in each country by building a system that allows Africa to effectively self-medicate using local natural products

(1)Problems to be solved

- In recent years, infectious diseases with high infectivity or fatality rates, such as Ebola and COVID-19, have spread widely, and adversely impacted on society.
- There is a possibility that in the future, new infectious diseases may spread, which highlights the importance of vaccines and therapeutic drugs.
- However, vaccines and expensive and rare drugs produced outside of Africa are usually not available or are cost-prohibitive for people in Africa.
- Although traditional medicines exist in Africa, many of them have not yet been validated.

(2)Proposed solution

- Establish R&D facilities necessary for drug development at universities or research institutes
- Conduct R&D on preventive and therapeutic methods against diseases such as COVID-19 by utilizing natural products in Africa.
- Provide technical support to local personnel to enable the establishment of scientific evidence on the efficacy of African traditional medicines.

(3)Expected impact

- The development of preventive and therapeutic medicines whose efficacy, quality and safety are guaranteed by scientific evidence, and utilizing traditional medicines in Africa will improve access to evidence-based medicines in terms of price and distribution.
- Establishing a self-sustaining R&D system through human resource development will enable the development of effective self-medication healthcare in local areas.
- This project will be the cornerstone of a new drug development platform that utilizes Japanese-style know-how, and will contribute to the improvement of UHC in Africa.

④Time required for implementation

- Technical support can be provided remotely by Kumamoto University.
- Once research equipment and communication environment are in place, local R&D can be started in a week.

R&D Project on preventive and therapeutic drugs for diseases such as COVID-19 using natural products in Africa

Points and strengths of proposed solution

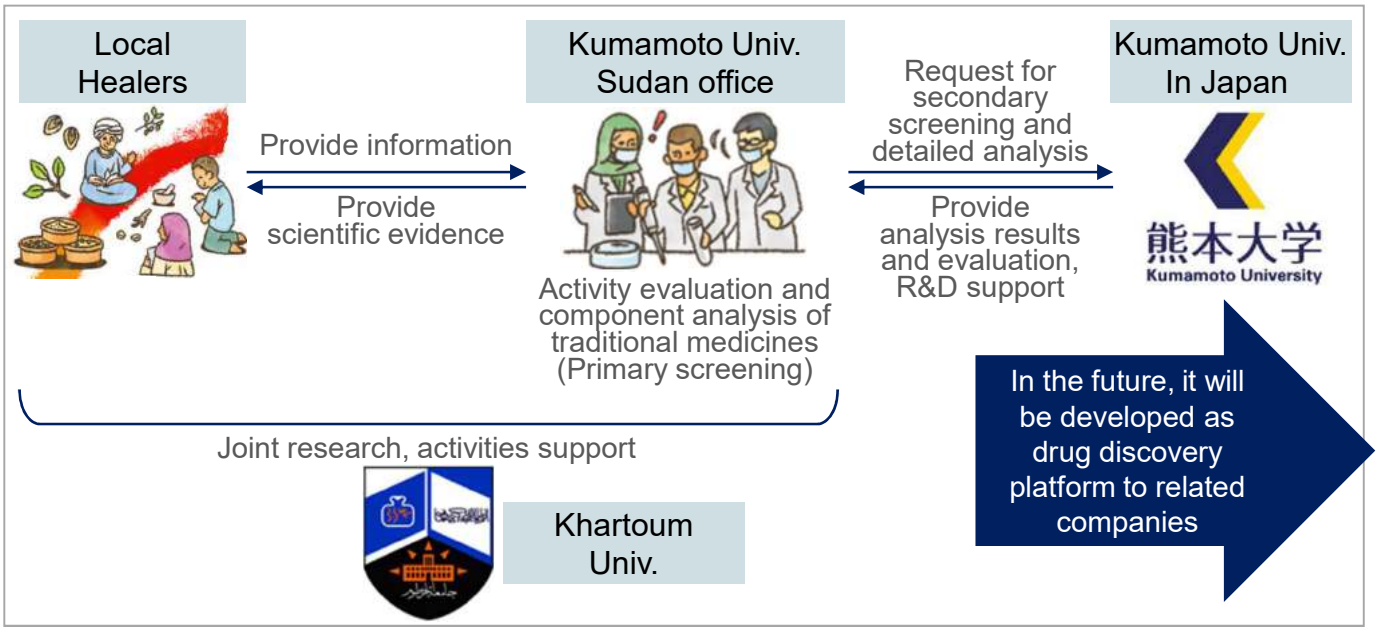
(1)Utilize "Natural Product Drug Discovery Platform" owned by Kumamoto University

- Kumamoto University has a "Natural Product Drug Discovery Platform". In order to maintain a database on useful plants, the university is working on optimal cultivation methods, extraction automation, creation of a library of useful plants, and evaluation of extracted components. Based on the "useful plant library" accumulated at the university, the university is building an evaluation system line that will lead to the creation of innovative drugs (1) by building a cultivation system that provides a stable supply of high-quality useful plants, and (2) by consistently performing extraction, analysis, and evaluation of the useful plants in the library.
- Utilizing this platform, the university has already discovered several Sudanese traditional medicines with antiviral activities against COVID-19 (including mutated viruses), and has already identified natural products that can be used for self-medication.

(2)Kumamoto university has already established relationships in Sudan

- A Sudanese researcher has been assigned to the Kumamoto University Sudan Office, and joint research is being conducted with the University of Khartoum.
- Kumamoto University can utilize the research facilities of the Mycetoma Research Center, which is conducting clinical trials of pharmaceuticals in Sudan with the support of Japanese pharmaceutical companies.

Implementation model【Example：Sudan】



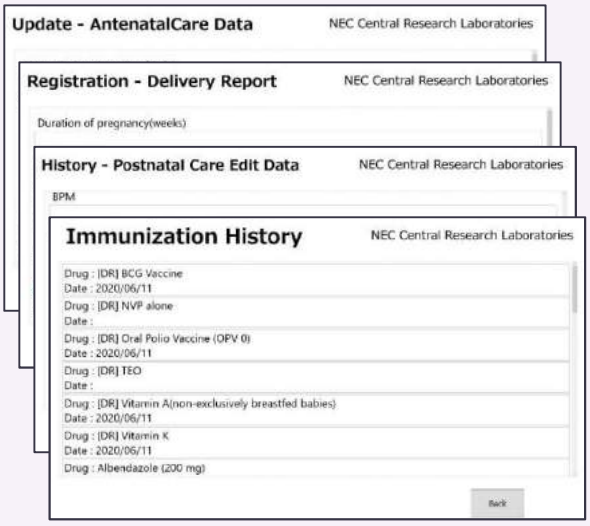
Issues for implementation

- COVID-19 may cause shortages or instability in supplies and power for R&D.
- Need to establish relationships with new healers who practice traditional medicines.
- In Sudan, joint research has been started, but local R&D finances are insufficient, and funding sources are being sought.

Orchestrating a brighter world NEC

Project to make medical services smooth and precise by the system utilizing the recorded Mother-Child information.

Biometrics Research Laboratories, NEC Corporation



Mother-Child information system (Prototype, under onsite research)

- This system aims to realize:
  - Recording / searching a history of medical treatment such as antenatal, delivery, postnatal and immunization history
  - Assisting legal identity confirmation working together with birth certification and birth registration procedure
  - Identifying neonate (including a few hours after delivery) accurately by biometrics technology.
  - Reducing implementation costs by adopting “Turn Key” system design.

Goal：Realizing secure and safer world for mothers and children during a period of pregnancy and delivery by digitalized social service.

(1)Problems to be solved

- In 2019, the number of under-five deaths reached 5.2 million and among children under-five, 2.4 million occurred in the first month of life[*1].
- More than 1 billion people are unable to prove their identity and therefore lack access to vital services including education, healthcare such as vaccination, and social protection[*2].
- Some digitalized systems do NOT cover actual requirements due to technical reasons.

*1: Levels & Trends in Child Mortality Report 2020, UNICEF, *2: ID4D Data, Global Identification Challenge by the Numbers, World Bank

(2)Proposed solution

- This system is designed to register the information related to delivery including personal data, medical treatment records such as antenatal, delivery, postnatal and immunization history to support healthcare services for mothers and children working more sufficiently.
- This system is also designed to co-work with system which provides the legal identity for all newborns such as birth registration to realize no one left behind.
- This system can run over a Laptop PC and can choose standalone or networked configuration by following an environmental conditions at site.

(3)Expected impact

- Registered data can be used for epidemiology assessments by analyzing data statistically and the result of assessments can assist medical care more effective for all.
- By connection with existing birth registration procedures, this system supports to confirm the conditions of providing a nationality to neonate at birth and as expandability of this system, by connecting with existing National ID, this system utilizes neonate information as for first data of nationwide lifelong ID systems which delivers legal identity for all.

④Time required for implementation

- The advantage of “Turn Key” system design is being able to provide easy and user-friendly operation which does not require much human resources at implementation stage.
- After a few steps of fundamental setting for system operators, this system can work without special training by easy-to-understand graphical user interface (in case of stand alone setting).

Project to make medical services smooth and precise by the system utilizing the recorded Mother-Child information.

Points and strengths of proposed solution

(1)System design for Africa

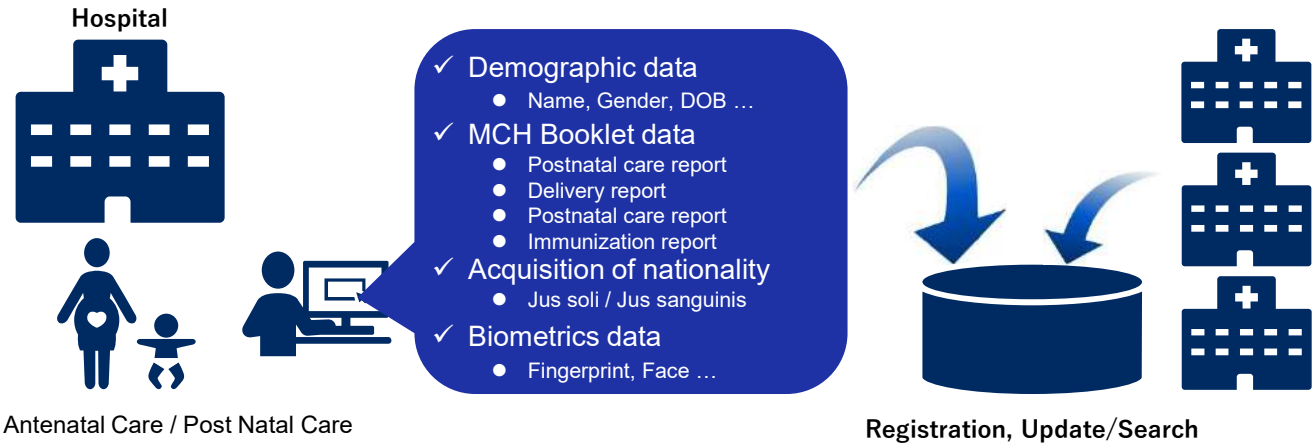
- This system has been upgraded many times by listening to the voice of Africa. The most important point NEC considers is that system design shall be based on listening to the voices in local to meet the requirements and mandates from the mothers and members at hospitals and at local governments. Functions adopted in this system explaining in this catalogue are the result of their voices and these can show where mothers and children are and assist how government can assist them to make the blight future.

(2)NEC, the global experts in Biometrics and ID management system

- NEC is globally well known company as a world leading biometrics technology provider. As a result of obtaining most accurate technology championship at global competitions held by NIST*3 several times, many countries implemented NEC biometrics technology based identification system such as National ID system. One of the examples of NEC's contribution is that the government of India uses NEC biometric identification system in 1.3-Billion-Person National ID system. This actual achievement represents that NEC's reliability and capability of realizing the huge nationwide system.

*3: National Institute of Standards and Technology, U.S.A

Implementation model

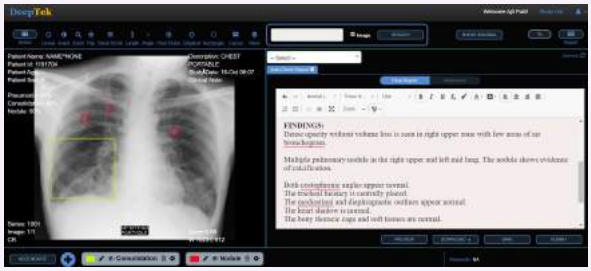


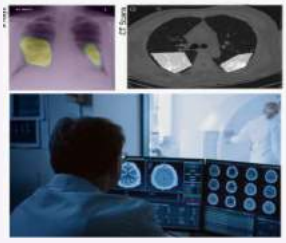
Issues for implementation

- To register the mother child information may needs legal steps to obtain an approval to use.
- This system is fundamentally designed for the use by Ministry of Health. However, some countries may have definition that system having personal ID shall be managed by Ministry of Home Affairs.
- In case of the ongoing installation stage of infrastructure (Power supply, Networking including mobile phone network, Facilities and so on), system implementation may need to wait till the end of installation.
- Even adopting easy graphical user interface, fundamental skill (literacy) to use PC itself and to understand the importance of this registration procedure are required.

Project to address the shortage of radiologists by introducing AI support system for chest X-ray imaging diagnosis

NTT DATA Corporation





Cloud-based AI supports doctors technicians to diagnose X-ray images

- The system streamlines diagnostic work of radiologists by indicating possible abnormalities in X-ray images of patients, both on the images and through text
- When a hospital uploads a chest X-ray scan image to the cloud, the AI can instantly identify disease and make a diagnosis that supports doctors.
- Since 17 pathological diagnoses can be made at once, it is more cost effective than introducing a solution that diagnoses each symptom.

Goal：To improve the number of diagnoses by supporting doctors, detect patients' symptoms early, and reduce the risk of serious illness

(1)Problems to be solved

- In Africa, lower respiratory tract infections are the leading cause of death. However, due to a shortage of doctors, especially in rural areas, many cases are not able to be diagnosed.
- Complex diagnoses such as COVID-19 require training, however, the current shortage of doctors and technicians who can provide instructions made accurate diagnoses difficult.
- Doctors are unable to fully perform their primary duties due to the time required to prepare reports for each patient.
- In the event of an outbreak of tuberculosis, etc., rapid screening is required.

(2)Proposed solution

- Introduce a support tool to instantly diagnose more than 17 diseases such asCOVID-19, tuberculosis, and pneumonia from chest X-ray images by AI support solution.
- Introduce AI diagnosis support as an educational tool for doctors and technicians at universities and top referral hospitals.
- Automatically generate structured-and quantified-clinical radiology reports right away.
- Introduce AI diagnostic support into the screening programs of the ministry of health and hospitals in case of outbreaks.

(3)Expected impact

- In areas with weak health systems where doctors are in short, early detection and early response to lung diseases of patients will prevent severe illness.
- AI diagnosis support will educate and enable highly accurate diagnosis even in areas where there are no instructors.
- Automatic report generation function optimizes radiology workflow and promotes efficiency in medical care.

④Time required for implementation

- As long as the diagnostic imaging equipment and communication environment are in place, the system can be installed in one week, including software installation and training for medical personnel.

Project to address the shortage of radiologists by introducing AI support system for chest X-ray imaging diagnosis

Points and strengths of proposed solution

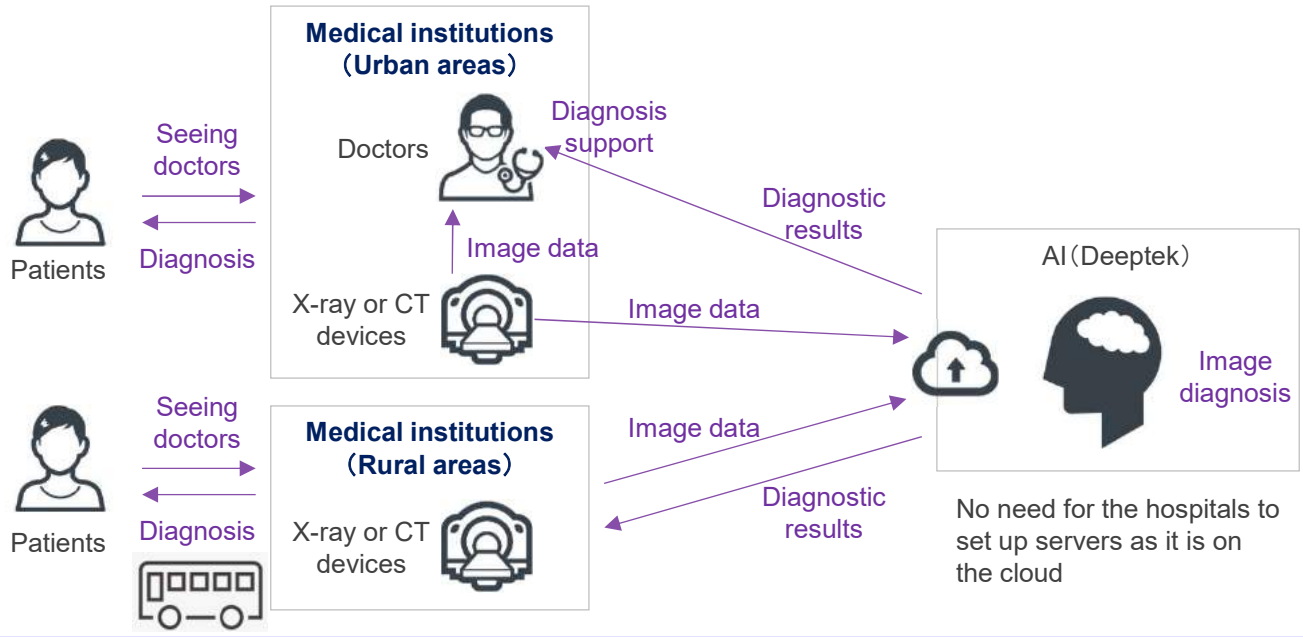
(1)Improved accuracy through extensive experience and data accumulation

- The system has been installed in more than 75 medical institutions in India, Japan, and other countries.
- More than 30,000 imaging diagnoses are performed per month, and accuracy is improving as data is accumulated.
- Accurate diagnosis is ensured by adopting a feedback loop in which AI diagnosis results are double checked by overseas specialists.
- Obtained third-party evaluations (e.g., Friends for International TB Relief (FIT)) indicating that the diagnosis is comparable to that of radiologists.
- Obtained ISO/IEC27001:2013 certification

(2)Small initial investment (equipment, network environment, etc.)

- This system is on a pay-as-you-go basis (a few dollars per image) and is plug-and-play, requiring only a PC and a digital X-ray system. The initial cost can be thus reduced.
- This uses a cloud system which needs a minimum communication speed of about 3 Mbps.
- Cloud-based PACS is also available.

Implementation model

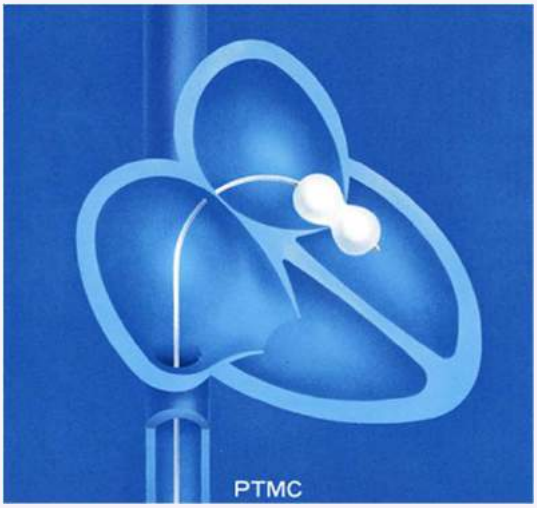


Issues for implementation

- In order to be used as an alternative in areas where there is a shortage of doctors, etc., a legal system that allows diagnosis without a doctor would be desirable.
- Since the accuracy of AI diagnosis is not high enough for diseases without sufficient number of samples, such as COVID-19, it is important to consider the implementation of AI solution based on the local living environment and disease situation.
- In areas where X-ray equipment is not available, it is necessary to collaborate with mobile healthcare services using portable X-ray devices.

Project to realize minimally invasive and fast recovery treatment for mitral stenosis patients by PTMC using the INOUE BALLOONs

Toray Medical Co., Ltd.



Reducing the burden of mitral stenosis patients and helping more patients with the Inouye balloons and technique education

- The Inouye Balloon Catheter is used in PTMC (Percutaneous Transvenous Mitral Commissurotomy) for patients with MS (Mitral Stenosis).
- It can be applied not only to the working-age population but also to the elderly with reduced physical strength, renal failure, pregnancy, and cardiac cachexia, since it reduces the patient burden by realizing a short, minimally invasive treatment (about 5mm incision).

Goal：By utilizing the Inouye balloons, this project aims to achieve minimally invasive and safe treatment and early recovery for MS patients.

(1)Problems to be solved

- The number of patients with rheumatic heart disease is estimated to be 30 million worldwide, of which 50-70% are MS patients. The majority of them are eligible for PTMC. Most MS patients in developing countries are in their 20s to 50s, their prime working years, and many lives (about 300,000) are lost each year worldwide due to heart failure caused by MS.
- A high percentage of MS patients are women, with the peak incidence occurring during the childbearing years, in their 30s. In most cases, pregnant women in Africa are not aware of their MS until they become pregnant, but open heart surgery performed on pregnant MS patients often results in the death of the fetus.

(2)Proposed solution

- Minimally invasive (about 5mm incision) and quick PTMC (about 1 hour) using the Inouye balloon reduces patient burden and enables early recovery of MS patients (discharge in about 1-2 days after surgery).
- Dr. Kanji Inoue, the inventor of the Inouye balloon, will train African physicians in the PTMC technique using actual cases, so that they can learn the atrial septal puncture technique, which is the most important part of the procedure, to the level where they can perform the actual procedure with confidence.

(3)Expected impact

- It can save the lives of both mother and fetus, which could not be saved by conventional open heart surgery.
- Early recovery of the patients will reduce the economic damage of households caused by the absence of the working generation.
- More MS patients can be safely saved by promoting the safe and proper use of the Inouye balloon through technique education.

④Time required for implementation

- Major hospitals in Africa have catheter rooms (X-ray and pressure measuring equipment), so PTMC for MS patients using the Inouye balloon is possible.

Project to realize minimally invasive and fast recovery treatment for mitral stenosis patients by PTMC using the INOUE BALLOONs

Points and strengths of proposed solution

(1)Extensive experience and safety

- Inouye Balloons have been on Japanese market since 1988 and have been on the international market since 1989. The products have been exported to 93 countries.
- Since its launch, there have been no product recalls or deaths caused by the product.

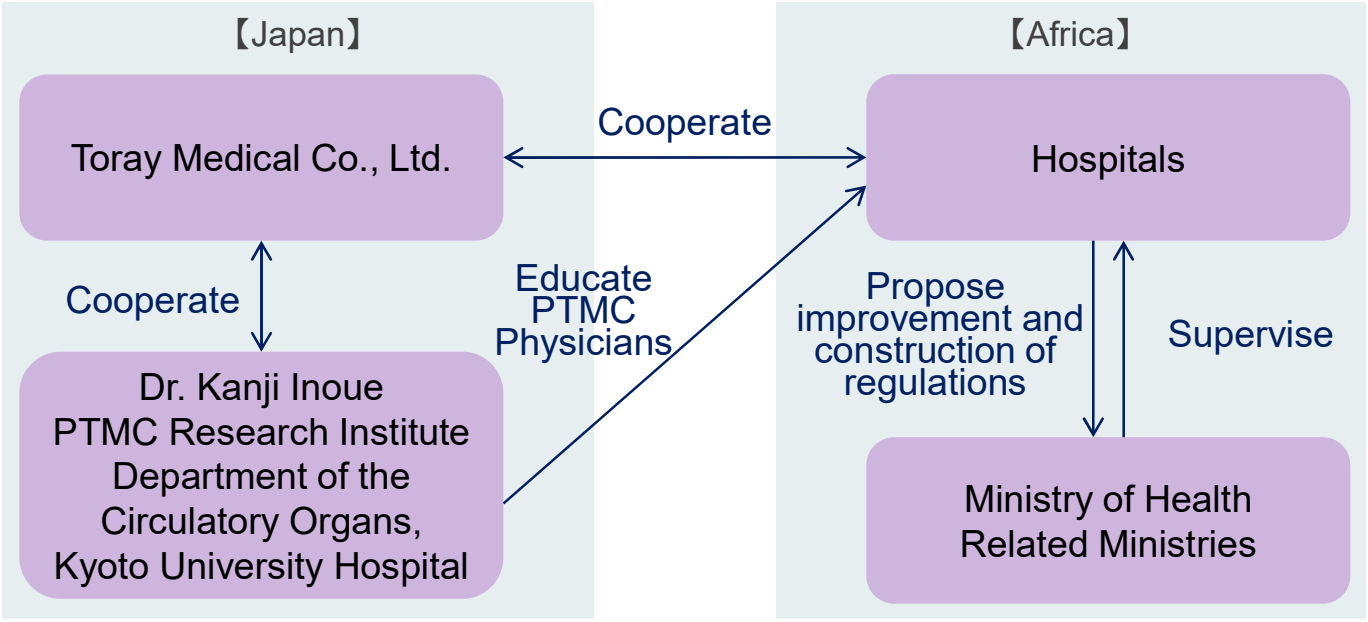
(2)American and European Cardiology Associations guidelines

- The following guidelines describe PTMC as the first-line treatment for MS, and it is the most effective treatment even in low-/middle-income countries.
    - 2014（1998,2006）ACC/AHA (American College of Cardiology/American Heart Association) Guidelines
    - 2012（2007）ESC/EACTS (European Society of Cardiology/European Association for Cardiothoracic Surgery) guidelines

(3)Agents in Africa

- Toray Medical already has distributers in Africa in the following countries.
  Algeria, Egypt, Kenya, Libya, Morocco, South Africa, Sudan, Tunisia, Ethiopia

Implementation model（Education）



Issues for implementation

- Hospitals need to have catheter rooms (X-ray and pressure measuring equipment).

Project to establish a plant to manufacture and supply high quality disinfectants

NORMECA ASIA CO., LTD. / Kaneichi Pharmaceutical Co., Ltd.

Solid type

Gel type

Domestic production and sales of quick-drying disinfectants effective against COVID-19, Ebola, etc.

- Simple manufacturing process with low technical difficulty in production; it can be manufactured with only materials and machines.
- Effective against COVID-19, influenza, Ebola, measles, rabies virus, and Gram-negative bacteria with 99.5% virus inactivation.
- Its quick-drying feature makes it suitable for emergency response without the need for towels, and it also prevents cross contamination.

Goal：Contribute to the reduction of infectious disease cases and deaths by providing a stable supply of high quality disinfectants

①Problems to be solved

- In recent years, infectious diseases with high infectivity and fatality rates, such as Ebola hemorrhagic fever that spread in Africa, or the new coronavirus which spread throughout the world have become a serious threat to public health. Hand disinfection is one of the most important countermeasures to control their spread, and minimize the risks of outbreak recurrence, or new infectious outbreaks.
- However, if a country relies solely on imports of disinfectants, it may face problems such as sudden increase in demand, leading to the inability to allocate sufficient quantities from exporting countries, , or import delays due to lockdowns and stagnating logistics causing disrupted supply of hand disinfectant.
- In addition, in some African countries, disinfectants that may not have sufficient disinfection effect are still used. This is due to issues like: inadequate quality checks, inapt inspection systems for imported products, or inadequate temperature and storage conditions, etc.

②Proposed solution

- This project will enable African countries to produce disinfectant locally by utilizing the company’s know-how in purchasing, production, and sales
- This project will produce high quality disinfectants (effective disinfection) by establishing a thorough quality control system that relies on measures like sampling inspections after production and before shipment, and storing samples for five years…etc

③Expected impact

- In the event of an outbreak, disinfectants can be stably secured without being affected by the infection situation in other countries.
- Improved disinfectant efficacy (for those currently using low-quality imported disinfectants) will strengthen infection prevention.
- The establishment of a plant will create employment for about 30 people.

④Time required for implementation and Investment

- About 1 to 2 years from the start of market research to the start of disinfectant production.

Project to establish a plant to manufacture and supply high quality disinfectants

Points and strengths of proposed solution

①Simple manufacturing process

- The following six machines are used for production. The process is simple and does not require any special skills, and can be manufactured with only materials and machines, so the technical difficulty is low.

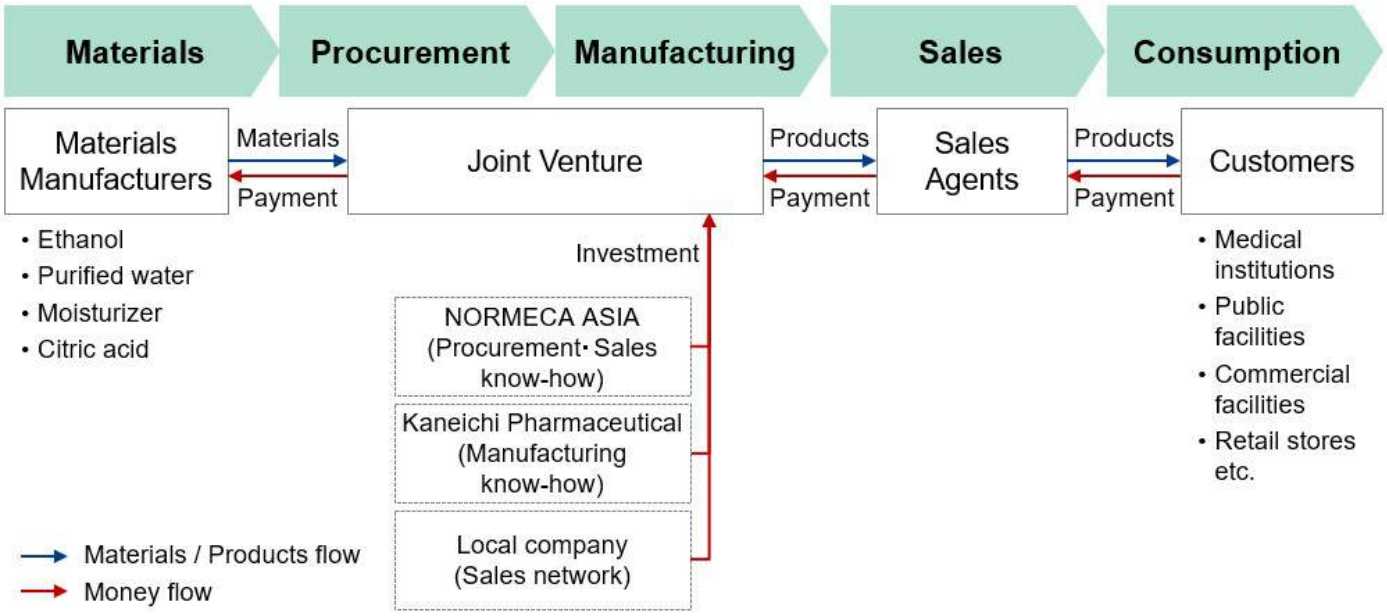
Manufacturing process (Use 6 machines)

① Cleaning machine	② Filling Machine	③ Capper	④ Printing	⑤ Labeling	⑥ Roller conveyor
• Wash a container	• Mix the ingredients and fill the container	• Close a cap	• Print a lot number	• Label	

②Prevention of secondary infection by moisturizing effect

- High ethanol concentration dries the skin and can lead to skin cracking and bleeding. This is a serious problem for medical personnel because it can cause secondary infections.
- This quality disinfectant has a powerful and deep moisturizing ability that protects the skin from cracking and prevents such secondary infections.

Implementation model



Issues for implementation

- Raw materials are expected to be purchased from local suppliers, but if procurement is difficult, they will be imported from Europe or Japan.
- The machinery and equipment necessary for production are expected to be transported from Japan to the site, but if the local infrastructure (water and electricity) is insufficient for stable operation of the plant, it will be necessary to purchase equipment to compensate for this (generators, water purifiers, etc.).

株式会社 アスアル
US ALL CO.,LTD.

Project to deliver healthcare service to rural areas with difficult access to medical facilities using mobile medical vehicles

US ALL CO., LTD.

Mobile medical buses equipped with medical instrument to meet local needs

- Since medical instrument can be selected and installed according to local issues and needs, it is possible to improve healthcare service provision in a cost effective way.
- Contributing to the acquisition and improvement of physicians' skills by providing them with on-the-job training using the mobile clinic buses.
- In the future, the company will set up local offices mainly in East Africa, and will provide maintenance service for their medical instrument.

Goal：Aim to reduce the risk of serious illness and death among patients in rural areas by improving their healthcare environment

①Problems to be solved

- The significant uneven distribution of health human resources and medical instrument has resulted in health disparities between urban and rural areas. In rural areas, patients' access to appropriate healthcare is inadequate due to the limited number of medical institutions, and the limited medical instruments in those institutions.
- One of the reasons why medical institutions are not able to maintain medical instrument is the expensive cost. Moreover, the high out-of- pocket expenditure paid by patients limits their access to healthcare, even if medical equipment is actually maintained.
- In many cases, albeit doctors availability, medical institutions and clinics in rural areas are unable to provide healthcare services of sufficient quality and quantity due to the lack of experience in using sophisticated medical instruments.

②Proposed solution

- Introduce mobile medical buses equipped with advanced medical instrument made by Japanese manufacturers to the regional core hospital, to provide high-level medical services to rural residents who have difficulties in accessing hospital.
- Utilize high-quality refurbished medical instrument and buses to meet local needs.

③Expected impact

- Improve the health status of rural residents who previously had difficulties accessing medical facilities, and reduce the risk of serious illness and death among patients.
- By eliminating the need to travel to urban medical facilities, the transportation cost burden on rural residents can be mitigated.
- The use of refurbished medical instrument and buses will keep costs low and therefore reduce the burden of medical costs on medical institutions and patients.
- The quantity and quality of medical care provided in the region will be improved through the acquisition and development of physicians' skills via repeated on-the-job training using mobile medical buses.

④Time required for implementation

- From manufacturing the buses to implementing them in site, it takes 12 - 18 months.
- Necessary technical training for maintenance will be provided by company’s engineers.

Project to deliver medical care to rural areas with difficult access to medical facilities using mobile medical vehicles

Points and strengths of proposed solution

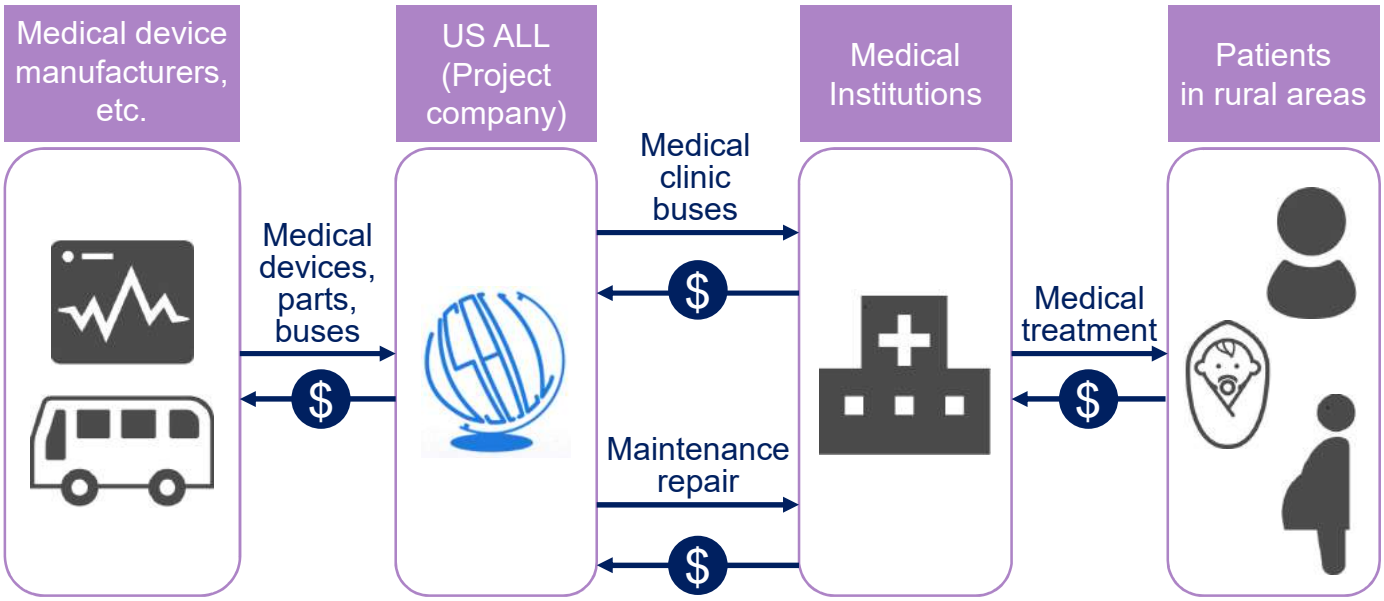
①Provide high quality yet affordable medical instrument and buses.

- Expertise in procuring quality used medical instrument and buses in Japan, as well as in refurbishing (repair and maintenance) technology for them.
- Competitors' products have limited functions (e.g., analog X-ray systems, low-performance CTs, etc.) depending on budget size, but with know-how and technology, the company can provide high-performance products (e.g., digital X-ray systems, high-performance CTs with a large number of detector rows, etc.) at approximately 50-60% of the price of new products.

②High level of experience and global track records in mobile clinic buses

- It is not enough to simply load medical instrument on a mobile medical bus, it is also necessary to equip the vehicle with various features such as X-rays shields and clean water and electricity supply. We have accumulated this know-how through many years of experience, and have sold mobile medical buses equipped with X-rays in Japan, the Philippines, Vietnam, and other countries.
- The Company is strengthening its maintenance system for medical instrument and mobile clinic buses by establishing local offices and collaborating with medical instrument dealers, mainly in East Africa. The company also has partner companies in India and Pakistan to build a global maintenance system.

Implementation model



Issues for implementation

- In order to export medical instrument, it is necessary to apply for and obtain approval in accordance with the export regulations of each country.
- Vehicles provided by this project are mainly route buses or minibuses, therefore, there is a risk that they may not be able to travel or may damage the medical instrument in poor road conditions.
- It would be more desirable if public insurance is/will be widely available so that even low-income rural residents can pay for medical care.
- Japanese buses are right-hand drive, therefore, it may be difficult to procure left-hand drive buses.

Project to establish a special zone for healthcare R&D and create new growth markets for wellbeing of people in Africa

QUNIE CORPORATION

Develop the medical industry, and contribute to economic development, job creation, and improvement of healthcare

- Establish a special zone for healthcare R&D by preparing an IT infrastructure for managing personal healthcare information and opening up the data to companies and research institutes.
- The special zone called Medicon Valley in Northern Europe is a successful model. There is yet no such initiative in Africa. This project would meet great needs of the utilization of medical data to tackle health and other issues unique to Africa through investment and expansion of its potential new market.

Goal：Contribute to the advancement of industrial structure, the creation of employment, and the improvement of the healthcare environment

(1)Problems to be solved

- In Africa, diversification of industries is required for economic growth, and since the countries rely on Europe and the US for medical technology in particular, it is expected to develop its own medical industry and create a continuous system for solving healthcare issues.
- In Africa, there are few places where advanced medical research can be conducted, as a result, high skilled human resources are draining away to the US, Europe, etc. (brain drain)

(2)Proposed solution

Propose the establishment of a special zone for healthcare R&D in the following steps, involving relevant stakeholders.

【Step 1：Building a Data Infrastructure】

- Accumulate medical-related data useful for R&D by linking with existing healthcare-related data such as EHRs. We consider that prerequisites are national ID and EHRs.
- Promote the collection and accumulation of genomic information.

【Step 2：Attract R&D investment】

- Differentiate itself as a healthcare R&D institution by leveraging its ability to fully and openly utilize healthcare-related data acquired in Step 1.
- Attract R&D investment by easing investment restrictions, providing tax incentives, and developing facility infrastructure.

【Step 3：Induce synergies in R&D】

- Induce synergies in R&D by promoting partnerships among research institutions and with domestic companies.
- Support the commercialization of R&D to create tangible benefits.

(3)Expected impact

- The promotion of R&D using data from African people will advance research on diseases unique to Africa and contribute to the establishment of new prevention and treatment methods.
- By attracting various institutions and establishing an environment where they can collaborate on R&D and business, opportunities will be created for advanced medical human resources to play active roles and contribute within Africa. It will also create a wide range of employment, including housing, food and beverage, and other industries.

Project to establish a special zone for healthcare R&D and create new growth markets for wellbeing of people in Africa

Points and strengths of proposed solution

(1) first-mover advantage

- While similar projects are being implemented one after another in developed countries, attracting a lot of investment money, there are still a limited number of projects on the African continent, leaving a lot of opportunities.
- Healthcare R&D can be differentiated from projects in developed countries because it requires research that takes into account differences in race and lifestyle. This is a field where there is a high possibility of gaining first-mover advantage by starting early.

Implementation model

Step 1	Step 2	Step 3
		
Building a Data Infrastructure	Attract R&D investment	Inducing synergies in R&D

Issues for implementation

Project to make cardiovascular treatment more accessible to patients.

Asahi Intecc Co., Ltd.

Catheter labs to provide low-cost cardiovascular care to patients across the country

- Asahi Intecc manufactures advanced medical devices used for cardiac catheterization such as guide wires and guiding & balloon catheters.
- We are looking for the following **two partners** – together with whom we'd like to operate a catheter lab / cardiology center in Africa:
  1. Local cardiology hospital / center, and
  2. Tele-health technology company

(1)Problems to be solved

- As the economy in Africa grows, non-communicable diseases, especially cardiovascular diseases, are becoming the primary cause of deaths in many countries as in high-income countries. However, due to insufficient facilities, scarcity of experienced cardiologists, and lack of health insurance, people do not have access to affordable cardiac treatments. The current healthcare model poses questions of affordability, availability, quality and variety.
- Medical devices to treat cardiovascular diseases for high-income countries are often too expensive, or do not satisfy local needs in low-/middle-income countries.

(2)Proposed solution

- Together with a local cardiology hospital and a tele-medicine technology company, we operate a cardiology center / catheter lab that provides the local population with quality cardiovascular treatments at competitive price.
- The center / catheter lab will also be able to monitor, examine, or/and diagnose those patients who live in a remote area and cannot come to the facility timely.
- In the long run, we hope to develop devices that address local issues in the area based on the local needs that we identify through this project.

(3)Expected impact

- Quality cardiology treatments to become more accessible for many patients by addressing the following issues
  - Insufficient facilities → a catheter lab with equipment and technologies to be established.
  - Scarcity of experienced medical professionals → Japanese cardiologists to give training to local doctors and nurses.
  - Lack of medical insurance → medical cost to be lowered by increasing the utilization of the facility by accepting patients from other medical institutions.
  - Patients in a remote area cannot commute → tele-health technologies to be adopted. It'll enable the government to reduce its cost to serve and the burden of delivering medical care to a wide area.

④Time required for implementation

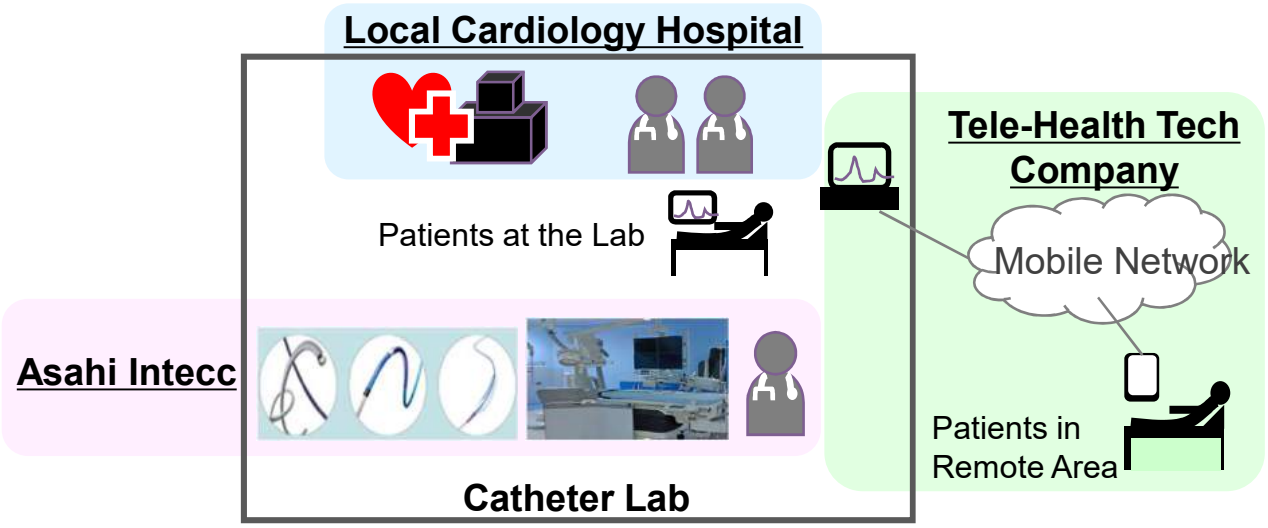
- To be discussed.

Project to make cardiovascular treatment more accessible to patients.

Points and strengths of proposed solution

- Asahi's catheter products are sold in 110 countries, and its guidewires have the top market share globally. The company considers Africa the key area for growth in the future. Hence, it is committed to successfully execute its growth plan on the continent.
- Asahi has built good relationships with KOL (Key Opinion Leader) doctors in Japan. Therefore it can send a skilled cardiologist to Africa to give training to local medical staff.
- Asahi's subsidiary in Italy provides catheter lab services across the country. Asahi plans to use its knowledge and expertise to successfully establish a leading service provider in Africa.

Implementation model



Asahi Intecc to:

- Help install necessary equipment and technologies and leases them out to the lab.
- Provide technical support and preventive maintenance of the equipment
- Procure medical devices, and maintain adequate stock level
- Provide medical training to local doctors and nurses by experienced Japanese cardiologist

Local Cardiology Hospital to:

- Provide a catheter lab facility, and quality service at competitive prices, while complying with all the regulations
- Work with other hospitals and other healthcare organizations to accept patients from them
- Hire and manage doctors, nurses, and other staff members

Tele-Health Tech Company to:

- Provide healthcare services on a technology platform which enables patients in all part of the country to access quality service, which otherwise would require long commutes and high cost. Examples of such technologies include tele-monitoring devices such as remote ECG that alerts a doctor to changes in health condition of a patient in a remote area.

Issues for implementation

- It may need to obtain necessary license or accreditation from the authorities to operate a catheter lab by following local regulations.

公益社団法人 日本臨床工学技士会 Japan Association for Clinical Engineers
一般財団法人 臨床工学国際推進財団

Project to develop Human Resources: Medical / Clinical Engineers

Japan Association for Clinical Engineers / Clinical Engineering Global Promotion Foundation

Training MEs and CEs to properly manage and use medical equipment in hospitals

- Clinical engineers, a national medical qualification unique to Japan, support the training of MEs(Medical Engineers) and CEs(Clinical Engineers).
  - ✓ ME：Management of medical equipment (maintenance, inspection, repair, etc.)
  - ✓ CE：Management and operation of medical equipment (assisting doctors)
- This will help prevent medical device malfunctions and extend the life time of medical devices. In addition, by delegating some of the physician's work to CEs, physicians can spend more time on tasks that only physicians can perform.

Goal：Enabling the sustainable provision of high-quality medical care by training domestic MEs and CEs

(1)Problems to be solved

- It is difficult to continuously provide high quality medical services due to situations where medical devices cannot be used for the following reasons.
  - ✓ Equipment breakdowns are frequent due to lack of proper maintenance and inspection of medical equipment. In many cases, the cause of breakdowns is unclear and thus the equipment is discarded.
  - ✓ Since there is lack of money for maintenance, most of medical equipment that has defects left unused.
  - ✓ It takes long time for repairing of medical devices after the failure.
- Physicians are too busy to provide the sufficient amount of medical services to meet the demand of patients.

(2)Proposed solution

- Train personnel who can manage and operate medical equipment in hospitals.
- If necessary, this project will support the establishment of a department within the university to train MEs and CEs. Specifically, the project will support curriculums and syllabuses preparation, and provide on-site training.
- Support the creation of a national medical qualification and the development of an educational system for CEs.

(3)Expected impact

- Preventing equipment failures and prompt repairing will enable the sustainable provision of high-quality medical services.
- Appropriate management will also increase the usable life of medical equipment and reduce the cost of purchasing medical equipment.
- Contribute to the development of the domestic medical industry, as knowledge about medical equipment will be accumulated and more peripheral tasks such as dealing with equipment malfunctions will become possible, instead of only importing equipment as finished products.
- By delegating some of the work of physicians to CEs, physicians will be able to spend more time on tasks that only physicians can do.

④Time required for implementation

- In order to maintain the quality of medical care as a country, it is important for universities and other academic institutions to be able to issue diplomas or certificates. In order to do this, it will be necessary to open a department at a university, and if the preparation period is included, it is expected to take at least three years to issue a diploma.

Project to develop Human Resources: Medical / Clinical Engineers

Points and strengths of proposed solution

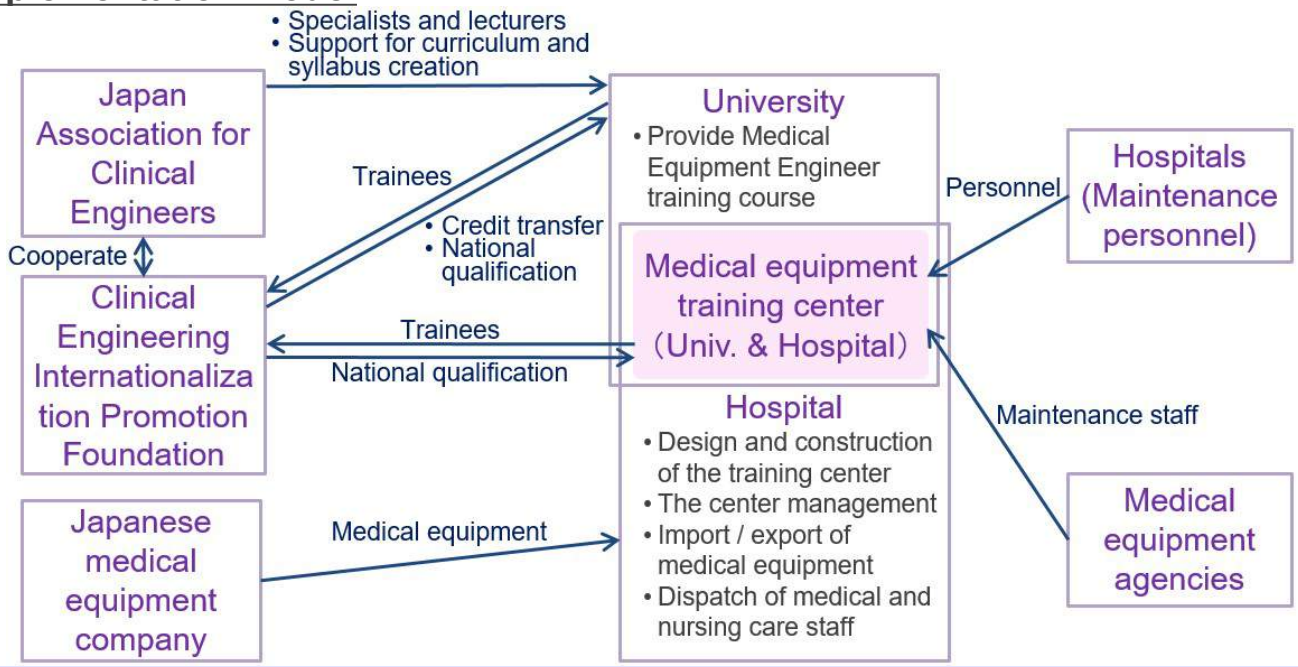
(1)Achievements in Asia and Africa

- In Asia, the Department of Medical Engineering has already been established in universities, and a system for issuing certificates has been established. In Africa, related projects are currently underway in Tanzania and Tunisia.

(2)Support in initial cost

- Issuing diplomas or certificates for MEs or CEs can be considered as a major of a higher education institutions.
- Consultation with the Japanese side on curriculums and lecture syllabuses is free of charge. Dispatch of lecturers can be discussed separately.
- Subjects that can be taught in the country (liberal arts, medicine, and engineering) will be taught by faculty members of existing educational institutions, while Japan will provide support for subjects that are lacking and for lectures and practical training related to medical engineering.

Implementation model



Issues for implementation

- Medical equipment used for the training and education does not have to be new, but should be selected according to need and purpose. For example, the equipment and budget will vary greatly in case that the engineers to be trained need to handle radiation.
- A certain amount of fund is necessary for the country to implementation.

Project for a COVID-19 rapid test kit (Point of care testing (POCT))

G CUBE CO., LTD.

<u>This rapid test kit will check the infection of COVID-19 without doctor, nurse, medical laboratory and any other medical equipment and confirm the presence of antibodies after the vaccination.</u>

- Visual self-check with the color of the line using the rapid test kit by the immunochromatography method
- Utilization for the screening as extensive check
- Confirmation of the presence of COVID-19 antibodies due to the infection in the past or vaccination by the presence of antibodies against the S protein

<u>Goal：Providing a rapid test kit for the antibody of COVID-19</u>

(1) Problems to be solved

- The lack of medical services and the insufficient number of health care providers persits. Their concentration in the urban areas leads to uneven distribution of medical services.
- Despite the efforts to supply the new coronavirus vaccine to African countries, the confirmation of antibodies among vaccinated people has not progressed.
- The lack of nearby medical facilities and hospitals limits the number of tested people and thus the exact number of infections remains unknown.

(2) Proposed solution

- Perform screening using the rapid test kit that allows people to test quickly by themselves.
- Test vaccinated people using the antibody test kit to investigate the antibody acquisition status.
- Perform tests on unvaccinated people using the antibody test kits to confirm their infection status.
- Use the antibody test kit to test infections in remote areas with no medical facilities.
- Introduce small and lightweight test kits to rural areas at low costs

(3) Expected impact

- The vaccination effect (antibody acquisition rate, etc.) can be understood from the test results, and the vaccination program can be implemented efficiently.
- Valuable information on the infection can be obtained by understanding the history of illness, .
- A wide range of tests can be implemented including the rural area.

(4) Time required for implementation

- While it is necessary to set up minimum necessities such as securing an inspection venue and collecting results, it can be easily implemented only with the test kits.

Project for a COVID-19 rapid test kit (Point of care testing (POCT))

Points and strengths of proposed solution

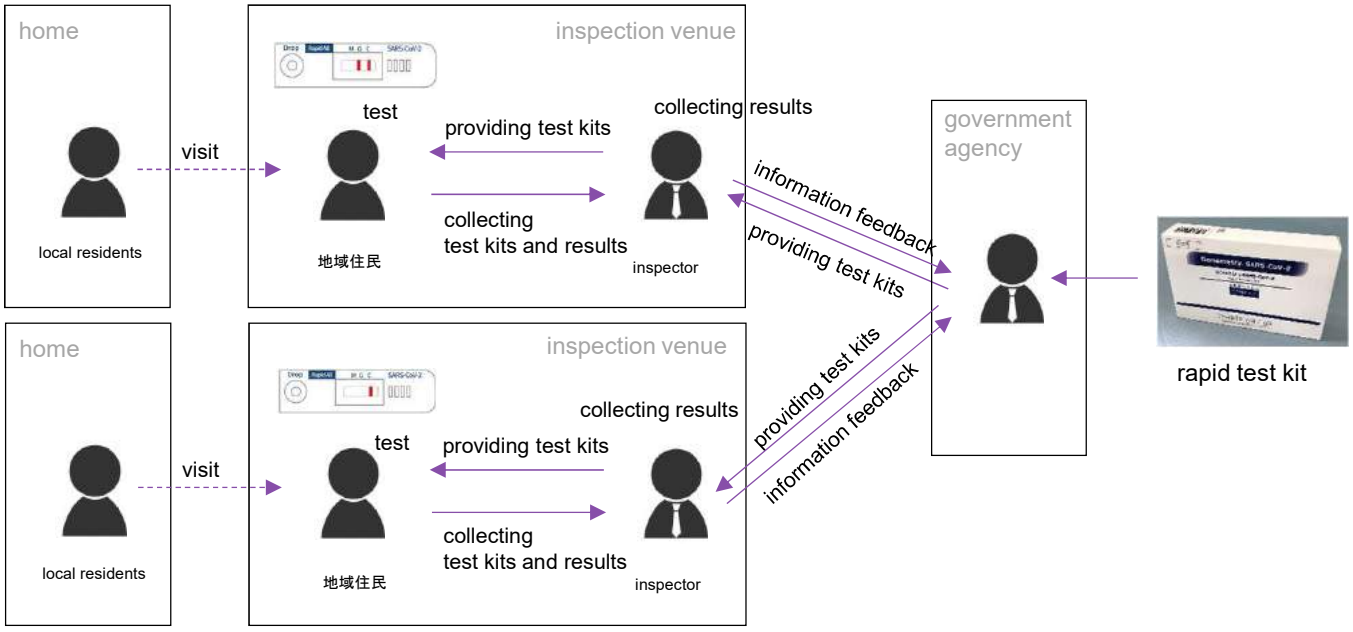
(1) Easy & Rapid

- Can be completed by visual confirmation after about 20 minutes with 1 kit per person
- Can be completed by simply taking a small amount of blood and antibody test sample by oneself.
- Allows to not only diagnose previous infections but also to detect antibodies after vaccination.
- Allows to reduce initial costs without using expensive equipment.

(2) performance and quality

- 100% negative concordance rate and extremely low risk of false positives
- As Japanese companies, licensed to manufacturing and sales of in-vitro diagnostic drugs in Japan, will carry out the manufacturing and quality control of research reagents, it is secured to supply stably the test kits of high quality.

Implementation model



Issues for implementation

- The establishment of a test sample collection system .
- The aggregation and the utilization of test results.
- The provision of the test kit to target population as smoothly as possible.

伯鳳会グループ HAKUHOKAI GROUP

Project to improve the rate of survival in disasters and emergencies by mobile medical system

Hakuhokai and Hikifune Hospital

Developing mobile medical system using trucks with medical equipment and electricity generation system

- The rate of survival would improve if certain tests and initial treatment using diagnostic imaging, chemistry testing, vital signs monitoring, etc. could be carried out on-site in areas where a disaster has impaired the local medical system.
- we developed a truck furnished with CT, ultrasound and chemistry testing equipment, and observation beds (Unit 1), a separate one (Unit 2) to provide power.

Goal：Saving lives by establishing an emergency medical system

(1) Problems to be solved

- When the local medical system is damaged by a disaster, it will not be able to provide appropriate medical care to save the lives it possibly could. If mobile medical systems can be brought to areas where urgent medical care is required, emergency medical care for disaster victims can be provided appropriately. By using truck vehicles, a mobile emergency medical system can be established in a financially sustainable manner.

(2) Proposed solution

- Propose the establishment of an emergency medical system utilizing two trucks:
- The first truck has the function of medical examination facility and it is equipped with Diagnostic Imaging Devices, Laboratory Testing Devices, and Bed Side Monitor.
- The second truck has the function of power supply, water storage, and network equipment carrier.

(3) Expected impact

- It is the only way to provide medical care using the power of advanced medical equipment in areas where the medical infrastructure has taken a hit or where there is no adequate medical infrastructure. We can provide emergency medical care to any area where trucks can enter.
- In addition to disaster response, the system can be used for traveling medical treatment in rural areas where medical equipment is inadequate. It can also be used as an isolated medical facility to deal with infectious diseases.

(4) Time required for implementation

- Only the time required to install the medical equipment on the bus and transport it to the country. We can provide the standard system in three months.

Project to improve the rate of survival in times of disaster by mobile medical system

Points and strengths of proposed solution

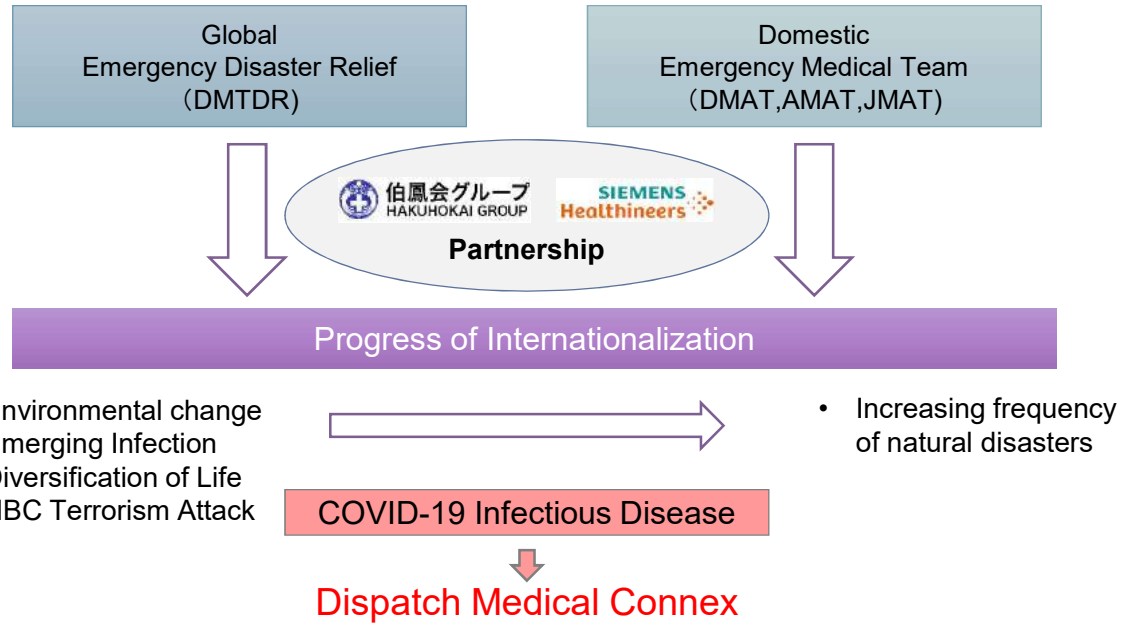
(1) Experience in Japan

- Such systems are used in Japan in disasters such as storms and earthquakes, and in accidents involving trains and automobiles. In Japan, the Fire Department and other government offices possess such emergency response systems that utilize trucks. Since trucks can be transported by ferry, the emergency medical system is also provided to areas where overland travel is difficult, like island areas.

(2) Low initial investment and operation costs

- Due to its mobile feature, one system can cover a wide area, making it a much cheaper to implement than building a medical facility.
- During normal times, the system can also be used to provide medical services in remote rural areas, thus contributing to universal health coverage as well as emergency medical services.
- The operational cost of the emergency medical system itself is very small.

Implementation model



Issues for implementation

EXAWIZARDS

Project to provide AI-based remote rehabilitation assistance

ExaWizards Inc.

The AI-based remote rehabilitation support service will provide high-quality rehabilitation support to a large number of patients.

- Rehabilitation is important in the quality of life after discharge from the hospital, but the rehabilitation support available to patients is limited in both quality and quantity due to insufficient resources.
- This is a solution that allows therapists to provide rehabilitation support remotely, and also uses AI to analyze walking posture and other factors to automatically propose a rehabilitation program.

Goal: Improving the quality of life after hospitalization

(1) Problems to be solved

- Not enough therapists are available to provide appropriate rehabilitation support to patients. There are large regional differences. Especially in rural areas, there is also lack of awareness of the importance of rehabilitation.
- Even with a system that provides appropriate rehabilitation, the period covered by insurance is often limited due to medical cost constraints, and therefore, not enough support can be provided.

(2) Proposed solution

- We can offer a solution that allows therapists to provide rehabilitation support remotely, that uses AI to analyze walking posture and other factors to automatically propose a rehabilitation program.
- It has the function of gait analysis. The AI analyzes the speed, rhythm, stagger, and left-right difference from the video of the patient undergoing rehabilitation, and can suggest the best training based on the gait automatically.

(3) Expected impact

- It can prevent the deterioration of quality of life after discharge from the hospital due to inadequate rehabilitation.
- Because of the use of AI, there are fewer restrictions on the number of therapists and other personnel, and it is possible to reach a large number of patients.

(4) Time required for implementation

- It is in the practical stage for Asians. There is a possibility that it may need to be customized based on the physique and gait of Africans, and it is assumed that this will be done starting with demonstration tests.

Project to provide AI-based remote rehabilitation assistance

Points and strengths of proposed solution

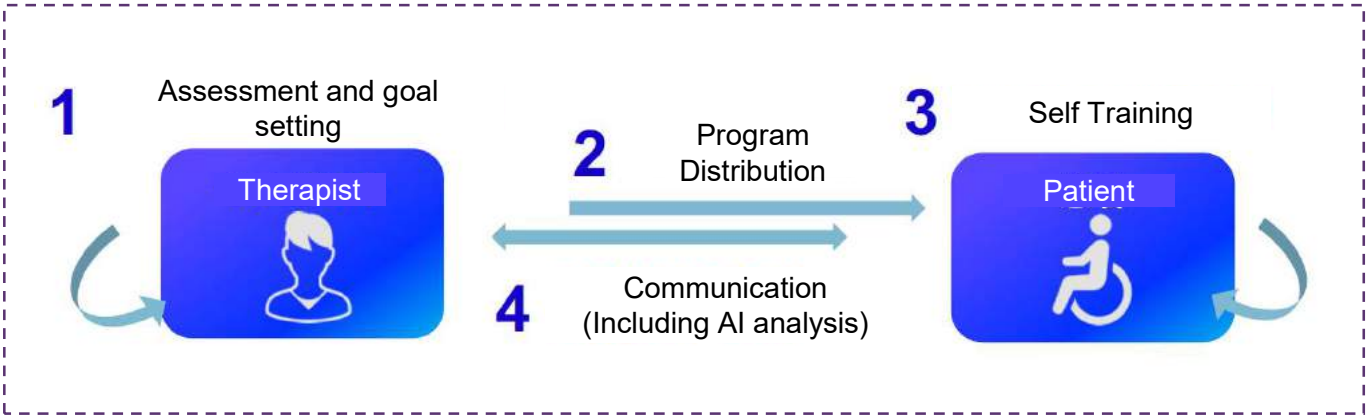
(1) Very limited resource constraints

- In improving rehabilitation, the availability of skilled therapists has become a constraint. This solution does not only make the use of the therapist's time effective by providing remote support, but it also has almost no resource constraints due to AI technology usage, which somewhat replaces the therapist's functions.
- No facilities such as hospitals are needed, and patients can be rehabilitated at home, thus reducing the overall cost to society of providing adequate rehabilitation.

(2) Bridging the regional divide

- It will be possible to provide high-quality rehabilitation support to patients in rural areas who have not been able to receive it in the past.
- The patient only needs a smartphone or tablet and a communication environment.
- This solution can contribute to the realization of UHC.

Implementation model



Everything is on the platform.

Issues for implementation

- Since rehabilitation is a part of medical treatment, it is necessary to follow its rules in the country concerned. In Japan, we conducted a series of demonstration experiments in cooperation with medical institutions, positioning it as a rehabilitation support.

Project to address the shortage of healthy protein by using beans in Africa

DAIZ Inc.

Developing healthy menus using plant-based meat to reduce the incidence of diabetes and other lifestyle-related diseases.

- By using the above plant-based meat instead of conventional meat, we can develop healthy menus that are locally relevant and reduce the risk of lifestyle-related diseases.
- To promote health literacy by making people aware of the health benefits of consuming plant-based meat.
- By developing plant-based meat that meets the tastes and preferences of local people, it is possible to reduce their resistance to plant-based meat.

Goal：Providing a rapid test kit for the antibody of COVID-19

(1) Problems to be solved

- The number of starved people is increasing in most parts of Africa. In addition, explosive population growth continues, making it increasingly difficult to produce and provide sufficient quantities of food.
- There is a need for a new food system that will reduce malnutrition and hunger in Africa.
- On the other hand, the number of people suffering from lifestyle-related diseases due to excessive calorie intake has been increasing dramatically.

(2) Proposed solution

- In order to broaden the scope of the use of plant-based meat, we will develop healthy menus (e.g., high protein and low fat) that suit the tastes and preferences of local people, and provide them as menus for restaurants and school lunches.
- To raise awareness of the health benefits of consuming plant-based meat and to improve health literacy.

(3) Expected impact

- The widespread use of healthy menus is expected to reduce the incidence of lifestyle-related diseases such as diabetes, which has become a social problem in Africa, eventually leading to the reduction of medical costs.
- In the future, if it is possible to produce “plant-based meat” using locally produced legumes, it can be expected to increase self-sufficiency, reduce environmental impact, and even provide a stable income for farmers. In addition, the production of meat, which is a source of protein, requires large amounts of food and water, so the widespread use of plant-based meat will eliminate a major concern about environmental impact.

(4) Time required for implementation

- Since plant-based meats (including prototypes) with various ingredients have already been developed, it is already possible to start developing locally adapted menus.

Project to address the shortage of healthy protein by using beans in Africa

Points and strengths of proposed solution

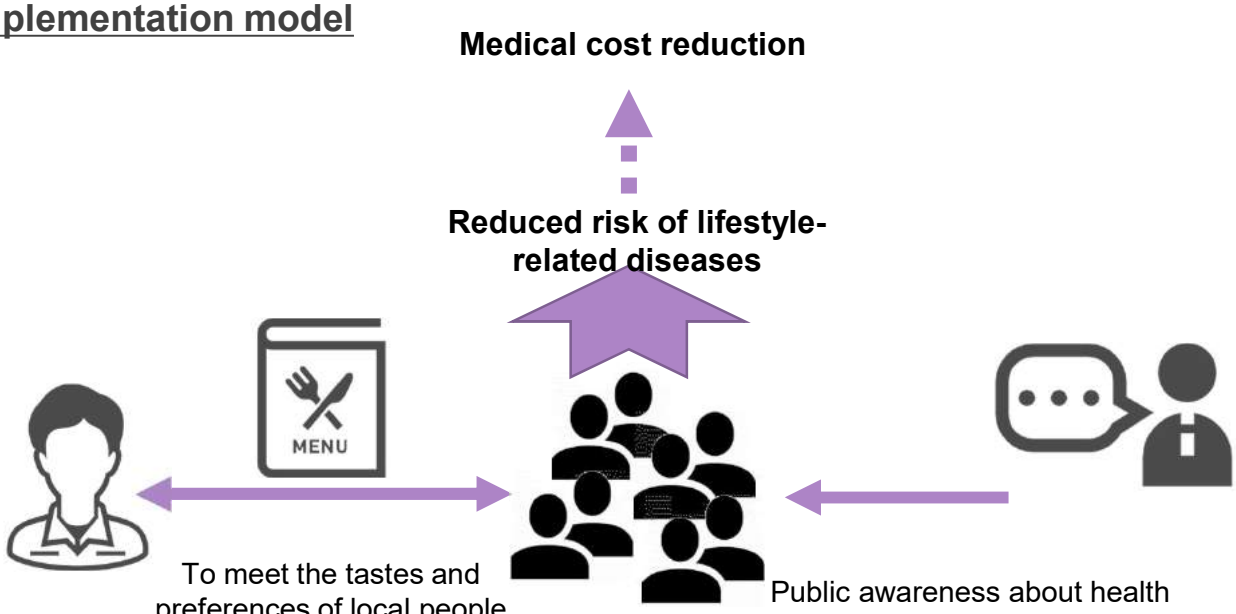
(1) High quality in nutrition and taste

- The technology of DAIZ, which has been attracting worldwide attention for the development of “Miracle Meat” (Patent No. 5722518 / US Patent No. 8756861), is a technology that can dramatically improve the nutritional components, flavor, and functionality of soybeans. It consists of applying various stimuli such as environmental factors and adding bacteria in a timely manner after germination. It is a technology that can dramatically improve the nutritional components, flavor, and functionality of soybeans.
- While other plant-based meats are flavored by adding ingredients other than soybeans, this technology is one of the few in the world that can reproduce all beef, pork, and chicken while also recreating the meat like texture by utilizing soybeans only..
- This product is already being marketed by several companies in Japan.

(2) Small initial investment

- Since a variety of plant-based meats have already been developed using the above technology, it is possible to develop healthy menus based on these plant-based meats and their manufacturing recipes, and to compress the initial cost of testing and introducing these menus.

Implementation model



Issues for implementation

Project to increase food production through soil improvement by 100% natural agricultural material (“MR-X”)

FUMIN Co., Ltd.

Improve the soil with 100% natural agricultural material to increase crop yields and enhance nutritional quality

- "MR-X” is a soil conditioner made from 100% natural material. In Japan, it is widely used in agriculture with the certification of agricultural cooperatives.
- It is a strongly acidic liquid with a pH of 2.7. It is extracted from marine sediments such as plankton and seaweed. Although it is an acidic liquid, it has the effect of preventing soil oxidation and activating phosphoric acid, essential for plant growth.

Goal：Increasing food productivity and providing adequate nutrition

(1) Problems to be solved

- Chemical fertilizers are commonly used to increase food production, but they are expensive, out of reach for small farmers, and not sustainable because they degrade the soil. This soil conditioner is safe enough to be consumed by humans and does not degrade the soil. It will be diluted with a large amount (500 times) of water, so 1 liter (USD 40) per hectare is enough to achieve the desired effect.

(2) Proposed solution

- This soil conditioner works on the fundamental functions of plants, so it is expected to be effective for all kinds of crops. It can be used in two ways:
- 1. Soak the seeds in a solution diluted with water. Doing so will revitalize the plant.
- 2. Spray the solution diluted with water. This will deter oxidation of the soil and activate the nutrient phosphoric acid.
- It is effective to do both, but either one will be sufficient.

(3) Expected impact

- In experiments conducted in Japan and Asia, crop yields doubled and the weight of each crop also doubled, therefore, quadrupled in weight-based production.
- It has been proven to improve not only the yield, but also the quality. For example, the sugar content of fruits increases, and they taste better, so they can be sold at a higher price.

(4) Time required for implementation

- Can be implemented immediately.

Project to increase food production through soil improvement by 100% natural agricultural material (“MR-X”)

Points and strengths of proposed solution

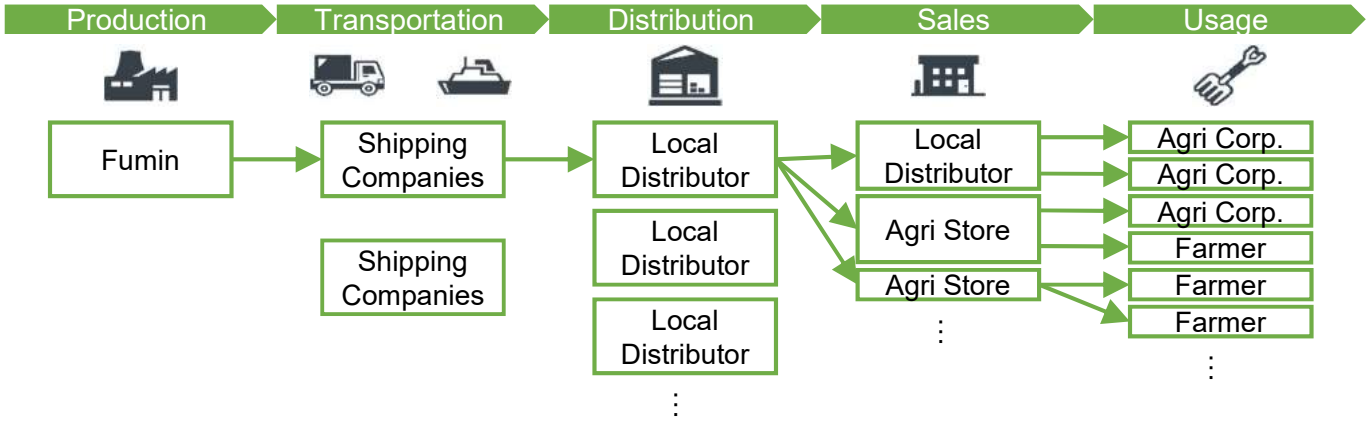
(1) Safe, Easy to use, Effective, and Cheap

- It is 100% natural and completely harmless for humans to drink.
- It is very easy to use as you can buy it in 1 liter bottles and just dilute it with a lot of water.
- In Japan, it is widely used as it is recognized to increase both yield and quality.
- It costs only USD 40 per hectare, which is very inexpensive compared to chemical fertilizers.

(2) Experience in Africa

- Experiments have already been conducted in Cote d'Ivoire, Senegal, and Morocco, and have shown clear results in promoting plant growth.
- It has also been introduced as an excellent technology in UNIDO's Sustainable Technology Promotion Platform (STePP).

Implementation model



Issues for implementation

- It is a 100% natural soil conditioner, but may be subject to the same regulations as chemical fertilizers in some countries. In such cases, the product must undergo test cultivation before it is allowed to be sold, which means that it takes time and money to introduce.
- Since it is commonly used in Japan and its content is clearly harmless, we can expect early approval even in countries where agricultural materials are regulated.

Project to provide clean water in areas with poor water sources by small water purification system

TODA CORPORATION, Y's Global Vision, Inc.

Lightweight, ultra-compact water purification system capable of purifying water at the same level as large seawater desalination plants

- Any water source (including seawater and contaminated water) can be purified to remove salt and impurities to produce clean drinking water that meets the standards of Japan's Water Supply Law.
- Since it does not require large-scale construction of facilities or infrastructure, it can deliver clean water to small villages without major infrastructure investment.
- It can also run on solar or wind power.

Goal : Achiving access safe dringking water for all

(1) Problems to be solved

- There are still many people left without access to clean drinking water. In areas where there is no good water source, they are forced to drink contaminated water, harmful to their health.
- There is currently no solution that can provide clean drinking water to areas that do not have adequate waterworks systems.

(2) Proposed solution

- This ultra-compact water purifier can be used to purify water perfectly, even from sources such as the sea or dirty grounds.
- The mechanism is the same as that of a large seawater desalination plant, and the quality of the water that can be purified is also the same. Although the amount of water that can be purified is limited due to the small size of the system, the cost of installation is overwhelmingly low.
- The system can also run on solar and wind power, so it can be installed in areas that are not electrified.

(3) Expected impact

- It can provide clean water in small villages where large-scale infrastructure development and water supply are not available.

(4) Time required for implementation

- If there is an environment where water can be stably sourced via a pump such as the sea, rivers or well, the equipment can be brought in for immediate installation.

Project to provide clean water in areas with poor water sources by small water purification system

Points and strengths of proposed solution

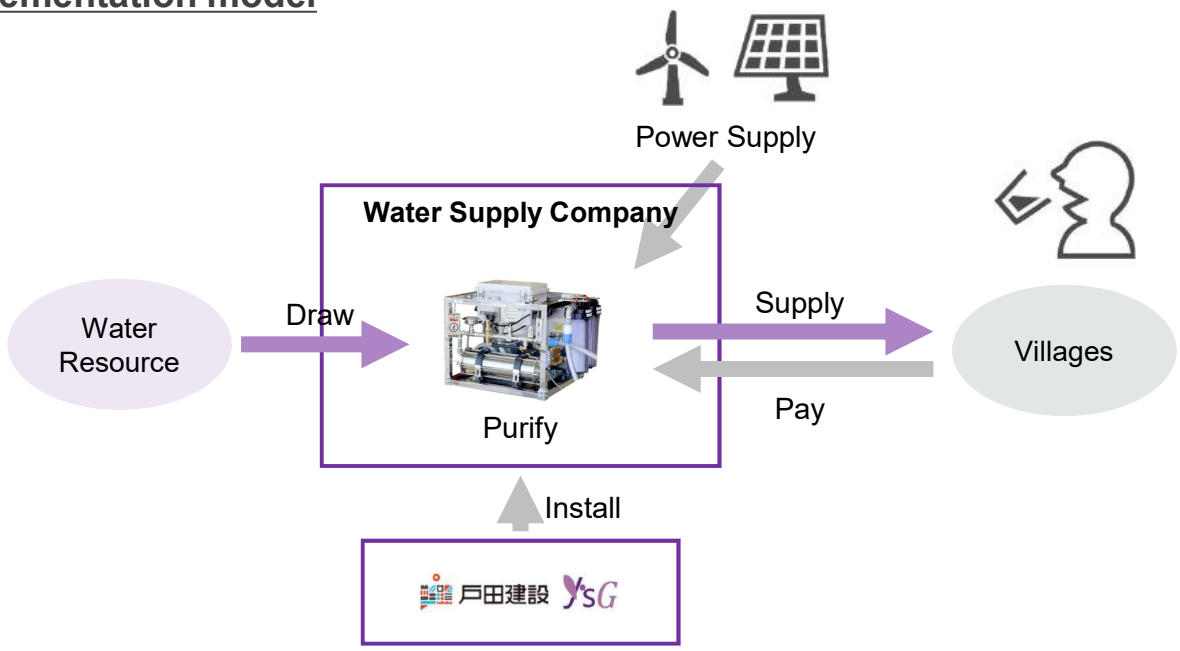
(1) Very good cost effectiveness

- It requires a very large investment to install water supply systems in villages far from cities, but this facility can provide clean water at a low cost. In other words, it is a kind of "off-grid" solution for water.
- If the required amount of water is to cover a very small village, the water purification system alone can be installed with an initial investment of about USD 20K. (The amount varies depending on the amount of water supply)

(2) Experience in Africa, in many types of sites

- It has been sold in South Africa and Uganda due to its high cost-effectiveness.
- This water purification system has also been installed in small islands and ships. They are also effective in preparing water supplies for disasters.
- It has also been introduced as an excellent technology in UNIDO's Sustainable Technology Promotion Platform (STePPP).

Implementation model



Issues for implementation

- In order to install the system in un-electrified areas, it is necessary to develop the power facilities at the same time.

Project to increase food production by Plant Factory

Multiple companies

Growing crops in factory will improve agricultural productivity and the nutritional value of crops.

- By cultivating crops in a factory using artificial light and culture fluid, crops can be stably produced regardless of climatic conditions and soil properties.
- Improved varieties of functional crops can also be stably produced, which can contribute to improving the nutritional value of crops.
- This is mainly for high value-added crops such as vegetables.

Goal: Increasing food productivity and providing adequate nutrition

(1) Problems to be solved

- Even though it is known which nutritional deficiencies the local population is facing, the lack of a variety of nutritious foods that can supplement these deficiencies is causing health problems.
- Due to climatic conditions and soil properties, there are some crops that cannot be grown even if one wanted to.
- In order to grow crops on poor land, large amounts of chemical fertilizers and pesticides are being applied, causing problems with environmental protection and food safety.

(2) Proposed solution

- A plant factory uses LEDs as a light source and culture fluid instead of soil to grow agricultural products in an environment where temperature, humidity, and air conditioning are all controlled by AI.
- It is possible to systematically grow and harvest vegetables of a constant quality without being affected by climate change. There is no need to worry about insect damage and no need for agricultural chemicals, and the safety of crops is enhanced. It also eliminates the need for washing in water, which saves on processing.

(3) Expected impact

- Crops that could not be cultivated due to climate conditions or other reasons can be grown. It will be possible to grow crops that match the nutrient deficiencies of the region.
- Since there are few external factors, cultivation can be done without any farming experience or knowledge.

(4) Time required for implementation

- It takes at least a year to build a factory.

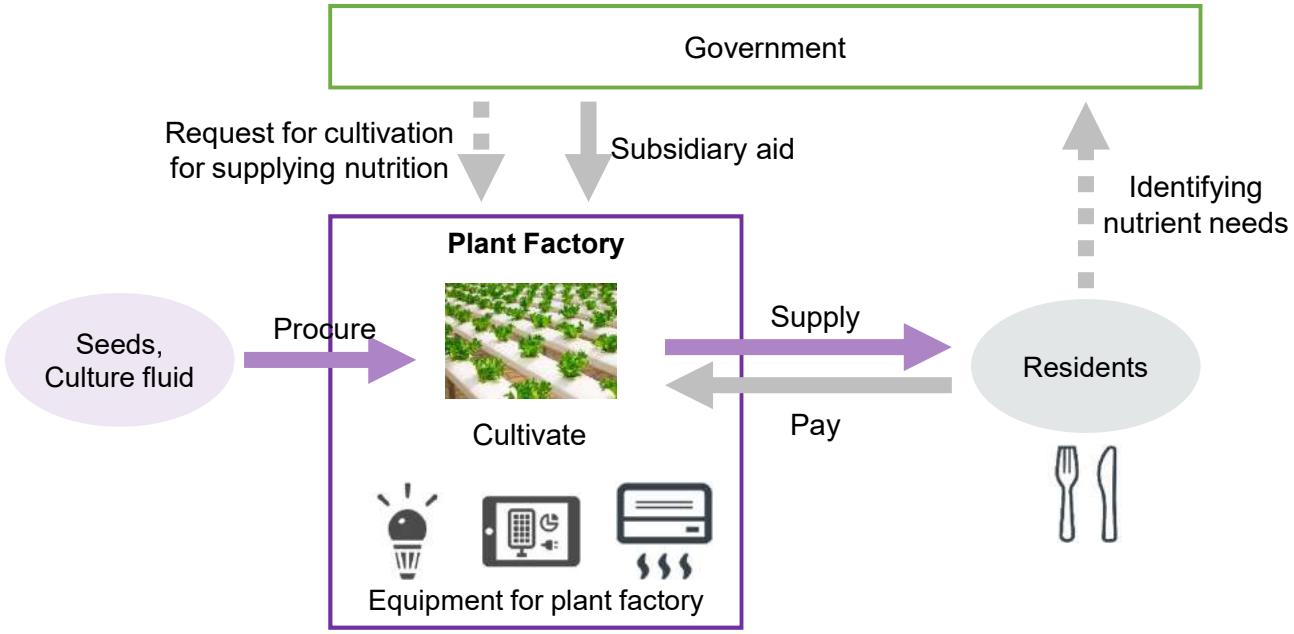
Project to increase food production by Plant Factory

Points and strengths of proposed solution

Variety of crops, variety of technologies

- In Japan, there are lands with various climatic conditions, where a wide variety of grains, vegetables, and fruits are grown. Based on the know-how cultivated there, efforts are being made to produce a variety of crops in plant factories, and many companies are engaged in fierce competition for technological innovation.
- The magnitude of the cost of plant factories is an issue, but new technologies are emerging to solve this problem. For example, water is circulated in ordinary plant factories, but by using a film with very small holes, only water and nutrients can pass through, blocking out harmful substances, thus eliminating the need for water circulation. This will lead to significant cost savings, especially in areas with water shortages.

Implementation model



Issues for implementation

- Since the construction of plant factories is very expensive, they need support from public financing programs.

Project to provide adequate nutrition to children by School Lunch System

Multiple companies and local government

Scene of JICA project in Madagascar
Source: JICA

Providing nutritious school lunches (“Kyushoku”) for children

- In Japan, it is common for lunch to be served as a school lunch in public elementary and junior high schools.
- For a while after World War II, the main purpose of the program was to provide adequate nutrition for children, but nowadays, the program also aims to promote understanding of food, develop appropriate eating habits (e.g., obesity prevention), and foster human relationships through food.

Goal: Providing adequate nutrition for growing children

(1) Problems to be solved

- Inadequate food supply for growing children.
- An unbalanced diet causes nutritional imbalance, which is detrimental to children's health.

(2) Proposed solution

- In Japan, school lunches are commonly provided in public elementary and junior high schools. The cost per person is lowered by cooking in large quantities and partly subsidized by taxes, which makes the cost of school lunches very low.
- Some municipalities even provide the meals free of charge. There is also a system to subsidize the cost of school lunches for families with financial difficulties.
- Not only is the food delicious, but its nutritional value is also taken into consideration.

(3) Expected impact

- All children, regardless of their family situation, will have access to adequate nutrition, with a low social cost.
- Increased understanding of food and the likelihood of healthy eating habits in the future.

(4) Time required for implementation

- While it takes time to establish a school lunch system, it is an initiative that can be started immediately with certain subsidies from the government and local governments.
- Nutritional guidance in reviewing menus can be obtained from Japanese experts.

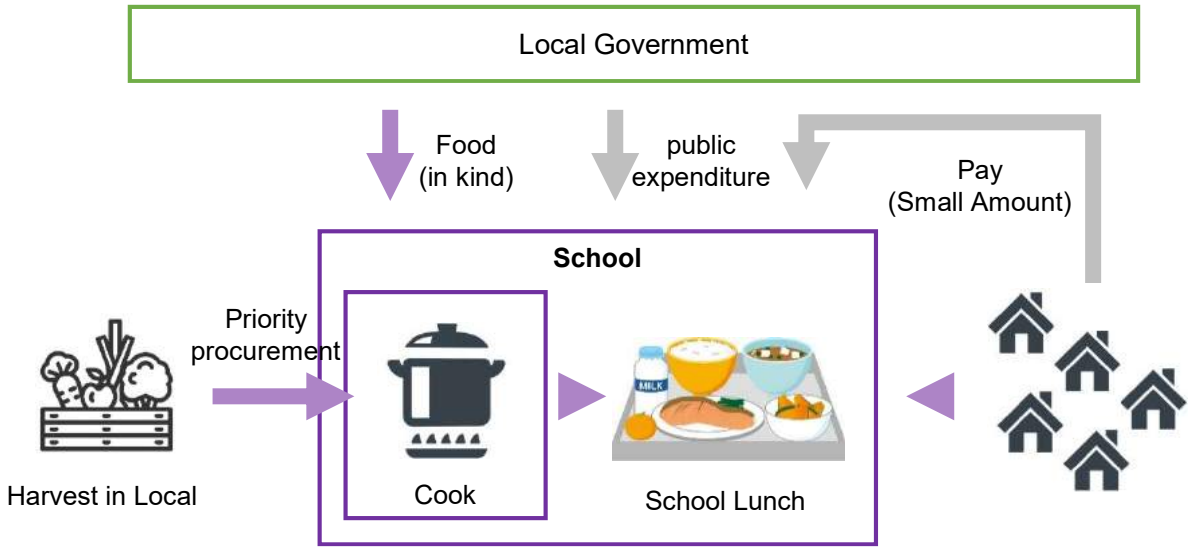
Project to provide adequate nutrition to children by School Lunch System

Points and strengths of proposed solution

Know-how backed up by years of experience

- School Lunch system started in 1889 when meals were distributed free of charge at an elementary school. Before the war, school lunches had already spread and were provided in several schools, but the war brought this situation to a halt. After the war, provision of school lunches gradually resumed with food aid from the United States and other countries. In 1954, the School Meal Law was enacted, since then school lunches were been provided in most elementary and junior high schools.
- School lunches have been established to serve not only one purpose of providing nutrition, but a variety of other purposes. Now, it is the common understanding for Japanese people that food and appropriate eating habits are cultivated through school lunches.
- There is a wide range of know-how in the management of school lunches, including hygiene management and optimization of cooking costs, and many countries have praised the system as one of the best in the world.

Implementation model



Issues for implementation

- In Japan, there is a system to provide school lunches to children below elementary school age, such as public nursery schools. In order to more drastically solve the issue of nutrition, it would be desirable to have a system that provides school lunches to preschool children as well.

Project to provide adequate nutrition by advanced means of preserving food (Freeze-drying)

Multiple companies and local government

<u>If food can be stored for a long period of time, it will be possible to deliver essential nutrients to rural areas</u>

- Freezing and canning have been used as a means of preserving food for a long period of time, but freezing requires a cold chain and canning is limited in terms of suitable ingredients, so a new means of preserving food is needed.
- Freeze-drying are being used to enable long-term storage of food. Since it is much less sensitive to climatic conditions, it can be an effective solution regardless of the region.

Goal: Providing adequate nutrition for all

(1) Problems to be solved

- Even though it is known that certain diets lack some essential nutrients, the lack of variety of food sources that can actually provide these nutrients still causes malnutrition problems..
- Due to climatic conditions and soil properties, there are some crops that cannot be grown even if one wanted to.
- Lack of cold chain and freezing/refrigerating storage systems makes it difficult to bring in highly nutritious food from other regions.

(2) Proposed solution

- Freeze-drying is a processing method in which food is frozen and then placed in a vacuum to sublimate its water content. As the water sublimates, the food can be stored for a longer period of time, and when water or hot water is added, the food easily returns to its original state, retaining its nutrition and flavor.
- Sublimation of water in food inhibits the action of enzymes and microorganisms in the food, thus enabling long-term preservation without the addition of additives.
- In addition to being rich in nutrients, freeze-dried foods are light, easy to transport, and do not require facilities for storage.

(3) Expected impact

- It will be possible to supply tasty and nutritious food to areas where nutritious food is not sufficiently available, such as rural areas.

(4) Time required for implementation

- Equipment for freeze-drying process is needed. Although it is possible to import processed foods from Japan and other countries, it is more cost effective to install processing equipment locally.
- At the point of consumption, storage facilities are not necessary for long-term safekeeping, but clean water or hot water is necessary.

Project to provide adequate nutrition by advanced means of preserving food (Freeze-drying)

Points and strengths of proposed solution

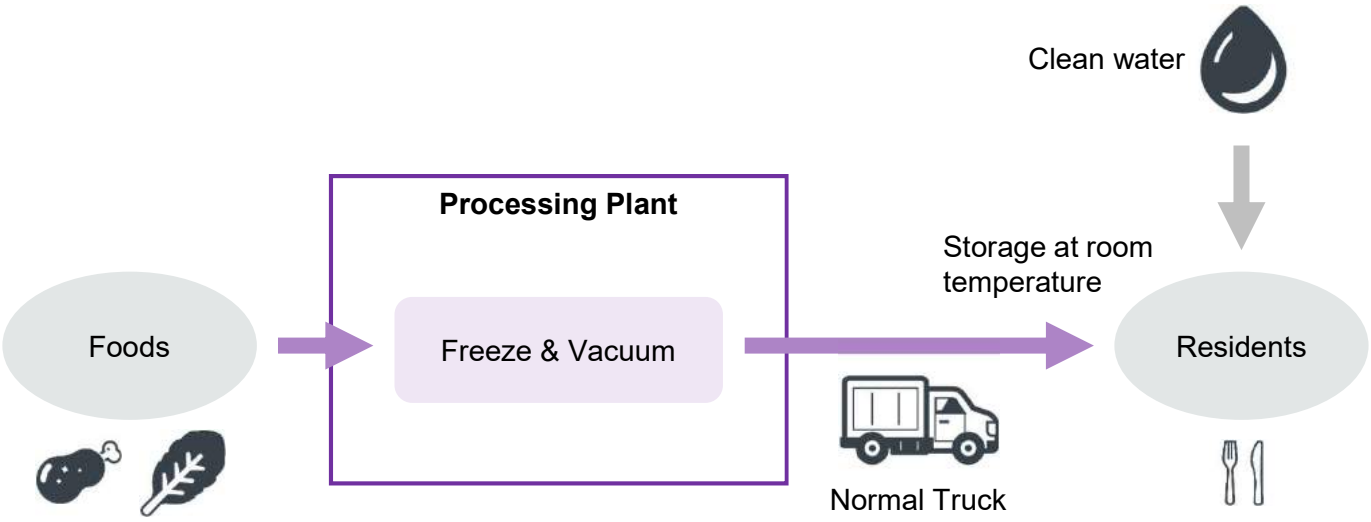
(1) Limited capital investment (No need for cold chains, freezers, etc.)

- Freeze-dried foods do not require special equipment for transportation or storage, making them easily accessible in any region, unlike frozen foods.
- Although freeze-dried processing facilities require investment, the market is expected to grow rapidly worldwide due to the low cost of distribution and storage, and the high added value of the food (high nutritional value and delicious taste).

(2) Technology that can be used for all kinds of food

- Basically, any food can be freeze-dried.
- While it's true that not all foods can be returned to their original form by adding water or hot water, but the nutritive value can be preserved in all cases, and any food can be processed without losing its nutritional value.
- If we can identify the lacking nutrients in rural areas, we can compensate that lacking intake by processing and delivering locally relevant and specific nutritious foods.

Implementation model



Issues for implementation

- Since clean water is essential for eating freeze-dried foods, it is advisable to consider combining this with solutions for securing water in rural areas and other areas.