

How to Practice Organic Farming at Low Cost and Low Input of Labor

① Organic Rice Cultivation nurturing Life

② Organic Farming at Low Cost by Crop

Rotation with Rice-Wheat-Soybeans-油脂
作物



NPO Civil Institute of Organic Rice Cultivation

Special Feature of Life-nurturing Organic Rice Cultivation & Organic Agriculture with Material Circulation

- ① This method resembles to SRI method in basic way of thinking. Difference is while SRI practice use very young rice plants in shallow water, and have to enter the paddy field repeatedly to remove weeds, in our method, we transplant about 4.5 leave age rice plants in deep water condition, so that there is no weeds coming out, and accordingly, no need to enter the paddy field for weeding! It can be called “Japanese type SRI method”!
- ② This method utilizes and keeps the rich natural environment, and biodiversity in Asia. It is the method to achieve stable, high yield without any use of chemical fertilizer or pesticides.

The Main Points for the Success

- Preparation of paddy field with banks and biotope which keeps deep water and the biodiversity.
- Soil preparation right after the harvest, & materialize the stable high yield by the use of fermented manure originated from soy beans.
- Preparation of healthy seedling at 4.5 leave age with wide spacing.
- Weed control by paddling 1~3 times under deep water condition.
- By sparse planting of grown rice seedlings to cultivate healthy rice plants, & materialize the rice cultivation without any use of pesticide!
- Control outbreak of insects in the paddy field with rich biodiversity.
- By the crop rotation of rice-wheat-canola-soy bean or soy bean-wheat weeds are controlled, nitrogen is fixed, materialize low cost production.

Organic farming was used to be **tough fight by hand weeding**, but, if the basic technique of our method is applied, it is possible to control weeds & insects without any use of chemical fertilizer or pesticide, 100% organic production without any contamination of pesticide at low cost!

Life-nurturing Organic Agriculture ; Calendar of Activities

Items	Time		Contents of Activities	Water Management
	Month	Day		
Field & Soil Preparation	Oct.	Early	compost ・ Fermented chicken manure Application ・ Plowing	
Nursery Bed	Mar.	Early	Awning ・ seed selection by salt water Field Preparation ・ Canal ・ Farm Road Repair	
		Middle Late	Hot Water Treatment of Seeds & seed soaking Nursery bed preparation ・ hastening of germination	
Application of Basal Dressing & Weed Control	Apr	Middle	Put soil in nursery bed ・ Sowing seeds ・ Dip in water ・ Keep warm ・ Put water in pool	
			Basal dressing ・ Spray soil improving material / Plow with rotary	
Trans-planting & Weed Control	May	Late	1st puddling at main paddy field with deep water ・ shallow water management	浅水 0 ~ 5 10cm
			2nd puddling; In case of much weeds, 3rd puddling after 10 days with deep water ・ Transplant ・ Deep water management	
Check the growth of rice plants & topdressing	June	Late	Check the growth of rice plants	深水 7cm
			Topdressing & weeding	
Midseason drainage	July	Middle	Midseason drainage	間断灌水
			Check the growth of rice plants & Topdressing	
Check the growth of rice	Aug	Middle	Heading	
Harvest	Oct	Early	Harvest ・ Threshing ・ Dehulling	

注 ①ビオトープには水を混ぜ、水田の生き物の越冬を助ける。②畦畔の草刈は年間4~5回実施する。

By creating Water Reservoir/Biotope, supply warm water & keep various living things!

Let us create paddy field where rich variety of microorganisms can multiply!

Where shortage of water is problem, Create water reservoir, in cold area, create water-warming system to provide warm water to the field, which at the same time, can serve as biotope! After transplanting rice, keep the water level above 7cm. In order to prevent growth of HIE, small amount of water is kept flowing! In middle to high mountain area, cold water should be warmed above 17°C in order to prevent damage for low temperature. Water-warming reservoir is needed. In warm water, rich biodiversity will control the harmful insects in the paddy field!



Water reservoir in Bhutan; It keeps water above 17° C, & 7cm in the paddy field to control the weeds...



Example in HOKKAIDO where weeds are successfully controlled by keeping water temperature above 17°C & kept flowing from the water reservoir with sun light — 4 —

Soil preparation should start right after harvest!

Create rich soil where variety of microorganisms can multiply!

Soil preparation should start right after the harvest. It is ideal to apply about 1 ton of well matured manure with fallen leaves as main ingredient, if possible, in order to improve soil fertility & keep the balance of minerals. In addition, fermented manure with rice bran is applied 100~200Kg/10Are(This amount may change depending on the condition of soil; In general, rather large amount at the beginning of organic farming, then, gradually reduce the amount as the soil gets improved). Mix the manure with soil after shallow plowing, which promote propagation of Microorganisms in the soil & Formation of TOROTORO layer.

Rice bran (for moisture control & supply of nutrition & minerals)

OKARA (waste from TOFU making), Waste from Beer or SAKE making as nutrients



Method of raising seedling for organic rice cultivation without any use of pesticide(April~Early May)

The fundamental condition for successful weed control is to grow big & healthy seedlings which have resistant power to insects & diseases and can grow in paddy under deep water management. Important point is to grow 4.5 leave age rice plant with wide spacing. Pot-type nursery bed is ideal, but, it is possible to grow 4.5 leave age plant in mat-type nursery bed if the amount of seeds to sow is under 80g/pot.



Mat-type nursery bed

Example of BAKANAE Disease ▪ Rotten roots

Rice plants with BAKANAE Disease were observed in the field of organic farmer and of conventional farmers in Paro!
This disease should be eliminated as soon as possible



In the nursery bed using organic fertilizer, rotten roots occurred in mat-type bed. (At the organic farmer's field in Paro)

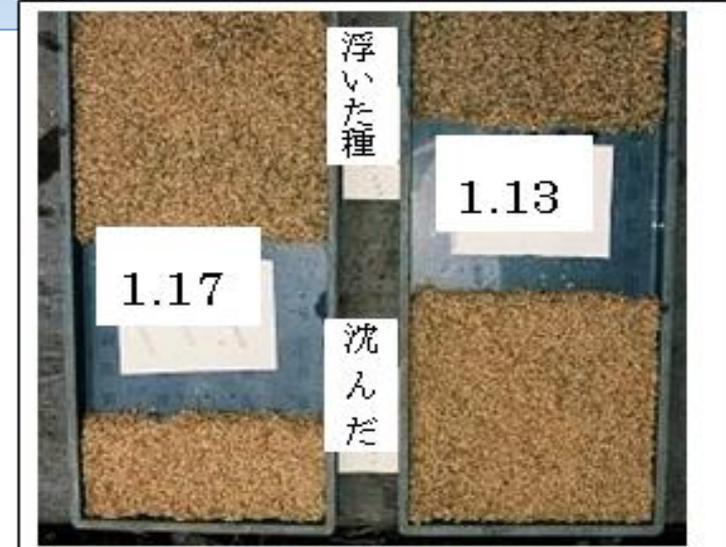
The Problem at the Nursery

① Prevention of communicable disease by selecting good seeds by Saline water; Disinfection of seeds can be done by warm-water treatment, but, it is not so easy to make the apparatus or to import it which can maintain 60°C for 7 minutes because of high cost. Therefore it is recommended to strict application of the selection of seeds by saline water(Specific gravity 1.15) as the seeds with disease can be eliminated by this method!。
(Do the test for BAKANAE Disease!)



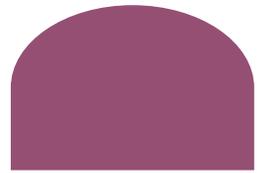
Apparatus for Disinfection by warm water

OR



Rice paddy with infection flows up!

How to prepare nursery bed soil



10ℓ of
mountain
soil with
40%
moisture



Crashed or
defatted
soy beans
1320g

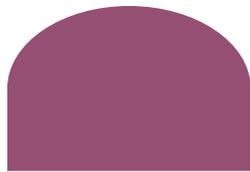


Guano
720g



charcoal
3.5kg

OR



10ℓ of mountain
soil with 40%
moisture



Fermented
chicken manure
(N:3%、P 6%、K 2%)
 $6g \div 0.06 \times 30 = 3,000g$

Chicken Manure should be mixed well, and make fermented over a month!

Dipping seeds in water(April~Early May)

Dipping seeds in clean water such as spring water, & let the seeds to absorb water. The length of this process is 150 (expressed by multiply the temperature of water to the number of days). E.g., if the temperature of water is 15°C, seeds should be dipped in water for 10days. For the first 3 days, abscisic acid, suppressor of germination, is released, the water should be exchanged for fresh water. When water is no more cloudy, exchange of water can be once in 3 days.

Whenever one germinated seed is found, the temperature should be raised to 25°C! Then all the seeds will germinate at once! In general, the germination temperature is said to be 32°C, but, at that temperature, disease germ can multiply. So, in our method, in order to avoid the communicable disease to happen, germination is promoted at 25°C. After all the seeds germinate, they are dried in shadow to be ready for sowing in dry & smooth condition.

The temperature and the length of days & amount of seeds should be kept within designated one!



Let the seeds absorb water by keeping them in flowing water.



Seedling Preparation is key to the stable production in Organic Rice Cultivation ; Transplant mature seedling at 4 to 5 leave age & beyond 15 cm height after growing in Pot-type nursery bed.



Seedling of 2 seeds sowing pot



Mature seedling of 40g seed sowing



In cold place, make device to introduce warmed water into the nursery bed!

Introduction of water should be over by noon, & after warming by sun shine, cover with silver ラブ to keep warmth & moisture. Germination will start within a week, then, remove the cover, & introduce water to the upper edge of nursery bed. UV of sun light will kill the germs & protect the plants from any disease by germs. 30~45days after sowing, plants will become 4-5~5.5 leaves age. When temperature goes down to 0°C in morning, introduce water to cover the 1st leaf & protect from coldness. In cold area, warm the water outside or inside the nursery before introducing into the nursery bed!



Point to be noted for nursery management; Till one-leaf age, water should be minimum to make roots stretch, but later, keep the nursery in water to provide water-soluble amino acids to all the plants.

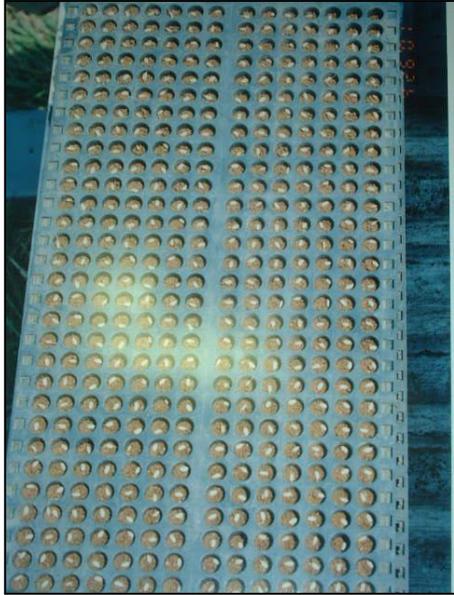


① Sowing on April 4th. On April 28th, at 2nd leaf age, damping off occurred because of rotten roots.

② At 3 leaf age, damping off occurred in mat-type nursery, but, no damping off in pot-type nursery. In case of mat-type nursery, the roots can not stretch because of mat, and have to grow in too much organic matters, thus, the cells at the roots edge got hurt to make it unable to absorb nutrient.

③ There is no damage in pot-type nursery bed, as it is possible to stretch the roots under the bed.

Precise sowing of 1 Seed sowing and the Quality of Seedling



Use of 1 seed sowing machine

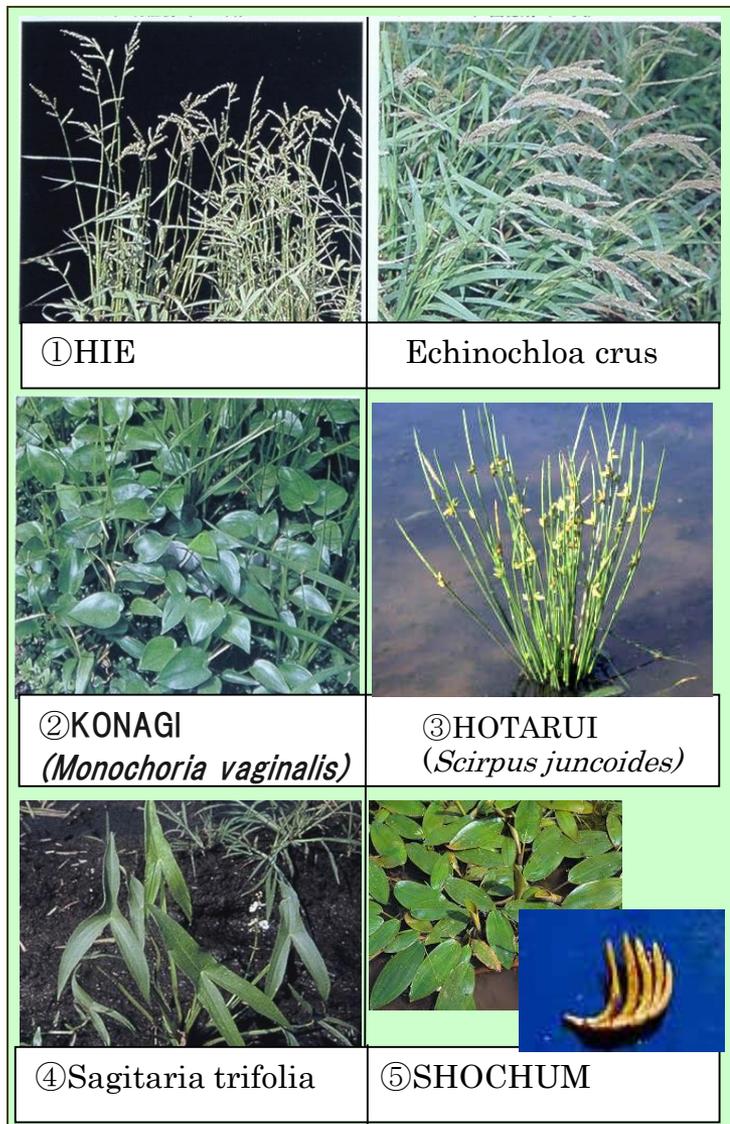


To make all the plants grow equally, nursery bed should be always in water after one-leaf age!



Basics of Weed Control Methods with Biodiversity

Categoryze Harmful Weeds in Paddy Field into 4 Types.



【Annual weeds (Multiply through seeds)】

- **Wetland weeds** like **HIE**(*Echinochloa crusgalli*) can not germinate & grow **without oxygen!** They germinate at 14°C.
- **Aquatic weeds** like **KONAGI** (*Monochoria vaginalis*) germinate **from the seeds at the surface of soil within 10mm depth. Germinate at 20°C earth temperature.** High sencitivity to light; Can not germinate & grow without light.

【Perennial weeds (Multiply by bulbs)】

- **Perennial weeds** such as *Eleocharus kuroguwai*, *Sagittaria trifolia* or **SHOCHUM** produce bulbs in **underground soil at 15~20cm depth in Sept. To Oct.** They die out in dry condition. They germinate 15~25days after introducing water.

【Weeds which can co-exist with rice plants】

- **Floating green algae** like *Spirogyra arcla* or *Spirodela polyrhiza* absorb **the excessive nitrogen in nitrous acid form, phosphorous, & potassium,** thus, purify the water. They also suppress the growth of KONAGI. They stabilize the temperature of water, and finally, become nutrition of rice plants after death.

Wetland weed:How to control HIE by considering the condition for germination & growth.

Under deep water condition, HIE can not germinate nor grow!

Wetland weed:HIE (*Echinochloa crusgalli*)

HIE can germinate, grow & multiply on wetland. It is very difficult to distinguish HIE from rice plant as they resemble each other by the time of heading, so, once they grow, it is very difficult to eliminate. **However, they can be controlled easily by deep water management!** The reason is that the germination is suppressed in water without enough oxygen. So, only the seeds near the surface of soil can germinate. Also, if they germinate in water, they stretch their stalk abnormally without elongating roots, so, they float to the water surface by keeping the water level over 7cm for 30 days as they can not resist buoyancy!

HIE floating over the surface of water as they can not resist buoyancy!



Echinochloa crusgalli

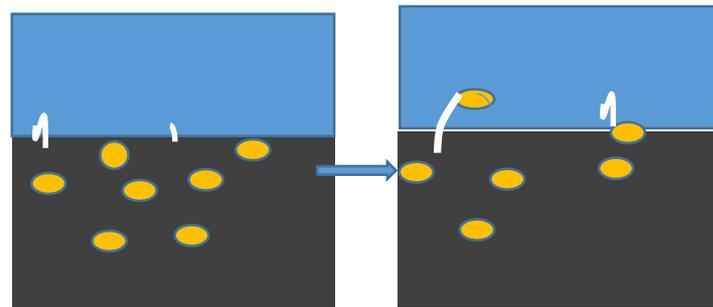
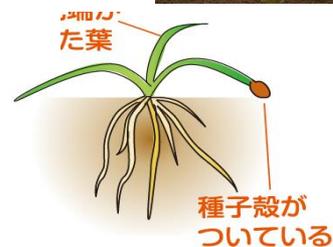


Aquatic weeds: Strange character of KONAGI in germination & growth

KONAGI produce over 3000 seeds per 1 stock & spread around 5cm. You should not step into the paddy field after transplantation as it will promote germination!

KONAGI (*Monochoria vaginalis*) • MIZUAOI (*Monochoria*

korsakowii); Each stock produce many seeds. When soil temperature become above 17°C without enough oxygen, seeds within 5mm from surface germinate & stretch roots to the soil surface. When roots get sun light, it turns into the soil & uphold the seed. The seeds below 5mm depth do not germinate as they can not feel the sun light! They may outbreak by puddling the paddy field after converting to organic. In such case, make the water level deep **at the 2nd puddling & cover the seeds before germination with fine, soft dirt by stirring the soil in water.** Also, their growth is suppressed by organic acid produced from the weeds suppressing materials such as rice bran, pellet of waste soy beans which are sprayed right after transplant the rice plants, and by keeping water level above 7cm so



Aquatic weeds: Seeds of HOTARUI: *Scirpus juncooides* can be removed by floating over water surface

Seeds are staying within 5cm from surface of soil, so, they float up to the water surface by puddling with large amount of water!

Aquatic weeds: HOTARUI (*Scirpus juncooides*)・シズイ

The seeds of HOTARUI have hard cover at their surface, & water can not penetrate. After staying in soil during winter season, They float up with the introduction of water in next season, & spread their growing area with the water flow. By utilizing this property, most of them can be removed after 1st & 2nd puddling as they float above water surface. By repeating this process for 2, 3 years, most of HOTARUI will disappear!

なお斑点米の原因となるカメムシはこのホタルイが大の好物です。田んぼの中にホタルイの発生が

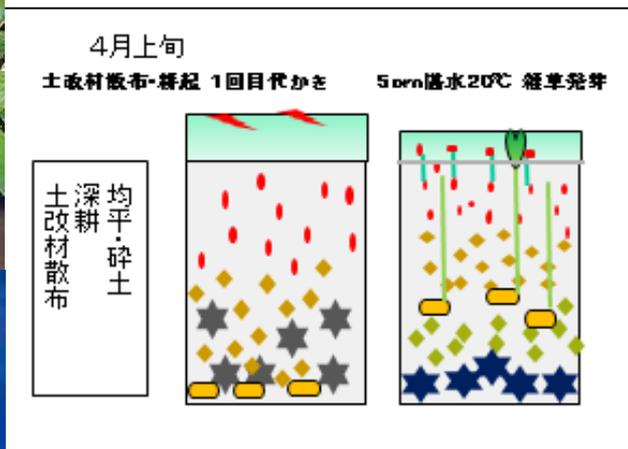
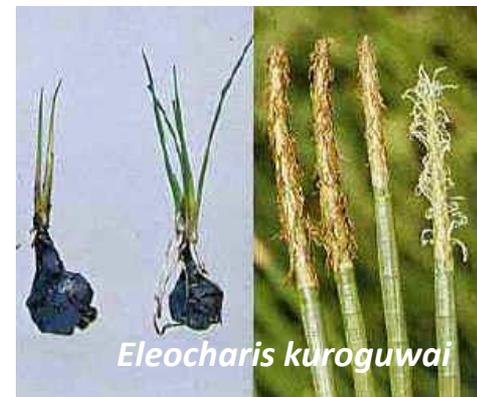


Perennial weeds can be controlled within 2 to 3 years!

SHOCHUM• *Sagittaria trifolia*• *Eleocharis kuroguwai* are removed by floating them after puddling twice to three times.

Weeds which multiply by bulbs: SHOCHUM, *Sagittaria trifolia*, *Eleocharis kuroguwai*

They can not be removed by simple deep-water management. They have bulbs 10~15cm depth in the soil, & multiply in wet paddy field. If water is kept in paddy field through Winter, this type of weeds will outbreak within 4~5 years. In that case, keeping water in winter should be stopped and plow deeply after harvest, dry paddy field in winter. In early spring, after deep plowing, move the bulbs by the 1st puddling, let them germinate before transplantation, and then, remove them by floating after 2nd and 3rd puddling.



Move up the bulbs by 1st puddling

Weeds floating on water surface can help suppressing weeds & water purification if the rice plants are big enough!

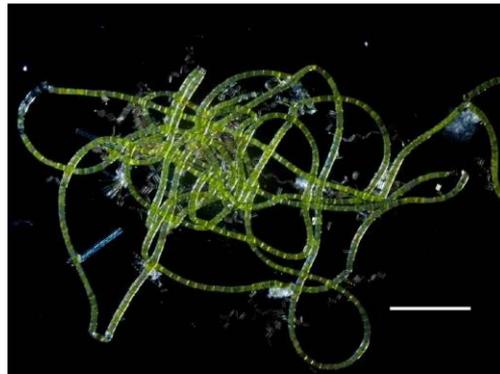
Floating weeds are helpful for suppressing KONAGI & water purification!

Floating weeds: Floating green algae such as *Spirogyra arcra*, *Lemna paucicostata*, or *Spirodela polyrhiza* family absorb the excessive nitrogen in nitrous form, phosphorus & potassium, thus, purify the water. Also, they cover the water surface resulting in suppressing the growth of KONAGI & other weeds by cutting sun light. They stabilize the temperature of water, also.

However, アカウキクサ has very strong power to spread and overwhelms rice plants, they should be stopped from spreading further by releasing water temporarily if they spread over whole paddy field.



アミドロ



サヤミドロ

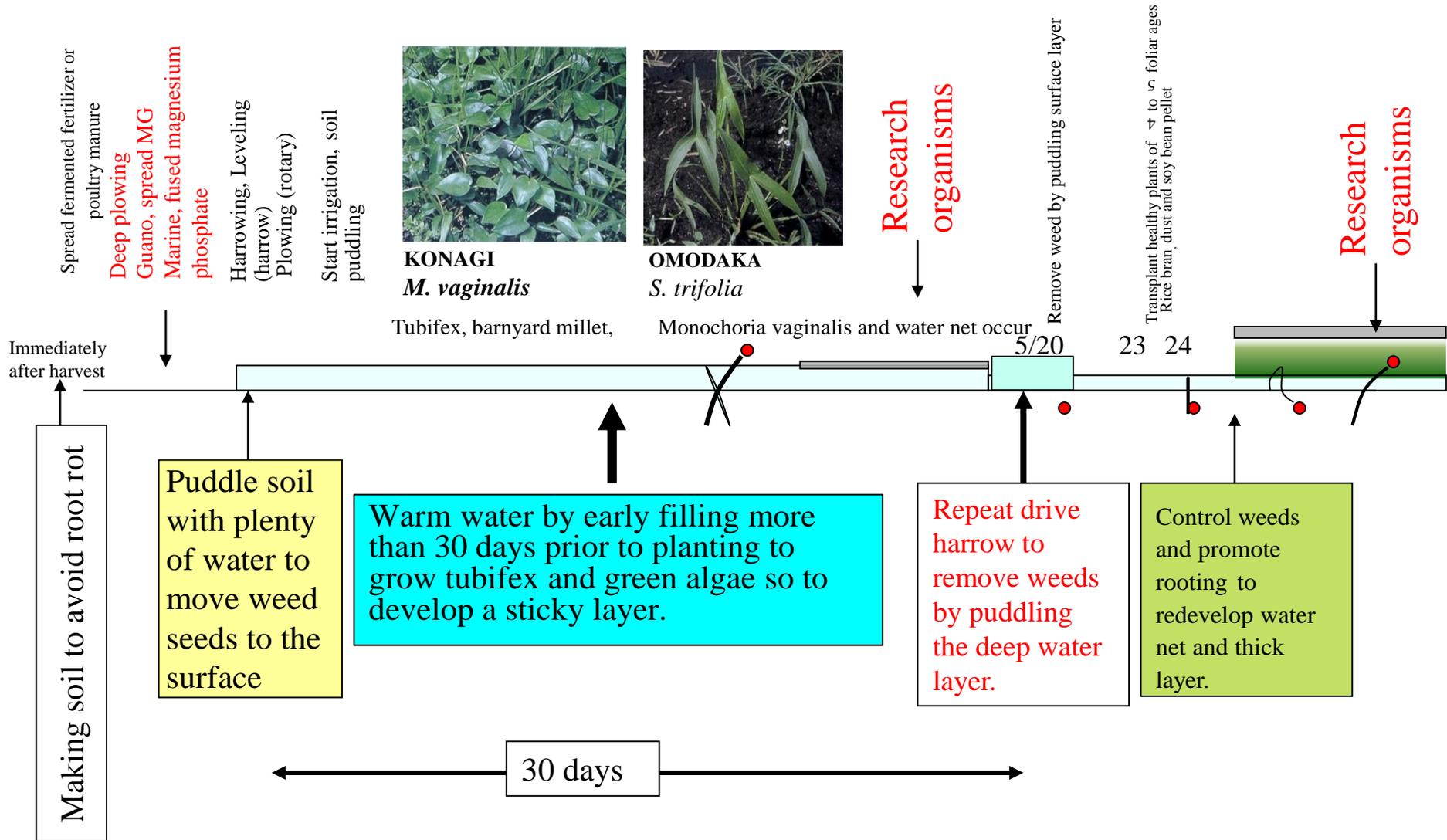


オオアオウキクサ

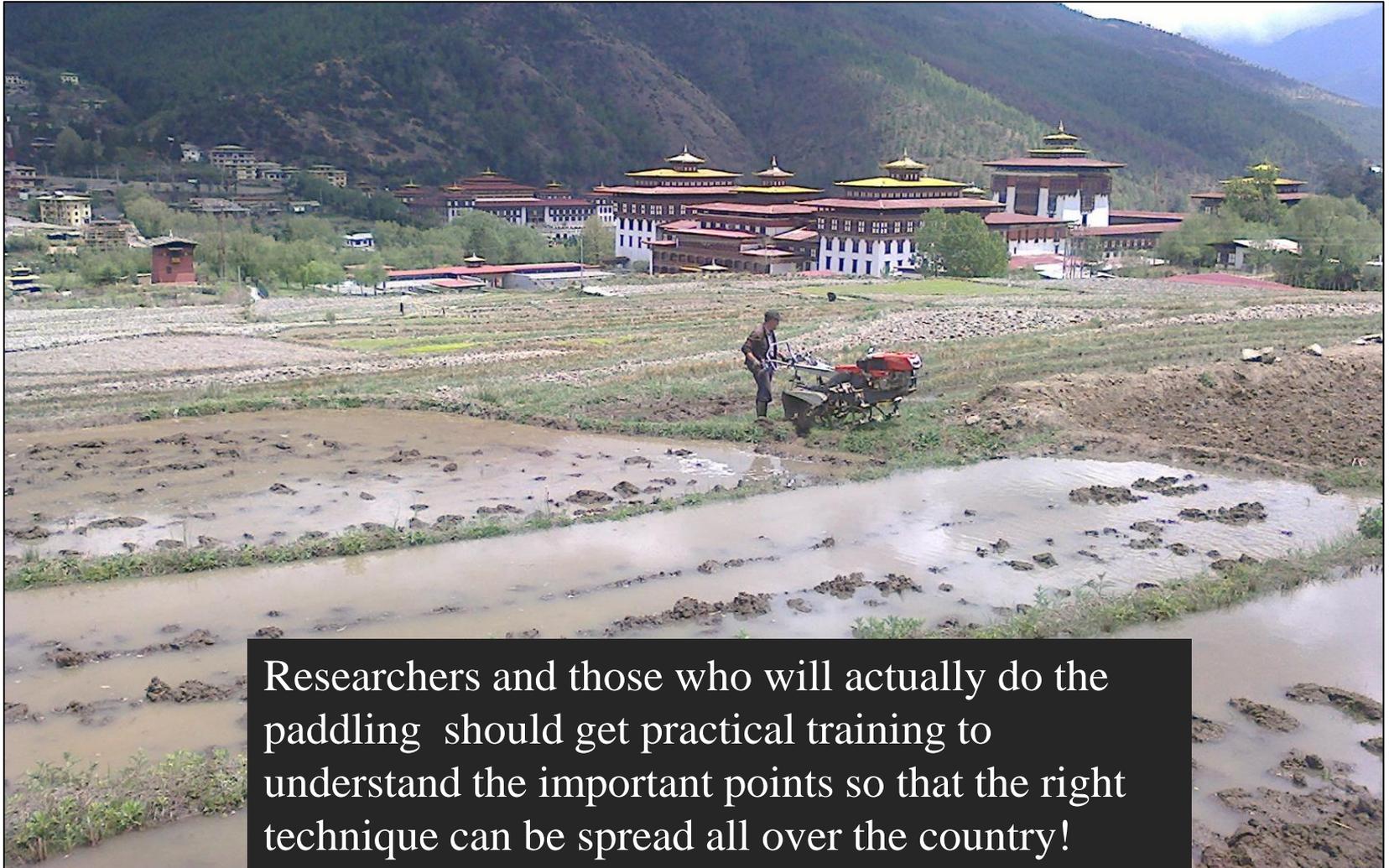
It is important point for control KONAGI not to step into the paddy field for weeding after transplantation

- ① It is important to just keep the water level deep! If you enter the field, the germination of KONAGI or HIE is promoted by moving their seeds to the surface of soil!
- ② If the water level is kept deep after hand weeding at the end of June, there will be no outbreak of weeds which affects the rice yield.
- ② Do not step into paddy field after early July, in principle!
(As there is no more new roots after early July when stalk-stretching period start, if you step into the field, you may cut the roots unintentionally which gives negative effect on ripening!)
- ③ The important point for controlling weeds is puddling with deep water condition. Those who join the work of puddling should join the seminar to learn basic technique.

Control of *monochoria vaginalis* by biodiversity based on early and winter water filling in continuous rice cropping

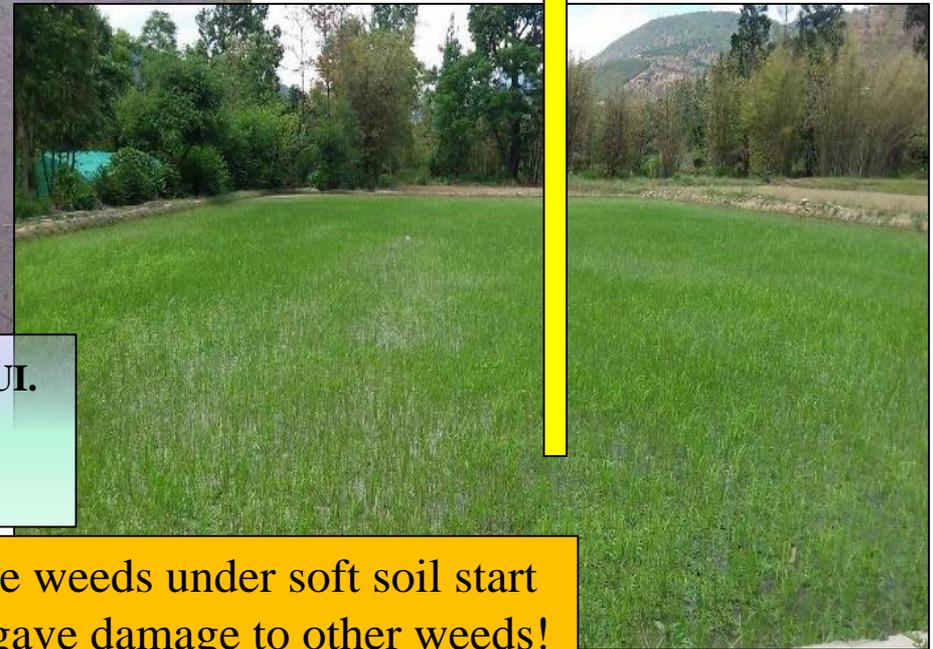


Water is introduced after plowing with rotary & paddling is done with deep water condition.



Researchers and those who will actually do the paddling should get practical training to understand the important points so that the right technique can be spread all over the country!

The situation of weeds after 1st puddling



- ① Major weed at Thimphu field was **HOTARUI**.
- ② At the field in Bajo, a large amount of Shochum, **HOTARUI** & HIE came out.

By second shallow paddling with water, these weeds under soft soil start fermentation & gave off butyric acid which gave damage to other weeds!

Effect of Puddling twice to three times



①Bajo

At ①the Field of Bajo & ②Thimphu, a large amount of HOTARUI seeds floating up by 3rd puddling. It was effective to suppress the outcome of **HOTARUI** after transplantation to some extent by removing the seeds. **However, water with dirt should not be removed as it is useful to control KONAGI!**

Next year, seeds of HOTARUI which floated up by 2nd puddling should be removed, and after 3rd puddling seeds should be removed with water after fine dirt settle down and water become clear.



②Thimphu

Transplantation by hand & by machine

Prevent Rice blast by changing random to regular planting!



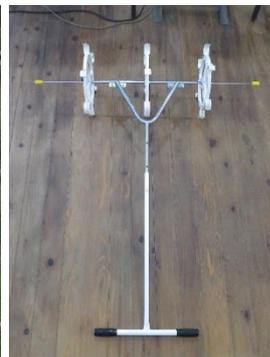
Field in Thimphu



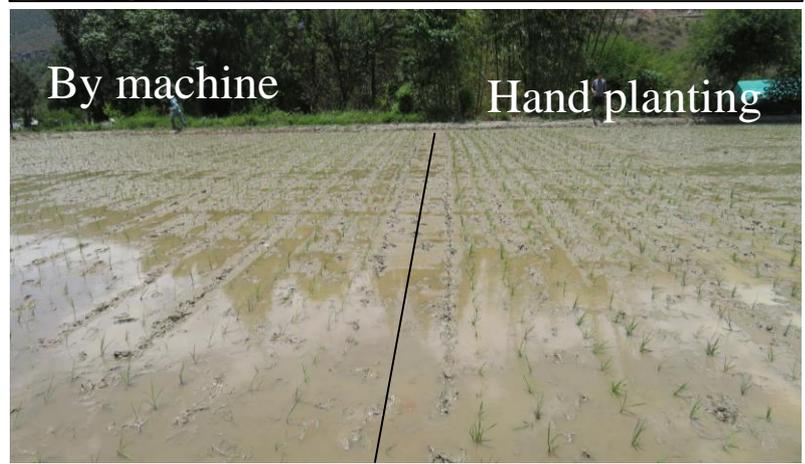
Field in Bajo



2017/06/21 11:05



Regular planting by the use of ruler(30 cm × 15cm)



Transplantation by hand & by machine

Weeds after transplantation (Paro - Thimphu)

Hand weeding once this year, but, no need of weeding is final goal!



At the field of organic farmer in Paro on July 4th; Shouchum was much less than usual year! Scirpus juncoides were a lot, but can be removed by hand weeding once!



Weeding by simple machine;
KONAGI should be removed by 2nd leaf age.

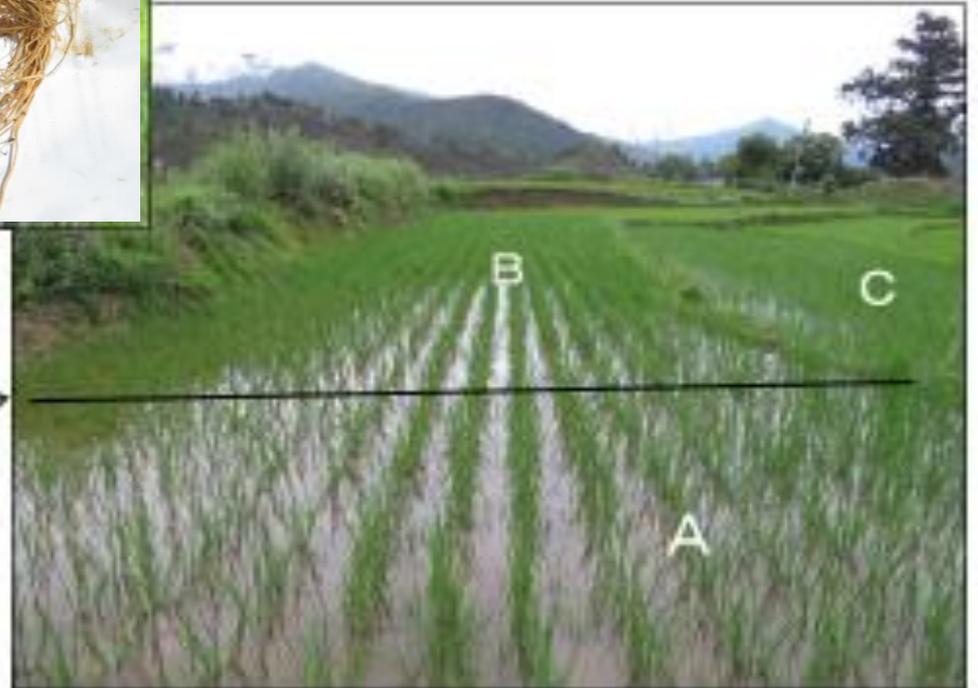
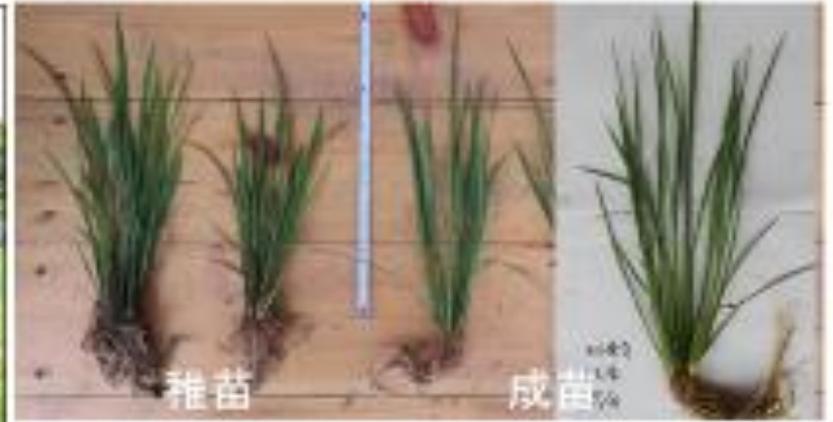


On-line planting at experimental field in Paro!

m

Other field; Random planting by hand & with machine ⇒ Hand weeding or herbicide use!

SASANISHIKI (Roots・Stems) at 9.5 Leaf-Age in Experimental Field of Organic Farmer in Paro (茎数18本が理想)



植付密度 — 15株/m²

A区 脱脂大豆 ポット 17.6本

B区 有機培土 マット 7.9本

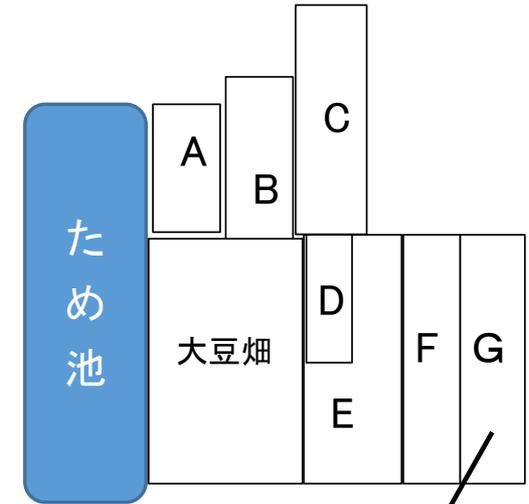
C区 有機培土 ポット 10.9本

目標穂数 18本 × 15株 × 110粒
⇒ 29,700粒

Result of Growth Survey at the Field of Thimphu 苗質と低水温の影響で茎数が不足。理想は18本

圃場ごとの茎数調査結果
(2017, 7, 6)

	A	B	C	D	E	F	G
10株平均	8.4	8.6	8.1	15.3	9.7	11.6	15.9
最大値	14	17	12	25	11	16	20
最小値	1	6	6	10	8	6	11
標準偏差	4.0	3.5	2.3	4.8	1.1	3.2	3.4



Results of Stem Count for Each Variety at Bajo Seed Center on July 7, 2017

品種名	10株平均茎数	標準偏差	植付密度	茎数/m ²
ササA	20.2	4.7		
ササB	14.9	5.6		
ササC	15.8	5.1		
ササAVG	17.0	5.1	13.4	228
IR28A	21.2	6.7		
IR28B	29.9	11.4		
28平均	25.6	7.7	13.6	348
IR64A	21.1	5.3		
IR64B	21	4.1		
64平均	21	4.7	14.8	311

Growth Situation of Rice
Plants in Conventional
Cultivation Field



SASANISHIKI



IR28

IR64

Check the growth of rice plants & apply 茎肥 (Late June ~ early July)

The best 茎肥 is fermented fertilizer made from waste soy beans, containing readily available nitrogen, phosphorus, potassium, magnesium & silica. E.g., make powder from waste soy beans, & mix with guano, ニガリ, & silica, adjust water content to 40%, ferment & make into pellet. It is applied ca 20kg/10a. With this fertilizer, the last tiller stem become same height as the main stalk, promote panicle differentiation, and **number of flowers (grain number/ear) increase. Also, silica absorbs excessive ammonia, thus, prevent to fall down & to make the taste worse.**

イネの生育診断を行って、茎肥を散布



収穫期のイネ

Characteristics of Healthy Rice Plants

Special feature of Organic Rice Cultivation

The rice plants grown with **nitrogen in the form of amino acid** instead of ammonium form **become resistant to disease and insect attack**. We can expect high yield without insecticide or germicide. **The sign of healthy rice plant appears in the color & shape of leaves**. **The rice plants with** too much green & bent leaves are sign of too much nitrogen & unhealthy state. In contrary, healthy rice plants have rough & straight leaves with light green color.



Rice plants 30days after transplantation

元気な稲の葉は、固く直立し、やや黄緑色が理想です。



出穂

Rice • wheat • soy bean • oil producing plants are planted next to each other, and refrain from cutting all the weeds on the bank, then, the biodiversity is improved, & the harmful insects become just one of the insects

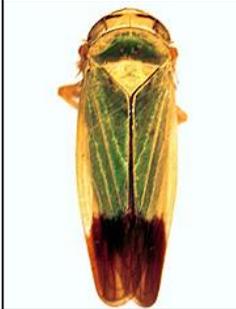
Harmful insects



Plant hopper



Stink bugs



ツマグロヨコバイ



Bee as a parasite of plant hopper

Predators



Spiders



アカガエル



By applying rice bran, Chironomids & tubifex increase, which provide feeds for frogs & spiders

Insect feed

(ただの虫ではない)



Chironomids



ミジンコ



Chironomids larvae



Spiders make net & move around

Puddle in April with water, & postpone to drain water from middle of June to July, **then, frogs and dragonfly increase!** Spiders & bees increase also!

Rice at the Harvest Time



Simple yield survey for evaluation of new cultivation method

① Survey of ;number of harvested stocks・Head number・Weight of head・Paddy weight.

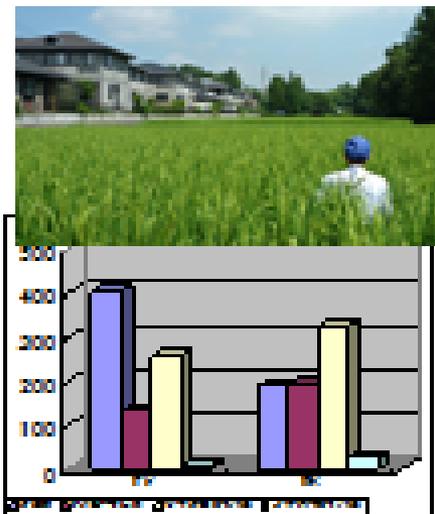
Field	Stok no	Panicle . no/stok	Paddy weight	Grain Weight	玄米収量	被害の内容
Paro	10	26	712	642	514	低温障害 大
Thimphu	17	18	774	708	566	低温障害 中
Bajo	11					高温障害・鳥害大
Japan	13	18	745	728	597	

② Survey of Component of Yield (Other than Ears Number, survey is done with sample)

Field	Number of Panicle	Number of grains per head	Total grains number	Ripening Ratio	Weight of 1000 grains	Yield
Paro	257	124	31,894	(76.6)	21	513
Thimphu	314	97	30,458	78.3	22	524
Bajo						
Japan	256	142	36,263	82.4	20	597

有機稲作栽培暦

(冬期湛水・1比加の場合)

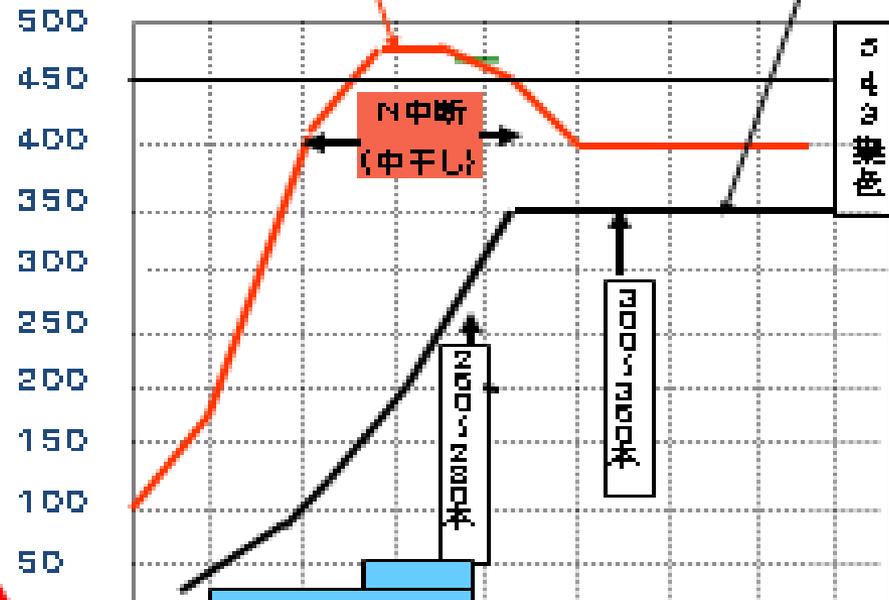


葉緑素濃度 (mg)

早期湛水

密植・多肥栽培

成苗の疎植栽培による安定多収栽培



有機栽培	
収量	660
株数	16
穂数	20
1穂粒数	110
登熟率	88
千粒重	22
慣行栽培	
収量	580
株数	21
穂数	23
1穂粒数	70
登熟率	82
千粒重	21

時期	2	3	4	5	6	7	8	9	10	11
作業内容		灌水・湛水 除草・雑草取り バイオトップ・圃場整備	1回目代かき あせ軍刈り 格種	2回目代かき 田植用草へレシッド散布	あせ軍刈り 生き物・生育調査・蓋肥	中干し・あせ軍刈り	出穂	あせ軍刈り・水田内雑草除去 挿籾	収穫・格付け出荷 堆肥・発酵肥料散布・耕起	

プール育苗

Weed control technique No.5

Management model of
organic agriculture
crop rotation (5 ha)

○The farm is intensively used
for crop rotation of
wheat/rape seed and soy
beans/sunflower.

○Dried paddy field is used for
triple-cropping recirculation of
organic agriculture every two
years for rice/wheat and rape
seed/soy beans.

○Wet paddy field is used for
organic rice crops though
winter and early flooding to
nurture life.

○More than 150,000 yen
average gross income per 10a

○62% income ratio

○Achieved an annual income
of 5 million yen for 5ha
managed by a family

Interrow as a measure against fusarium and mildew



Japanese milkvetch



Wheat (supplying nitrogen from root nodule
bacteria of soy beans)

canola



canola

Soy beans (eliminated weeds
by cultivating twice)

No need for nitrogen fertilizer
after growing soy beans
Weeds hardly grow

Rice planted after soy beans

Weed control by rotation crop;
Rice-Wheat・NATANE-Soy beans
Weeds are controlled in field & in paddy field!

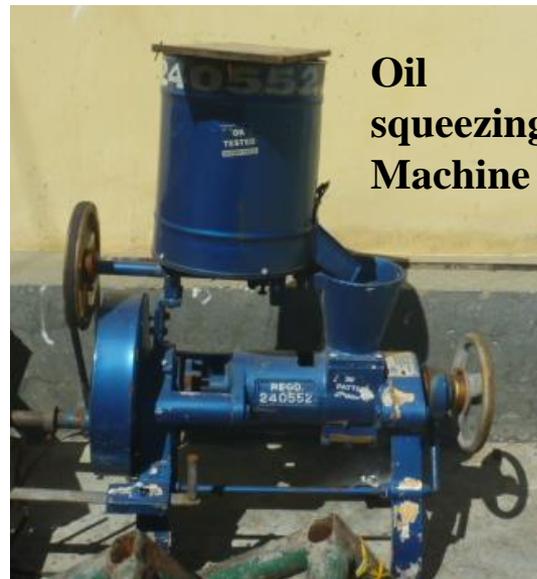
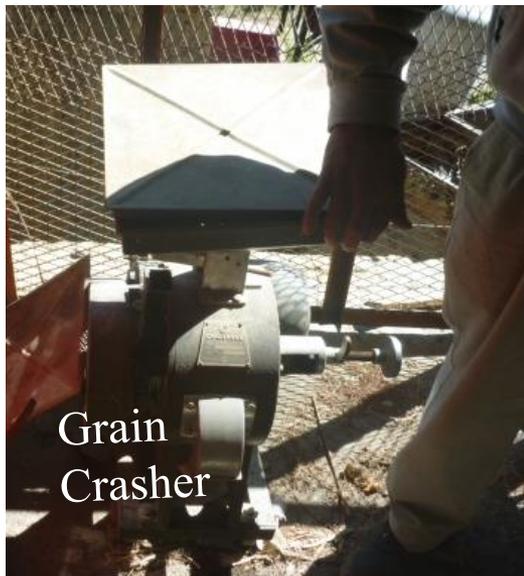
循環型無農薬・有機農業の作付け体系

年次	作物	1	2	3	4	5	6	7	8	9	10	11	12	
1年目	小麦 イネ・ナタネ	小麦 (黄色)					収穫	イネ・ナタネ (青)					収穫	イネ・ナタネ (赤)
2年目	ナタネ 大豆・小麦	ナタネ (赤)					収穫	大豆 (緑)					収穫	小麦 (黄色)
3年目	小麦 イネ・ナタネ	小麦 (黄色)					収穫	イネ・ナタネ (青)					収穫	イネ・ナタネ (赤)

The procedure to achieve rotation crop system;

- ① Construction of small scale Oil-squeezing place & Obtaining making oil technique. (One place each for Paro, Thimphu & Bajo)
- ② Construction of Factory to produce Fermented Fertilizer utilizing the waste from oil making and Chicken manure. (At Organic Agriculture Center)
- ③ Conservation of Seeds & System for Providing them (Bajo Seeds Center)
- ④ Technical Training Seminar for Agriculture leaders・Workers・Farmers.

Production and Processing of Soybeans As Nitrogen Provider



- ① Establish and spread the technique of stable & high yield cultivation of soy beans.
 - 1) Plow, crash soil & sow seeds after making soil soft by introducing water.
 - 2) Select & use the type of soy beans which is high oil content and high yield.
- ② Use of oil squeezing machine or grain crasher:
 - 1) High quality soy beans are dried to 10% water content, squeezed to get oil & purified.
 - 2) Low grade soy beans are crashed & used as organic manure.

Refining Method for Fresh Vegetable Oil



- ① Oil Extraction Machine
- ② Precipitation Tank
- ③ Purification through filter paper
- ④ Bottling with cap.
- ⑤ Product
- ⑥ Cleaning with hot water and soap.



遺伝子組み換え作物は

In Japan, most of the raw materials for oil (Soy beans・NATANE・Corn) became imported GMO!

In order to keep the health of people, it is important to produce oil from non-GMO materials produced domestically!

The waste after making oil can be utilized for organic fertilizer which will promote organic farming with rotational cropping.

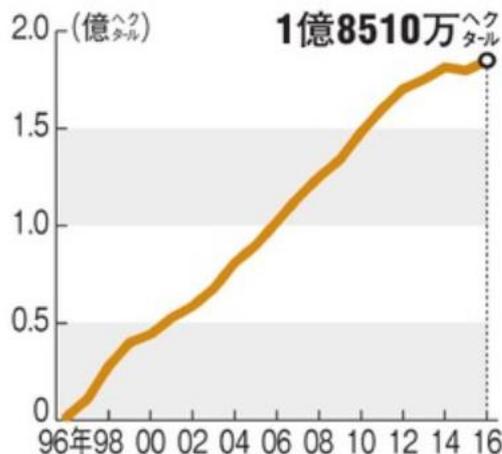
The KIZAKINO NATANE is the type of NATANE is for oil making NATANE without Erucic Acid.



栽培面積トップ5

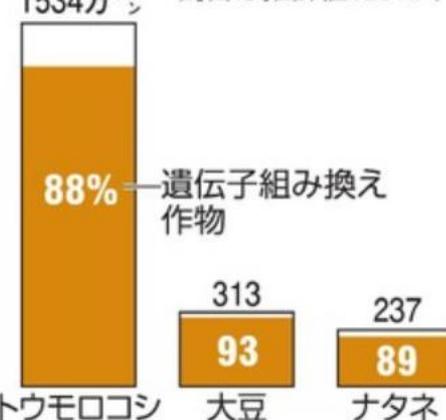
- ① 米国
- ② ブラジル
- ③ アルゼンチン
- ④ カナダ
- ⑤ インド

世界の栽培面積は年々増加



日本が輸入する作物のうち 遺伝子組み換え作物の割合

割合は推計値、2016年



国際アグリバイオ事業団報告書、財務省貿易統計から

Growing soy beans on the field after harvesting wheat or NATANE;

Sow seeds after plowing /crashing hard soil twice

Timing to sow: Beginning of July

Sowing density

13,000~16,000 Stocks/10a

①Big size soy bean 0.38 g / 1 grain⇒5kg

②Small size soy bean 0.12g/ 1 grain⇒2kg

Make drainage;

Sow seeds after making drainage
in the paddy field, or sow after
plowing all over the field.

Sowing activity;

Using sowing machine⇒2~3 lines
with 60~65 cm distance between
lines. Sow 10 cm interval.



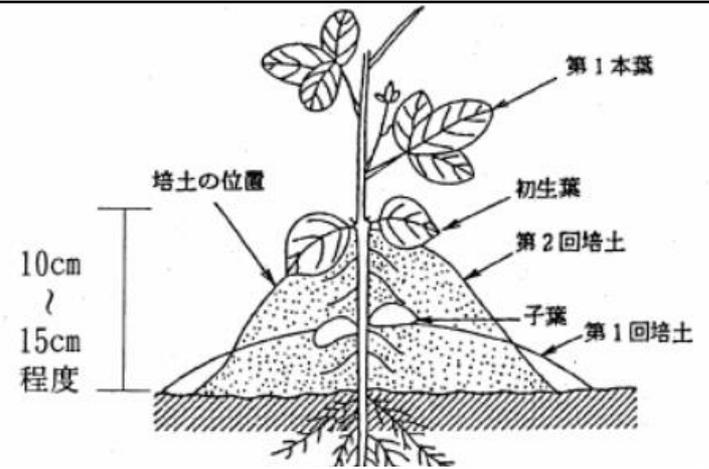
Cultivation & banking twice. Should be done on time.

1st time ⇒ 2nd main leaf period;

Beginning of July

2nd time ⇒ 4th main leaf period;

Beginning of August.



右図はhttps://agrin.jp/ufile/7/20/17387/image1_file0109050216031511293.pdfより引用



In the field where the rotation crop is done, weeds are suppressed, and soil becomes fertile.

Weeds are suppressed by tilling twice(Sowing seeds on July 10)



Paddy field with rotation crop of soy bean-wheat-rice



Field with rotation crop of soy beans and wheat, weeds are suppressed.



Soy beans seem to be sown without tilling the soil to fine condition.



Seeds were sown in early September?

- ① In Bhutan, soy bean(ENREI) was sown too late!
- ② Sprout of soy bean was no good as the soil was not tilled to make fine before planting.
- ② In this situation, microorganism at the roots can not develop to provide nutrients to the soil.

Out break of stink bugs and bean beetles is suppressed by frogs which come from the adjacent paddy field

① By arranging field and paddy in mosaic way, biodiversity is maintained, & outbreak of harmful insects is suppressed.



② Soy beans are capable to fix Nitrogen over 24kg/10.

③ Protein content of soy beans is over 40% which is almost same as the protein content of micro-organism.

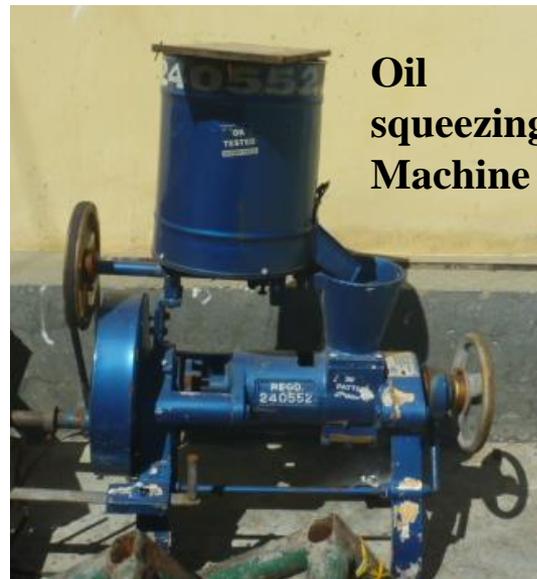
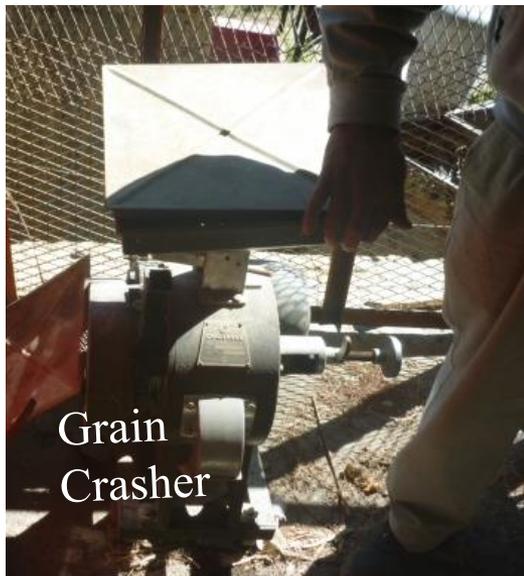


Stink bug



Bean beetle

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Plant wheat after harvest of soy beans

- Variety

For noodle⇒IWAINODAICHI

For bread⇒YUMEKAORI or
YUMECHIKARA

- Sowing time

End of Nov.~Middle of Dec.

- Sowing amount; 5kg/ 1 0 a

- Fertilizer control

No nitrogen supply as a principle(acidic soil should be neutralized with CaO • In case of wheat for bread, crashed soy beans is applied as additional fertilizer.



小麦跡の黒米・1交代掻きでも 水田雑草の発生は少ない

播種日5月4日



大麦跡 コシヒカリ 玄米420kg
移植日 6月18日
ポット苗機械1本植 45日苗

小麦跡 黒米 玄米300kg
移植日 6月24日
ポット苗 1本手植 50日苗

イネの跡は大麦又はナタネ

【品 種】

麦⇒ 2条大麦・6条大麦・
裸麦(モチ麦)

なたね⇒キラリボシ(ダブル
ロー品種)

【播種時期】

麦⇒11月上旬までに播種

なたね⇒10月20日までに播種

【肥培管理】

元肥 民稲研1号2袋/10a

追肥 民稲研2号1袋/10a

【雑草防除】

追肥後に中耕培土1回



平成30年版 大豆・麦・なたねの栽培暦 (大豆-タチナガハ、小麦-カナダ小麦、なたねキザキノナタネ)

時期		栽培管理			備考
月	日	小麦跡の大豆	大豆作跡のなたね	稲作跡の小麦	
10月	中旬		大豆の畝間に播種	発酵鶏糞100kg 堆肥1トン散布。プラウ耕・ロータリー耕・播種	温水池兼ビオトープの整備(越流防止) ④ポイント研修
10月	下旬	収穫・乾燥・調整			
12月	下旬			麦踏	
1月	中旬			麦踏	
4月	上旬		異株抜き	追肥(屑大豆・脱脂大豆+なたね油粕20kg/10)	②ポイント研修
6月	中旬	麦跡ロータリー耕	収穫・乾燥・搾油	収穫・乾燥・製粉	
7月	上旬	播種			
	中旬	1回目中耕培土			
8月	上旬	2回目中耕除草			
	中旬	発酵鶏糞30kg追肥			
9月	上旬	手取り除草			④ポイント研修
10月	下旬	収穫・乾燥・調整			