



**Social implementation research on cultivation of rice suitable for sake brewing by effluent from large scale Johkasou
—Eco-friendly sake “Sui Shigen” is newly released ! —**



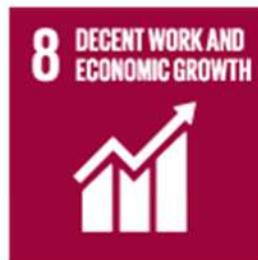
Dr. Shuhei Masuda

Associate Professor, Civil Engineering and Architecture, Department of Creative Systems Engineering,
National Institute of Technology Akita College



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD



- ✓ Goals for sustainable development
- ✓ Resource circulation in whole society is one of the important themes

Medieval Japan : Realization of a resource recycling society by sewerage resource and agriculture

Farm village

I would like to make a good rice field. How do I achieve it?

Compost storage is ...

It is traditional agricultural equipment that is used on agriculture from long time ago.

Compost has used carefully as fertilizer .



Agricultural products



Trading of night soil

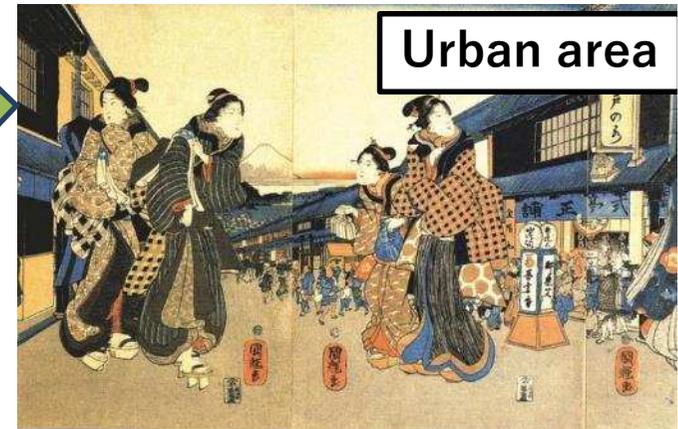
Annual desludging fee of vault toilet is 5 ryo (1 ryo = Approx. JPY 100,000~400,000, Housing complex with 12 rooms)



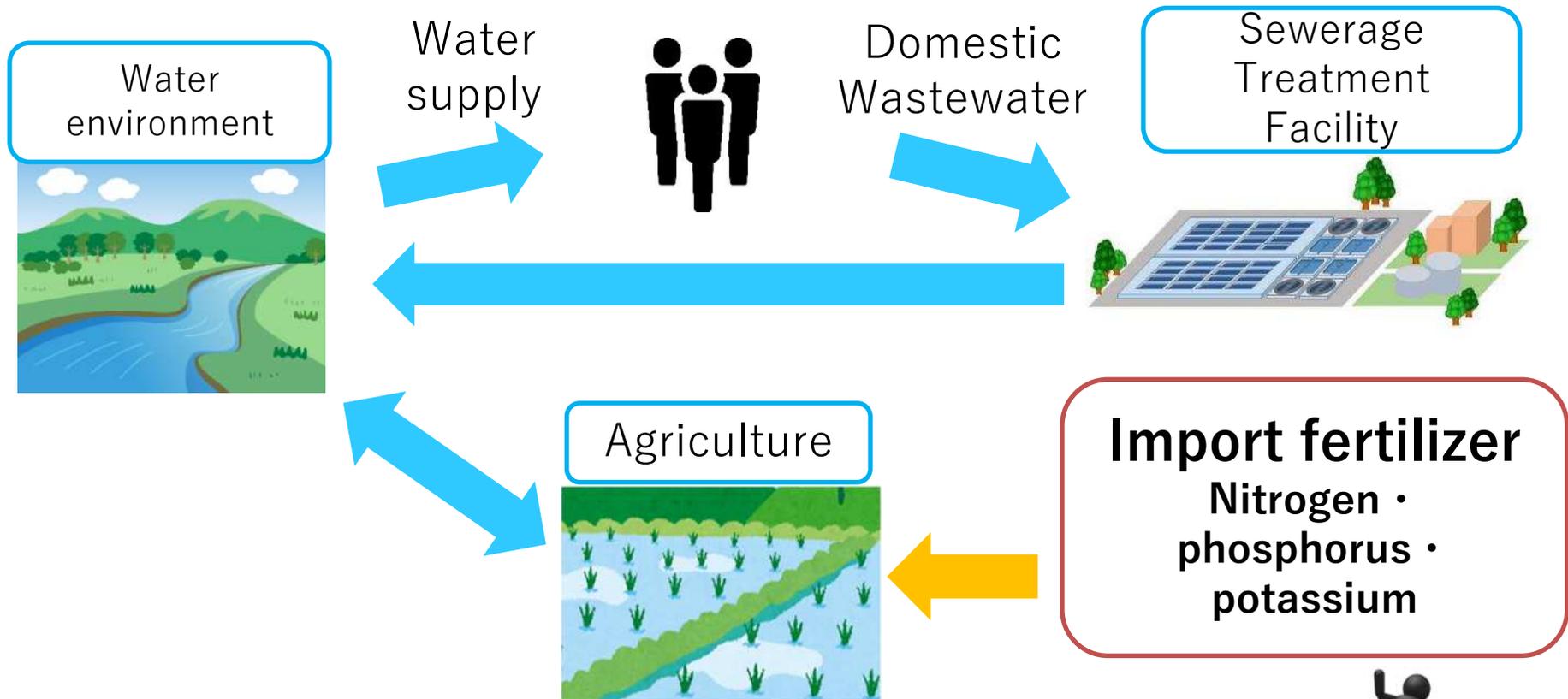
Night soil



Urban area



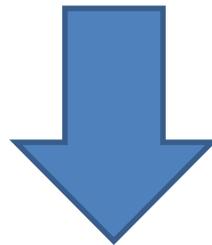
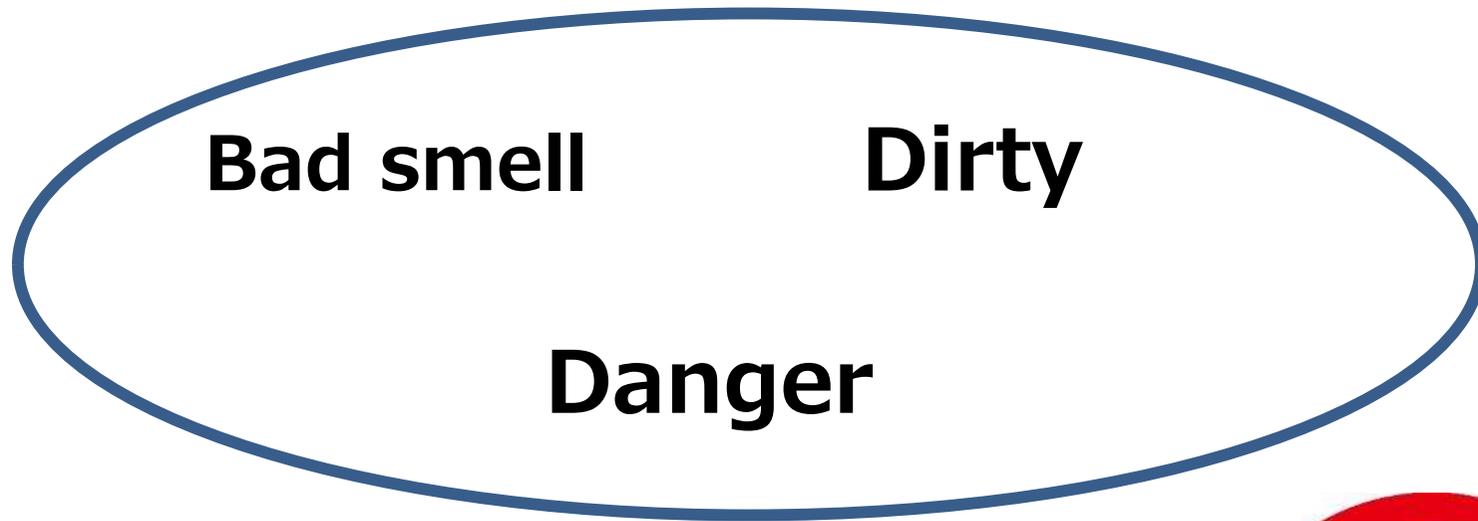
Modern times : Disconnection of sewerage system and agriculture



- ✓ **Isolation** of water • resource circulation
- ✓ Agriculture **depends on import fertilizer**

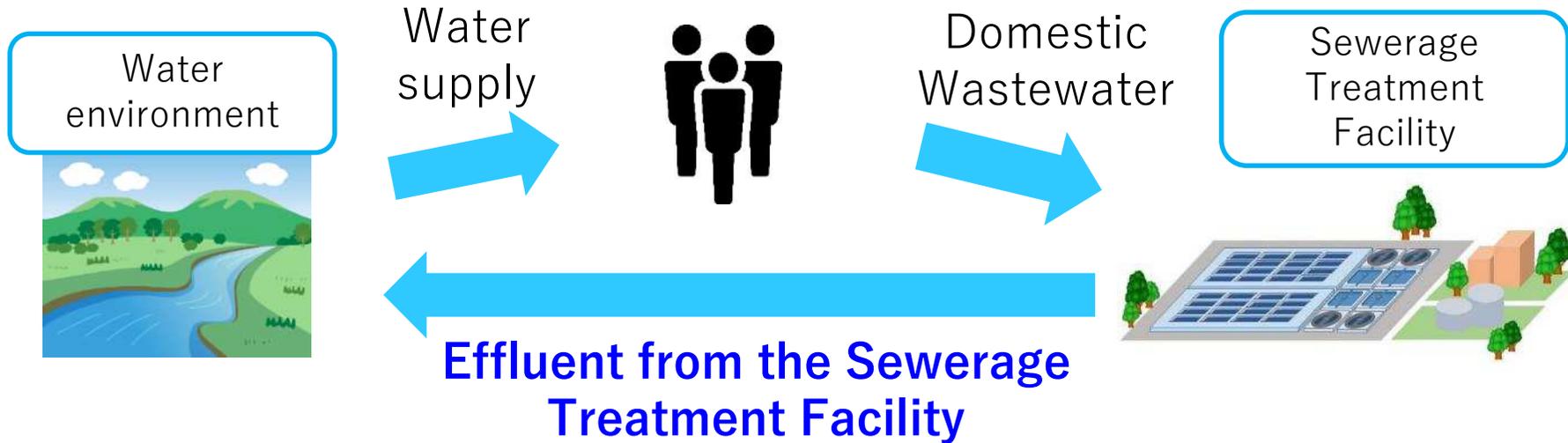


Formation of stereotype on sewerage resource



Using for agriculture is outrageous!

Domestic Wastewater Treatment is...



- ✓ **Scientifically safe water** that is implemented by biological treatment and disinfection
- ✓ Containing **nitrogen and phosphorus** can be used as nutrition for plant



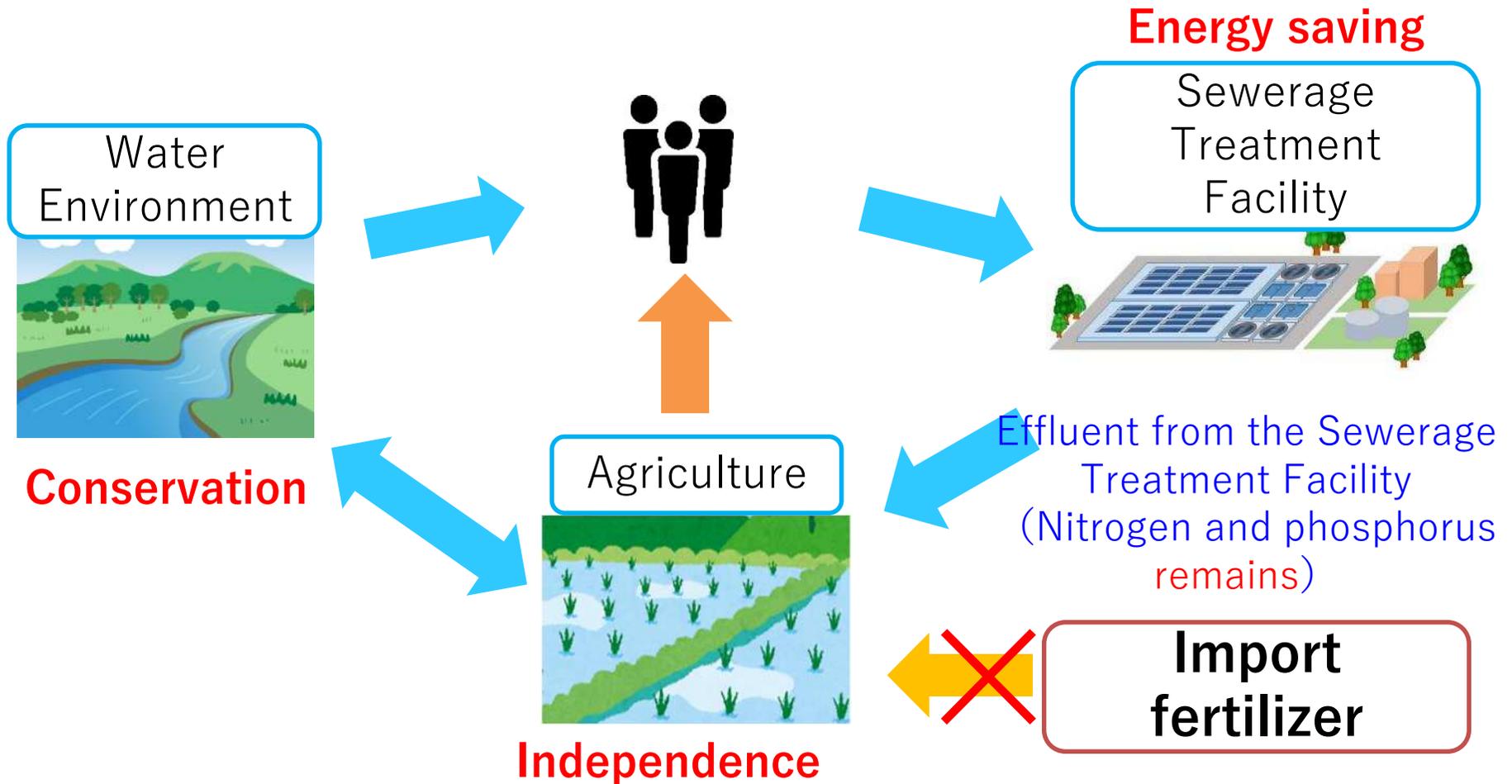
It's possible to utilize in hygienically condition as agricultural fertilizer

Advanced treatment : There are cases that require much energy to remove nitrogen and phosphorus



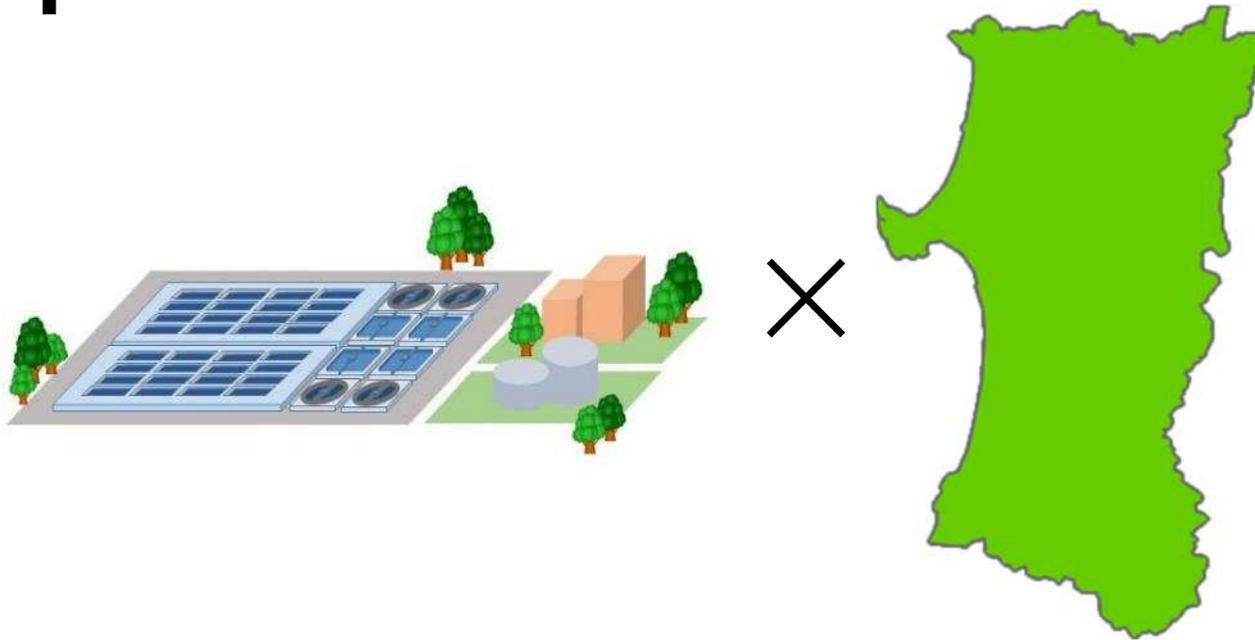
Prevention of hyper bloom of algae
(Prevention of **Eutrophication**)

Vision : Goal of resource circulation



Establishment of sustainable regional community by circulation of water & resource and preservation of environment

Idea got in Akita prefecture



Effluent from the Sewerage Treatment Facility

×

Rice suitable for sake brewing (brewer's rice)

×

Sake

History

FY 2017~2019

Test in the pilot paddy field : **evaluation of safety**

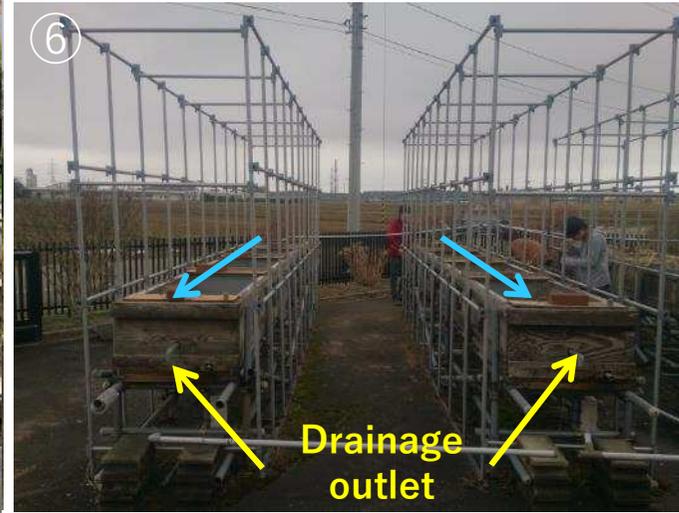
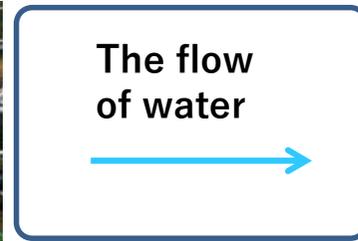
FY 2020~ongoing

Test in the actual paddy field : **evaluation of quality & technology**



Test in the pilot paddy field (brewer's rice "Akita Sake Komachi" × effluent from the Sewerage Treatment Facility)

○Experiment with Reactor (effluent + rain water)



○Experiment with pot in greenhouse (effluent + tap water)



Safety : Influence of heavy metal for soil and unpolished rice

unit : mg/kg

	Item	Measured value	Standard value
Act to Prevent Soil Contamination on Agricultural Land Control standards for the prevention of the accumulation of heavy metals in the soils in the farmland	Cadmium (Rice : 35 samples, 2017~2019)	0.02 ✓ (Max : 0.07)	0.4
	Copper (soil : 2 years)	16.1 → 8.8 ✓	125
	Arsenic (Soil : 2 years)	4.8 → 4.8 ✓	15
	Zink (Soil : 2 years)	85.0 → 84.1 ✓	120

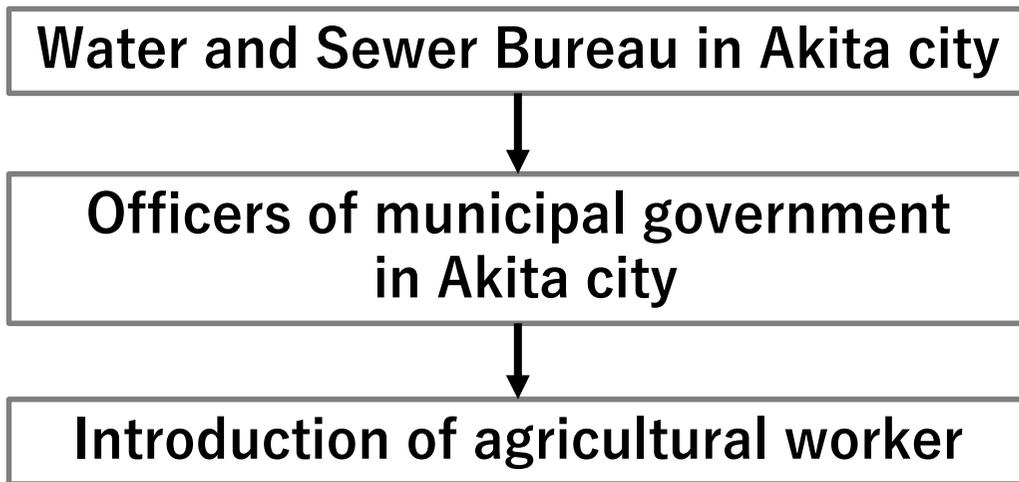
Risk of heavy metal by irrigation of effluent is **low**

NEXT STEP : Search for the paddy field for demonstration

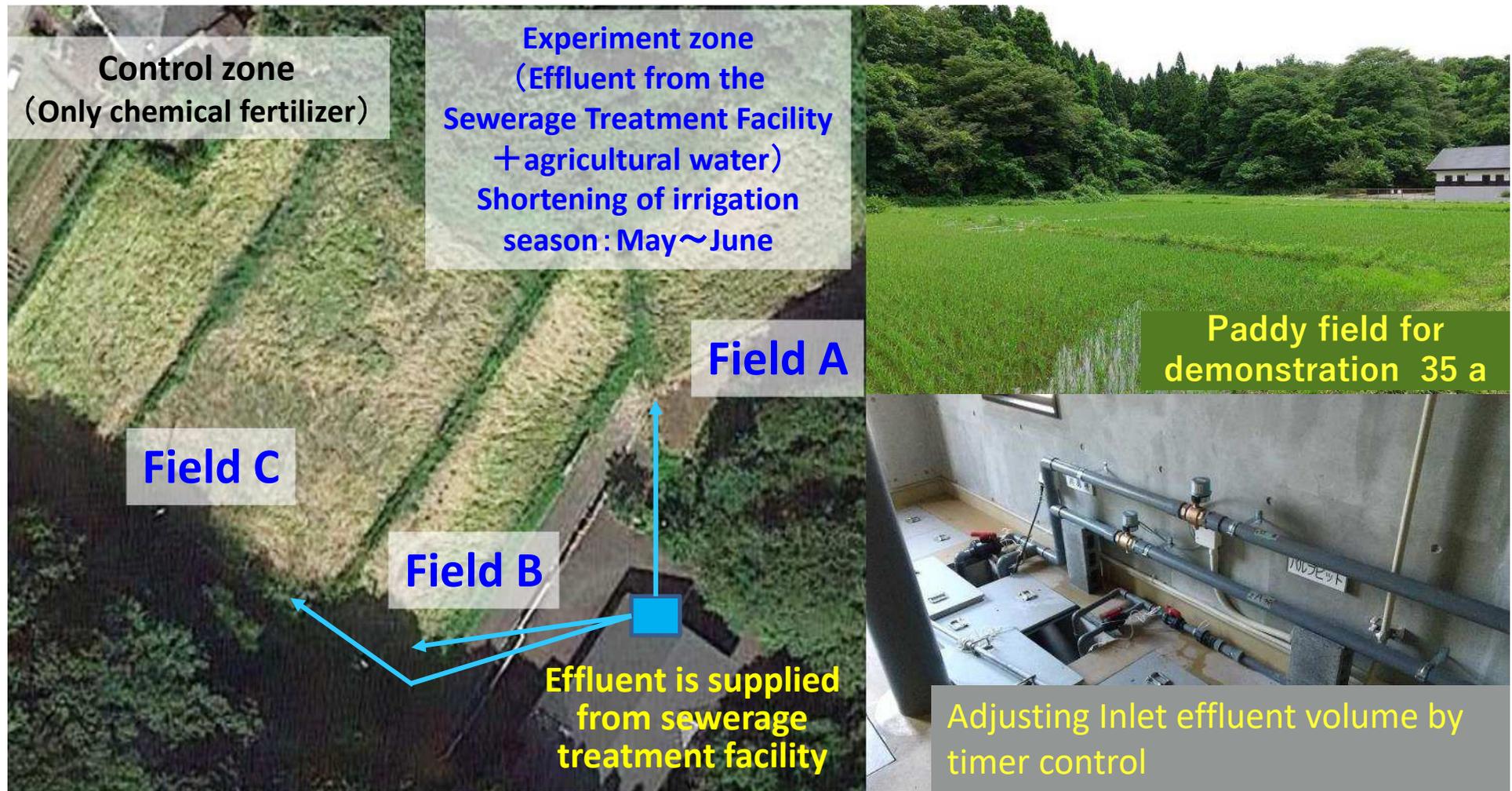


Condition

- ① Paddy field shall be located **nearby** the sewerage treatment facility
- ② Can get **approval** by farmers
- ③ Irrigation of effluent in paddy field shall not affect to the around **water supply**



Activities in the actual paddy field (FY 2021)



- ✓ Scale up to 35 a
- ✓ No chemical fertilizer · cultivating brewer's rice by effluent from the Sewerage Treatment Facility + irrigation water
- ✓ Load of effluent from the Sewerage Treatment Facility: Field A < Field B < Field C

Status of growth



Quality of harvest

	Experiment zone (Average of 3 fields)	Judge	Control zone
Crude protein (6.5~8.0%)	8.9%	△	8.2%
Thousand kernel weight (Less than 28.5g)	26.8g	○	27.1g
Percentage of whole grain (More than 65%)	78.9%	○	77.5%
Cadmium (0.4 mg/kg)	0.06 mg/kg	○	<0.05 mg/kg

- ✓ Total amount of harvest : 1.4 t (first class rice)
- ✓ Little higher value of Crude protein in experiment zone however, it is in the **permissible range**

Towards the Brewing !



Dewatsuru Sake Brewery agreed with the purpose of this project and readily agreed to brew it. (…but requires capital)

Crowdfunding (FAN AKITA)

*Currently renamed to SCOP

【秋田高専プロジェクト】
水をつなぎ、未来をひらく米づくり
日本酒「酔思源」誕生！
ラボメンバー

プロジェクトメンバー

究極！
SDGs × 日本酒

フルーティーで
華やかな香りと
米の旨味を活かした
酒となりました！

※画像はイメージです

From 1- February to 15-March 2020,
2,168,000 JPY (from 290 people) was
collected. Also received support from
local businesses.

Thank
you !

Sui Shi Gen

Eco-friendly Sake : “**酔思源**” has debut !



National Institute of
Technology Akita College
x Dewazuru
Released in April 2020

The name of sake is derived from

「**飲水思源** (In Sui Shi Gen)」

which is an idiom made from historical events of China.

飲水思源
(In Sui Shi Gen)
~ *Those who
drink it should
remind of its
source.* ~



Statue by Lake Tazawa

Sake tasting reviews: **Gorgeous *ginjoko*,
refreshing sour taste, and good balance of
rice flavor.**

Collaboration with Students



き が け (第3種郵便物認可)

秋田高専(秋田市)の創造システム専科 准教授、増田周平さん(左)と水環境工学Ⅰらが、「下水処理水で育った酒米を使った」本酒りに挑戦している。出羽醸造造(大仙)

秋田高専 増田准教授ら挑戦

下水処理水を活用した酒米作りに取り組み増田准教授(前列中央)ら(増田准教授提供)

下水処理水で酒米栽培

品質クリア、地域資源に光

市と協力し、3月に完成予定。飲みながら、稲刈りや日本酒造りに欠かせない水の循環について思いをさせてもらおうと「酔愚漢」と名付けた。

家庭や工場から出る汚水は下水処理場で浄化され、安全性を確保した上で河川などに放出される。増田さんは「下水」という言葉に汚いイメージを持つ人もいるかもしれないが、「下水処理水は毒」と話す。この処理水には窒素やリンなど、作物の肥料となる成分が豊富に含まれている。これら成分を農作物の肥料として活用できるのではないかと仮説を立て、研究室に所属する学生と2017年から研究を始めた。

増田水田を作った稲を育てたころ、水田や土壌に含まれる銅やヒ素などの含有量が、国が示す基準値をおおむね達成していることがわかった。形が整った米穀割合を示す整粒歩合も目標値を超え、安全性と品質の問題がないと判断した。

実証結果を受け、栽培面積を着々と広げた。昨年は秋田市北手の田んぼで、酒

「秋田酒(まろ)を生育し、およそ1・4倍を取った。田んぼには近くにある農業集落排水の処理施設から下水処理水をくみ上げて流した。栽培した稲を調べたところ、有害物質のカドミウムの含有量が基準値より大幅に低いことが分かった。育てた酒米は4月4日、酒造りへの協力を依頼した出羽鶴へ納入。特別限定醸造酒として醸造される。」

「酔愚漢」の名付け親は増田さん。物事の基本を忘れず大切にすべきなという意味の中国の故事成語「飲水思源(水を飲みて源を知る)」から着想した。

「地域資源を循環させ、持続可能な農業の発展につなげるプロジェクト。活動を通して、下水処理水が普通日目の目を見ない資源に光が当たり、興味を持ってくれる人が増えたらうれしい」と増田さん。日本酒は純米大吟醸で、720g入りの瓶で2千本程度の醸造を見込んでいます。今後はパベルデザインや流通販路について話を詰めています。

(宮岡明美)

Source: 15-February, 2022, Akita Kai Shimpō

- ✓ Practical studies with actual & onsite experience
- ✓ Education for sustainable development (ESD)
; Diversity, Mutuality, Finiteness, Fairness, Collaboration, Responsibility

Image against sewage resources

Bad smell

Dirty

Danger



Benefit

- **Circulating use of local resources**
- **Reducing environmental impact**
- **Features (ethical consumption)**

Acknowledgment

- Akita City Water and Sewerage Bureau
- Akita Prefecture Construction Bureau
Sewerage Management Division
- Akita Research Institute for Food and Brewing
- Agricultural cooperative corporation
Murakoshi Nosan
- Nissui Con Co., Ltd.
- Nippon Denki Kogyo Co., Ltd.
- Yuai Building Service Co., Ltd.

Part of the content of this presentation was supported by a Sumitomo Foundation Environmental Grant.



Thank you for your attention