FINAL REPORT

VERIFICATION SURVEY WITH THE PRIVATE SECTOR FOR DISSEMINATING JAPANESE TECHNOLOGIES FOR SUSTAINABLE DEVELOPMENT OF THE PRIMARY INDUSTRY BY RESOLVING ENVIRONMENTAL ISSUES CAUSED BY FISHERY WASTES UTILIZING UCHISHIRO SOIL-BACTERIA

BY

THE JAPAN INTERNATIONAL COOPERATION AGENCY,
CENTRE FOR AGRARIAN SYSTEM RESEARCH AND DEVELOPMENT,
MANAGEMENT BOARD OF AGRICULTURAL HI-TECH PARK,
BIOTECHNOLOGY CENTER AN GIANG,
AND
SYUDENSYA CO., LTD

PICTURES

＜Kick off Ceremony Aug 11th-2015＞

AHTP (Agricultural hi-tech park)

Organic Forum

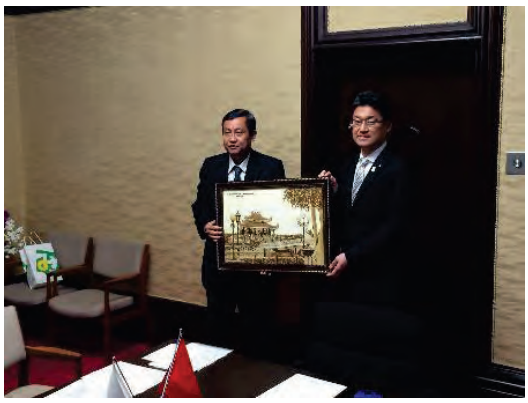
Demonstration on BUIK-100

Output(Bio-product) by BUIK-100

BUIK-100 (AHTP)

＜An Giang Delegation at MIYAZAKI Prefecture Mar 24th-2016＞

（MIYAZAKI Prefectural Office）



Vice-Chairman of An Giang
and Governer of Miyazaki Prefecture

An Giang Delegation Member

＜Oparation Training for BUIK-500 April 4th -6th 2016＞

BCoA (Biotechnology Center of An Giang)

Operating BUIK-500

BUIK-500 in BCoA

Fishery Waste from Processing Factry

Operation Training

Aquaculture Experimental Pond

Signing Ceremony with Vietnamese Partner

(Hanoi, Nov 10th 2016)

I. BACKGROUND

Fishery is a key industry in Vietnam; the country is ranked as one of the top 10 countries exporting the fishery products abroad. The production grew at an average of 10.25 per cent between 2001 and 2010, creating over USD$ 5 billion in export value for the country in 2010[1].

As a result of such a rapid growth in the recent few years, the increased residues, a by-product of the fishery processing for the exports, are becoming growing environmental concerns. Increased dumping of the fishery residues not only deteriorate the smells and sceneries of the surroundings but also contaminate the soils, rivers or oceans. Sustainable management and handling of the fishery residues are, therefore, critical in order to enable the sustainable growth of the industry.

This Survey will provide the Product called "BUIK SYSTEM[2]" developed by Syudensya Co., Ltd. "BUIK SYSTEM" utilizes bacteria called "Uchishiro soil-bacteria", which was found in Japan in 1950'.

BUIK System can bring two benefits in the Primary Industry Sector; namely, fishery, agriculture and livestock sector. First, "BUIK SYSTEM" helps reduce the the amount of the residues produced by the fishery industry. This is because the residues and wastes from the fishery industry are seen as "the precious resource" for "BUIK SYSTEM". Second, the fertilizers or probiotics produced as a result of decomposing the fishery residues can be further utilized in the in the agriculture, aqua farming and livestock business. For example, the organic fertilizer can replace the chemical fertilizers currently in use in Vietnamese farmers, promoting the organic farming. Additionally, the produced probiotics can be fed to the fish in the aqua farming.

Throughout this Survey, Syudensya Co., Ltd intends to demonstrate the effectiveness of "BUIK SYSTEM" and "Uchishiro soil-bacteria" not only to reduce the environmental issues of fishery residues but also enhance organic farming and improve aqua farming of Vietnam. The ultimate goal of the Survey is to demonstrate a potential sustainable model of the Primary Industry by recycling the wastes such as fishery residues, into fertilizers or probiotics.

II. OUTLINE OF SURVEY

1. Title

   Verification Survey with the Private Sector for Disseminating Japanese Technologies for Sustainable Development of the Primary Industry by Resolving Environmental Issues Caused by Fishery Wastes Utilizing Uchishiro Soil-bacteria

2. Purpose

   (1) Objectives

   The Survey aims to demonstrate and disseminate "BUIK SYSTEM" through the experimentation of i) producing organic feeds and fertilizers from fisheries wastes and residues ii) establishing a safer production system of agriculture, livestock and

[1] http://www.unep.org/greeneconomy/Portals/88/documents/research_products/Tradeopportunities/Vietnam%206%20November.pdf (last retrieved on 4th March, 2015)

[2] "BUIK SYSTEM" is the product name of a food waste treatment machine. The machine produces an organic fertilizer and probiotics utilizing "Uchishiro soil-bacteria", which further feed for fish and livestock. Please refer to the II. 4 of the Survey Outline for the further details.

aquaculture industry with reduced chemical fertilizer, agrochemicals, and antibiotics. To achieve the purpose, the Survey intends to verify the effectiveness of "BUIK SYSTEM" by introducing the mechanical unit, the technique, and operation know-how about the food bio-recycling system, utilizing "Uchishiro soil-bacteria" and fermentation/decomposition treatment system established as "BUIK SYSTEM".

(2) Expected Outputs

Output 1: Assessment of efficient production of fertilizers and probiotics using locally procured materials in "BUIK SYSTEM"
Output 2: Assessment of the effectiveness of the produced probiotics in the aquaculture sector
Output 3: Assessment of the effectiveness of the produced fertilizers in agricultural sector
Output 4: Assessment of the effectiveness of leveraging the produced feeds in the livestock sector to produce liquid fertilizer and further to apply the fertilizer to the agriculture sector
Output 5: Formulation of a plan for disseminating "BUIK SYSTEM" in Vietnam

3. Activities

Activities related to Output 1:

(1) Discuss the details of the verification activities for the efficient production of fertilizers and probiotics with the counterpart organizations
(2) Conduct the verification activities using the fishery wastes and residues
(3) Monitor the progress of the production
(4) Calculate the running costs and assess the feasibility and efficiency of actual day to day usage
(5) Obtain feedbacks from the above verification activities and apply the learnings to the another cycle of the production of fertilizers and probiotics

Activities related to Output 2:

(1) Discuss the details to verify the effectiveness of the produced probiotics for aquaculture sector with the counterpart organizations
(2) Select two acquire farms/ponds that are under the similar condition in order to compare the results
(3) Conduct verification activities by feeding probiotics to the fish in one of the selected the aqua farm/pond.
(4) Compare and analyze the results between the two aqua farm/pond
(5) Evaluate the results obtained from the verification activities

Activities related to Output 3:

(1) Discuss the details to verify the effectiveness of the produced fertilizers for agriculture sector with the counterpart organizations
(2) Select two fields that are under the similar condition in order to compare the results
(3) Research the rules and standards for the organic farming in Vietnam
(4) Conduct verification activities by feeding the fertilizer on to one of the selected field
(5) Compare and analyze the results between the two fields
(6) Evaluate the results obtained from the verification activities

Activities related to Output 4:

(1) Discuss the details to verify the effectiveness of the produced fertilizers for agriculture and livestock sector with the counterpart organizations
(2) Mix the small amount of the produced feeds to the feedings of the livestock
(3) Accumulate the livestock's urine in order to produce liquid fertilizers
(4) Select two fields that are under the similar condition in order to compare the results
(5) Conduct verification activities by feeding the liquid fertilizer on to one of the selected field
(6) Compare and analyze the results between the two fields
(7) Evaluate the results obtained from the verification activities

Activities related to Output 5:

(1) Conduct analysis to understand the present market environment of bio-waste recycling business in Vietnam. The analysis incudes the estimation of the potential demand for the "BUIK SYSTEM".
(2) Assess potential challenges for disseminating "BUIK SYSTEM" and "sustainable primary industry model" proposed by this Survey
(3) Confirm the procedures required in order to obtain the permission to import the Uchishiro Soil Bacteria to Vietnam for a commercial purpose
(4) Carry out events or workshops to introduce and promote "BUIK SYSTEM" and the activities conducted under the Survey
(5) Prepare a dissemination plan based on the Survey results obtained
(6) Create a manual to set the standard of the quality to use "BUIK SYSTEM" which would ensure to establish a foundation of the sustainable primary sector

4. Information of Product/Technology to be used

"BUIK SYSTEM" can provide the food waste bio-recycling system, which is consisted of 1) a high-speed food waste treatment machine using the effective and practical microorganisms, called "Uchishiro Soil Bacteria," and 2) operation technique to produce viable bacteria fermented products from food wastes. Fermentation and decomposition treatment of unutilized resources, namely food wastes, is processed under the moisture controlled conditions with Uchishiro Soil Bacteria. Odor is removed when the agricultural product is processed in the combustion furnace.

Installing "BUIK SYSTEM", food wastes can be quickly recycled as organic fertilizer and probiotics (feeds) for fish and livestock. For example, in Japan, "BUIK SYSTEM" has been installed for cleaning measure of fishing ground environment that has been worsened in recent years. The products from the system, which can be preserved for a long period and which has no bad odor, can be used anytime in a good condition.

The details of Product/Technology used for the implementation of this Survey are shown below:

Product/Technology	Specification	Imported or locally procured
BUIK-100	・ Capable to decompose 100L (80kg) of food wastes	Imported from Japan
BUIK-500	・ Capable of decomposing 500L (400kg) of food wastes	Imported from Japan

5. Implementing Organization

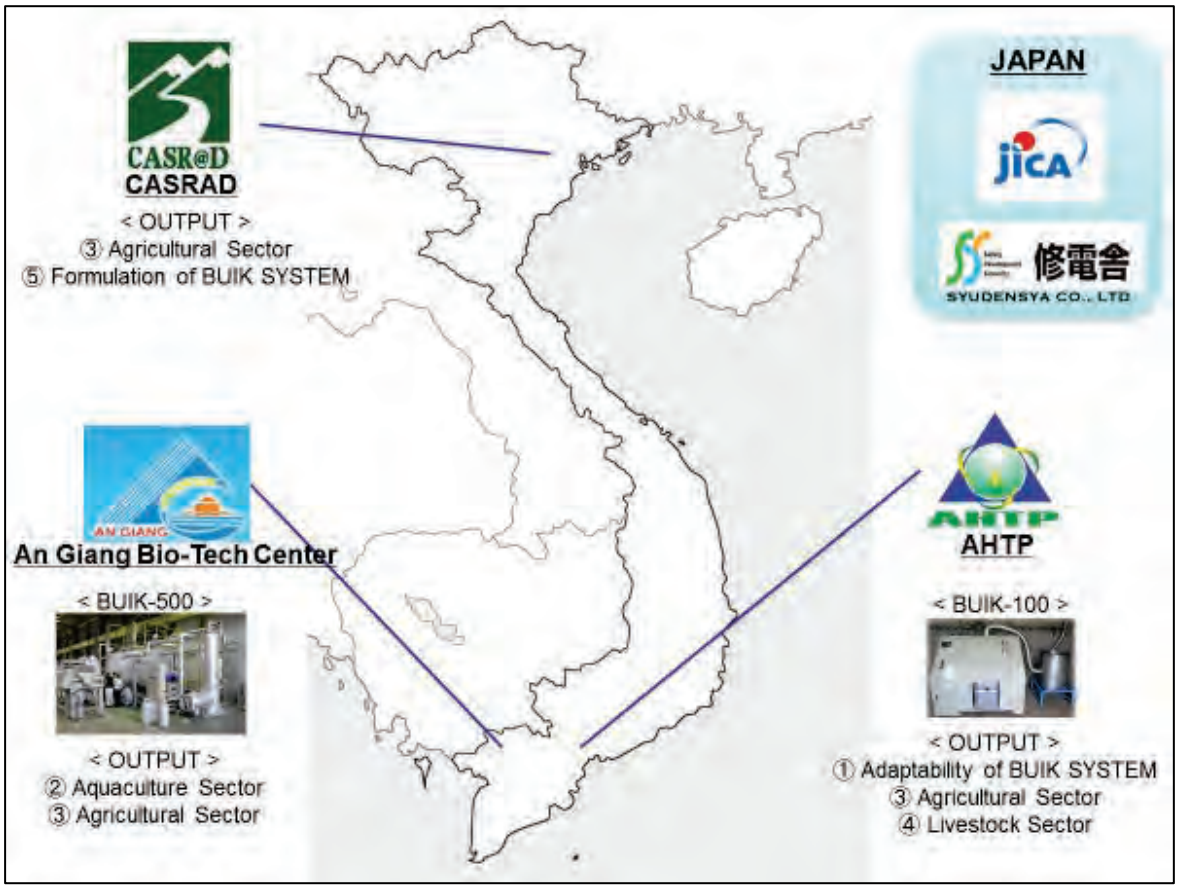
<Vietnam Side>

(1) Centre for Agrarian Systems Research and Development Vietnam Academy of Agricultural Sciences (CASRAD)
(2) Management Board of Agricultural Hi-Tech Park (AHTP)
(3) Biotechnology Center An Giang Department of Science and Technology

<Japan Side>

(1) SYUDENSYA CO., LTD
(2) Nomura Research Institute, Ltd.
(3) K&COMPANY INC.
(4) Raycean Inc.
(5) University of Tokyo

6. Survey Area



source (http://www.sekaichizu.jp/atlas/eastern_asia/country/map_p/p_vietnam.html)

7. Duration

2 years and 5 months from the day of the signing of the contract between Syudensya Co., Ltd. and JICA.

III. Results of Survey

Activities related to Output 1:

(1) Discuss the details of the verification activities for the efficient production of fertilizers and probiotics with the counterpart organizations

- The verification activities were agreed by the counterpart organizations on the Kick off Meeting held on August 11th ,2015.
- Import license of UCHISHIRO bacteria for research purpose was issued by Vietnamese government.
- UCHISHIRO Bacteria was successfully imported into Vietnam.
- BUIK-100 was imported into Vietnam.
- BUIK-100 was installed on site at AHTP, Cu Chi.
- BUIK-500 was imported into Vietnam.
- BUIK-500 was installed on site at Bio-tech Center, An Giang.

(2) Conduct the verification activities using the fishery wastes and residues

<BUIK-100(HCM)>

- Test operation with fishery waste was held on August 11th, 2015 as the demonstration of Kickoff Meeting.
- Product (fertilizer or feed additives) was successfully produced.
- Staff from AHTP got operation training and start operate BUIK-100.

<BUIK-500(An Giang)>

- Operation training for BUIK-500 was held on April 4th through 6th, 2016.
- First operation was successfully done by staff from Bio-tech Center.
- Fishery waste for BUIK-500 was sold from “AGIFISH” where is 5minuits away from site of BUIK-500.

(3) Monitor the progress of the production

- The product (fertilizer/feed additives) which produced on August, 2015 by BUIK-100 had same quality and same operation hours as ordinal product which made in Japan.
  (Fishery waste: 50kg, Rice Bran: 30kg, Product Output: 35kg)
- The product (fertilizer/feed additives) which produced on April, 2016 by BUIK-500 had same quality and same operation hours as ordinal product which made in Japan.
- (Fishery waste: 300kg, Rice Bran: 200kg, Product Output: 222kg, Solid Output(bones): 31kg)

(4) Calculate the running costs and assess the feasibility and efficiency of actual day to day usage

BUIK-500 Product Runnning Costs

5-Apr-16

BUIK-500 Test Running				Ideal Running Costs			
Machine Running Costs				**Machine Running Costs**			
Fishry Wastes	300 kg	45 JPY/kg	13,500 JPY		20 JPY/kg	6,000 JPY
Rice Bran	200 kg	40 JPY/kg	8,000 JPY	100kg	15 JPY/kg	1,500 JPY
Similar Material of Rice Bran	0 kg	5 JPY/kg	0 JPY	100kg	5 JPY/kg	500 JPY
UCHISHIRO BACTERIA	50 g	50 JPY/g	2,500 JPY		50 JPY/g	2,500 JPY
Electrisity(6.7kw×8h)	58.2 kwh	15 JPY/kwh	873 JPY		15 JPY/kwh	873 JPY
Fuel	35 l	90 JPY/ℓ	3,150 JPY		90 JPY/ℓ	3,150 JPY
Food Waste Oil	0 l	10 JPY/ℓ	0 JPY		10 JPY/ℓ	0 JPY

Product Output from BUIK-500		Product Output from BUIK-500	
Day(1batch)	222 kg		300 kg
Month(30Day)	6,660 kg		9,000 kg
Year(360day)	79,920 kg		108,000 kg

【Simulation】

Annual Costs of BUIK-500		Ideal Costs	
Machine Runnning Costs		**Machine Runnning Costs**	
BUIK-500×1バッチ	28,023 JPY		14,523 JPY
360Day(year)	**10,088,280** JPY		**5,228,280** JPY
Labor Costs		**Labor Costs**	
1Labor(40,000JPY/M)	40,000 JPY		40,000 JPY
360Day(year)	**480,000** JPY		**480,000** JPY
Depreciation Costs of Machine		**Depreciation Costs of Machine**	
Main Machine(25,000,000JPY)×1	25,000,000 JPY	(20,000,000JPY	20,000,000 JPY
Depreciation Year : 5years	**5,000,000** JPY		**4,000,000** JPY
Depreciation Costs of Optional Machine		**Depreciation Costs of Optional Machine**	
Optional Machine	5,000,000 JPY		5,000,000 JPY
Depreciation Year : 10years	**500,000** JPY		**500,000** JPY
Overhead Expense 5%	**803,414** JPY	**Overhead Expense 5%**	**510,414** JPY
Total	**16,871,694** JPY	Total	**10,718,694** JPY

Production Costs		Production Costs	
Per kg	211.11 JPY/kg		99.25 JPY/kg

Selling Price	500 JPY/kg	Selling Price	500 JPY/kg
Amount Sold	39,960,000 JPY	Amount Sold	54,000,000 JPY
Gross Profit	23,088,306 JPY	Gross Profit	43,281,306 JPY

(5) Obtain feedbacks from the above verification activities and apply the learnings to another cycle of the production of fertilizers and probiotics

- There are no issues on the quality of Product and Operating Hours. However, there is still running cost issues. The cost of ingredients and some material should be smaller than the result in the survey. According to research, there is cheaper input in other places. During the survey terms, ideal inputs were not founded around Au Chi, and An Giang site. When it moves to the commercial stage, those matters should be solved.

Activities related to Output 2:

(1) Discuss the details to verify the effectiveness of the produced probiotics for aquaculture sector with the counterpart organizations

- As the discussion with AHTP about aquaculture sector, AHTP appointed the survey site for BUIK-500 into the Bio-tech Center An Giang.

- The meeting about aquaculture experimental plan was held by Bio-tech Center and SYUDENSYA.

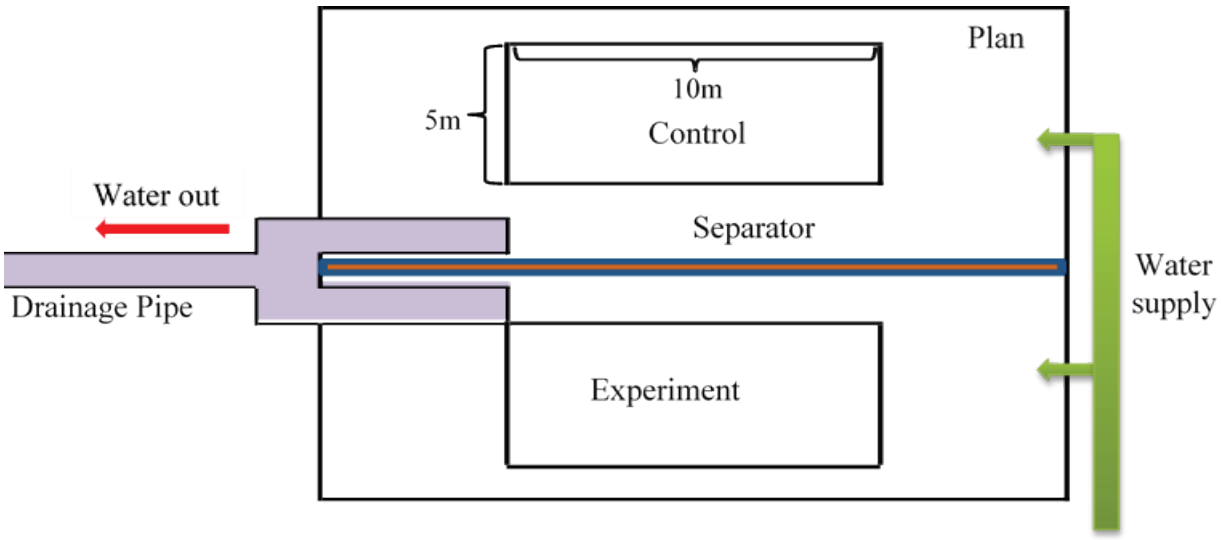
(2) Select two acquire farms/ponds that are under the similar condition in order to compare the results
- Bio-tech center agreed that the comparative experiment at the site of Bio-tech center property.
- The comparative experimental plan between ordinal way and UCHISHIRO aquaculture way was settled.
- There was no two available ponds at the site of Bio-tech center, and so one available pond was divided to two ponds by partition.

(3) Conduct verification activities by feeding probiotics to the fish in one of the selected the aqua farm/pond.
- The testing Object: was “Tra” fingerlings which was raised from seed sizes (an average of 33,3 gam/pc) until they reach marketable size (about 1,000 gam/pc). Fish was reared in two net cages (5*10*4m) placed in ponds name K2 at An Giang Biotechnology Center.
- The testing Feed Additives: was UCHISHIRO Bacteria produced by BUIK - 500 systems that was placed at An Giang Biotechnology Center.

Picture 1. Tra fingerling

Picture 2. *UCHISHIRO Feed Additivve*

- Two net cages (5*10*4m) placed in ponds name K2 at An Giang Biotechnology Center.



- The K2 pond was separated into two smaller ponds (Control and Expxperiment pond) by wooden piles and plastic sheets to without from circulation of water. Each of smaller ponds had got a separated drainage system.

- Experimental farming
  - 1st cage: using probiotic mixed on aquafeed one time per day to feed “Tra” fish.
  - 2nd cage: control model (didn’t using probiotics).
  - Stocking density: 60 pcs/m2 apply for two cages both.

Picture 3. Experimental farming

- Mixture method: Probiotic will be mixed with clean water. After that, spread over surface of aquafeed and cover pelleted by additive. Finally, dry them for 15 – 20 minutes. Tra fish was fed twice a day (8.00 - 9.00am and 4.00 - 5.00pm) by commercial floating pellets which contains 30% protein (apply for first two months) and 26% protein for the remaining period (4,5 months).
- The experimental period: began at 4th August 2016 and finished at 15th February 2017 (6,5 months).
- Experimental place: An Giang Biotechnology Center, Chau Thanh District, An Giang Province.

Picture 4. Feed and Mixing with *Uchishiro* B

(4) Compare and analyze the results between the two aqua farm/pond

Table 1. Uchishiro B sample analysis results

No.	Parameters	Unit	Result	Method
1	Moisture content (*)	%	10.03	FAO P.83:2012
2	Lipid (*)	%	23.28	FAO P.96:2012
3	Crude fibre (*)	%	2.49	FAO P.98:2012
4	Digestible protein (*)	%	16.5	AOAC 971.09
5	Total Plate Count ($30^{O}C$)	CFU/g	3.5×10^{3}	SO 4833-1:2013
6	Mold & Yeast	CFU/g	<10	ISO 21527-2:2008
7	*Pseudomonas* spp. (**)	CFU/g	<10	ISO 13720:2010
8	Total anaerobic microorganisms (**)	CFU/g	5×10^{1}	ISO 15213:2003 (TCVN 7902:2008)
9	Total decompose cellulose microorganisms (**)	CFU/g	7×10^{2}	Ref. TCVN 6168:2002

Note:

(*) Parameters were accredited by *Vilas.*

(**) Use subcontractor.

- In general, the level of protein in *Uchishiro* B was lower than protein in fish meal (55 two aqua farm/pond at 15th February 2017 (6,5 months).id in fish meal (4,9 tein in

fish meal (55 *Uchishiro* B had made by rice bran and fish waste which contained a lot of lipid. The composition of microorganisms in *Uchishiro* B was also lower than that of other probiotics on the market.

- The ratio of mixing on aquafeed was 50g/kg (5%) apply from released to 15th December 2016 (4,5 months). For the remaining period (2 months), applied ratio of mixing 100g/kg (10%) because Uchishiro B could had an impact unclearly due to fish growth slowly. The total amount of probiotic using for experiment was 159.5 kg.

Table 2: ***Residue sample analysis results***

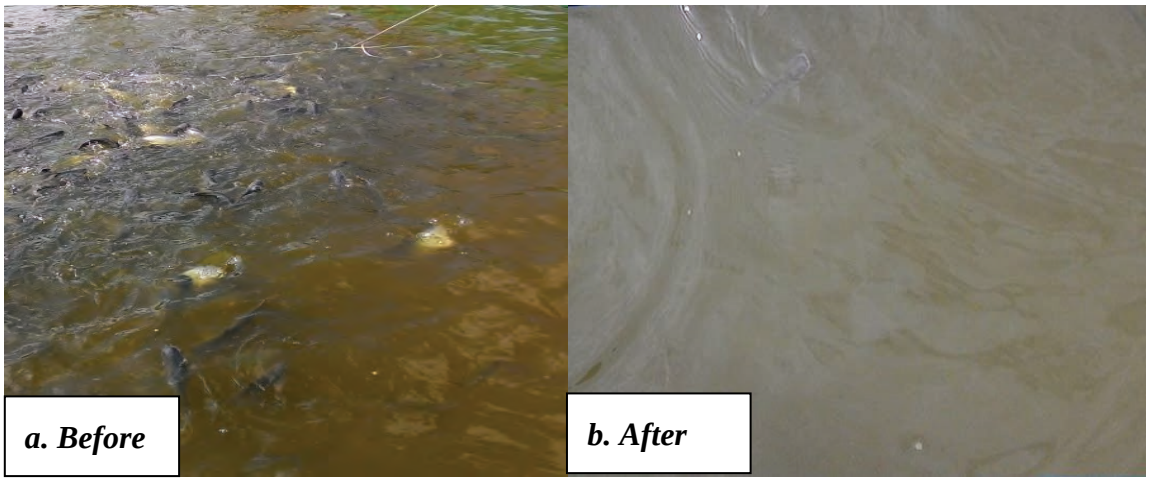
No.	***Parameters***	***Unit***	**Control Pond**	**Experiment Pond**
1	Total Plate count (30^oC)	CFU/g	1.0×10^6	1.3×10^6
2	*Escherichia coli*	CFU/g	40	1.2×10^2
3	Coliforms	CFU/g	1.3×10^3	1.0×10^3
4	Total nitrogen	mg/g	14.71	10.49
5	Total phosphorus - P	%	1.01	0.94
6	Total anaerobic microorganisms	KL/g	1.2×10^5	1.3×10^5
7	*Pseudomonas sp.*		9×10^1	7×10^1

- The total plate count and total anaerobic microorganisms in residue sample of Experiment pond were higher than of Control Pond while the total nitrogen and total phosphorus were lower can be considered as evidences for the good impact by *Uchishiro* B.

Water Quality

Number of water change

- Pond water was only changed in case of contaminated to maintain a good environment living for the growth and development of fish. The method to determine pond water which was got polluted based on water color and pond water parameters testing results that were observed and monitored throughout the experiment.
- The ***picture a*** below shows that pond water was contaminated and needed water change



Picture 5. Pond water before and after change

- This chart below show the comparison of water change number between the experiment and control:

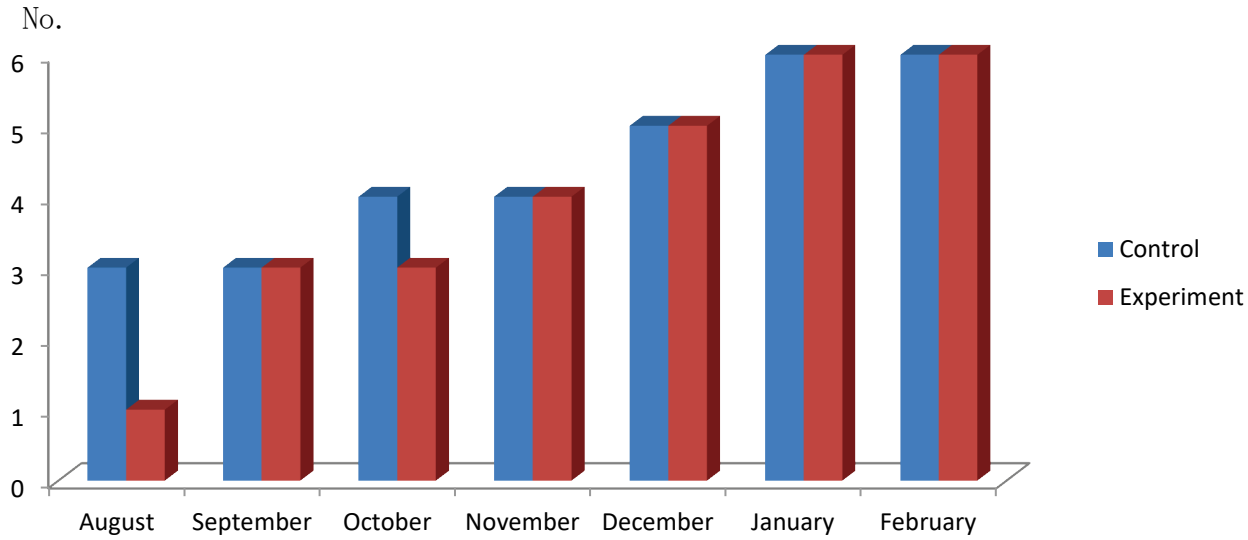


Chart : The comparison about number of water change between Experiment and Control

***Note**: *each number of water change was about 20 hours.*

- In the first of three months, the time for water change of experimental pond was 30% less than the control. Therefor, *Uchishiro* B had good effect on improving and maintaining water quality in pond at that time. However, there weren't difference in the remaining period because the amount of fish residues in ponds maybe too much for *Uchishiro* B can be got a good impact clearly.

Picture: Collected and tested pond water

Ponds water parameters

- Ponds water parameters of two ponds both were tested and colleted during of the experiment to supply for pond water changes and probiotic impact assessment.

Table . Pond water parameters analysis results

No	Parameter	Control	Experiment	Request (Boyd, 1998)
1	pH	7.8 – 7.9	7.7 – 7.9	7 - 9
2	DO	3 - 6 mg/litre	3 – 6 mg/litre	3 – 6.5 mg/litre
3	NO_2^-	0.1 – 3 mg/litre	0.1 – 1 mg/litre	< 0.3 mg/litre
4	NH_4^+	0.1 - 10 mg/litre	0.1 – 10 mg/litre	0.2 - 2 mg/litre
5	TSS (bef – aft)	42.8 – 42.2 mg/litre	35.2 – 39.1 mg/litre	50 – 150 mg/litre
6	BOD_5 (bef – aft)	26.5 – 27.1 mg/litre	24.1 – 23.8 mg/litre	5 -20 mg/litre

- Data fromt ***table 3*** above indicate that:
  - pH and DO parameters of two ponds both were not different and suitable for the growth and development of fish.
  - NO_2^- and NH_4^+ parameters of two ponds both haven't got a lot of difference and higher general request. However, they were also suitable for Tra fish.
  - TSS and BOD_5 parameters were average values which was collected at the beginning and the end of pond water changes. Parameter values were more and

more higher that means the pond water quality was also more and more polluted. Therefor, the experiment had got better results than control.

Comparison of Fish growth

- During experiment conducting, 15 pcs from each cage were weighed randomly monthly in order to determine fish growth rate.

Picture : Collected and weighed fish

- Tra fish in two ponds both was infected parasites on the second month of experiment period. However, the infection time of experimental fish was longer than control. The cause maybe due to the decrease temperature and stress caused by raining in a long time (storm) which was suitable for condition of parasite growth. For this reason, the fish growth rate could be decreased.

Tricodina ***A&B: Dactylogyrus on gills*** ***C&D: Gyrodactylus on skin***

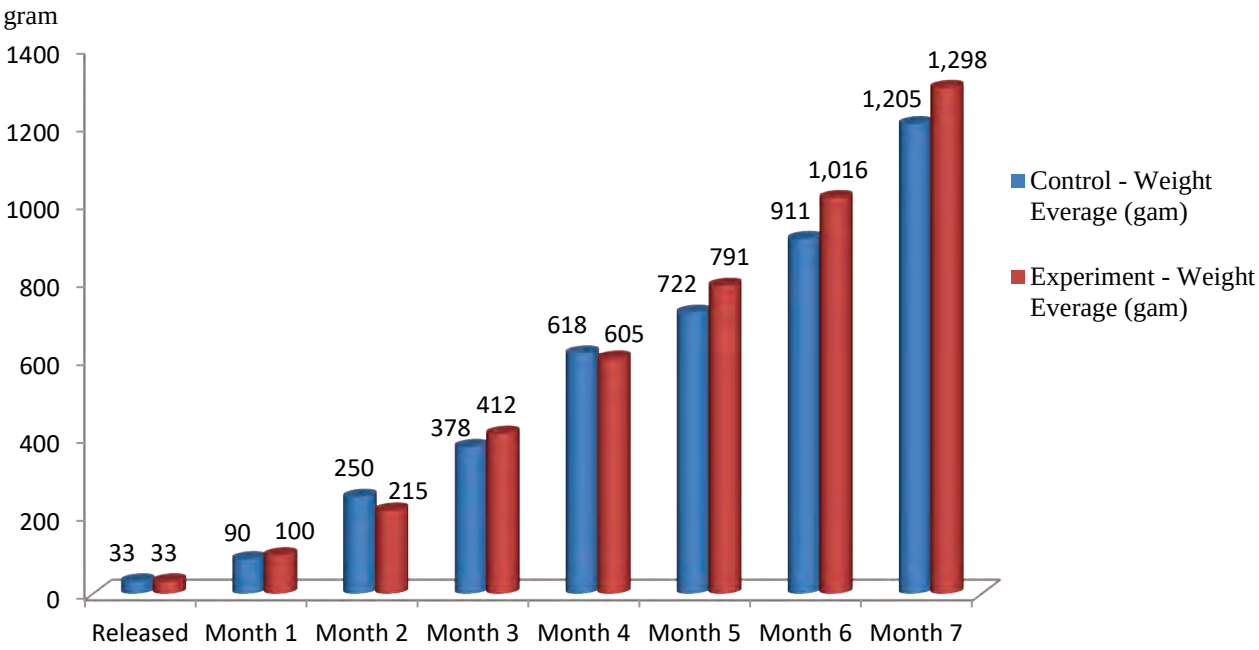


Chart : The comparison about weight average between Experiment and Control

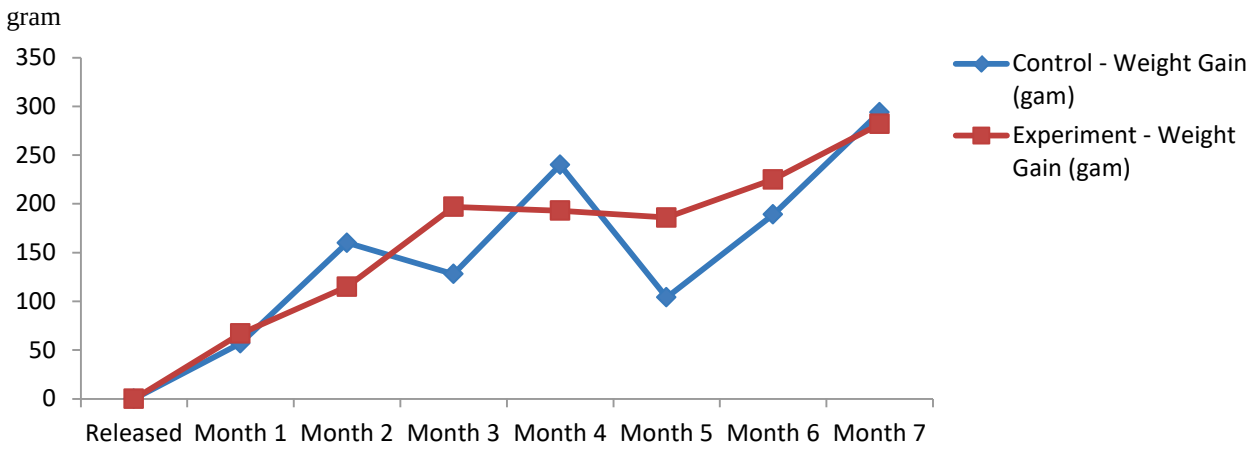


Chart : The comparison about weight gain between Experiment and Control

- Chart above indicated that good effect of probiotic (*Uchishiro* B) on fish growth rate. The average weight of experimental fish was higher 10.3% compared to control after 6 months using probiotics. Moreover, the fish growth rate was also maintained stability during of experimental period. That means experimental fish healthy had less effected by outside impacting conditions than control fish.

The comparison about survival rate (SR)

- At the end of the experiment, determine survival rate (SR) of fish in each cage:
  - **SR (%) = (Survival fish/initial fish)*100**

SR $_{\textbf{control}}$ = (2879 pcs/3094 pcs)*100 = 93%.

SR $_{\textbf{experiment}}$ = (2842 pcs/3075 pcs)*100 = 92,4%.

- The survival rate of fish was not significantly different between two treatments. Tra fish survival rate that is farming in pond usually ranges from 60 to 80%.

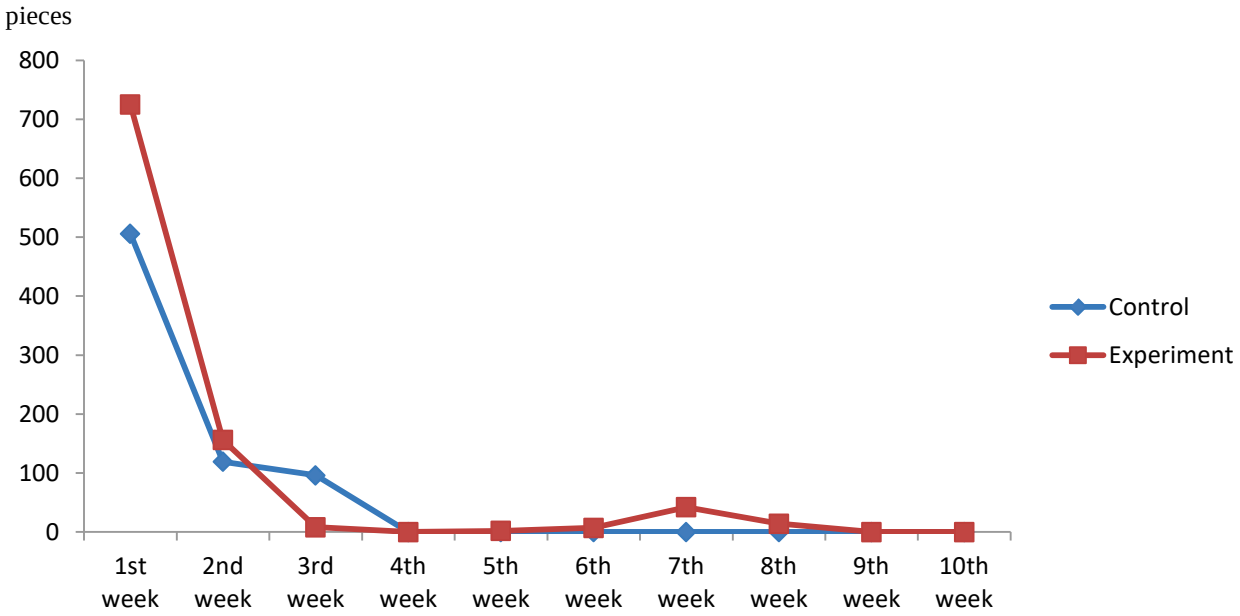


Chart : Number of Fingerlings Died (Floated body only)

- The number of dead fish in both treatments during the first week was caused by being scratched during fishing and transportation. That number would be released before the experiment began.

The comparison about Feed conversion rate (FCR)

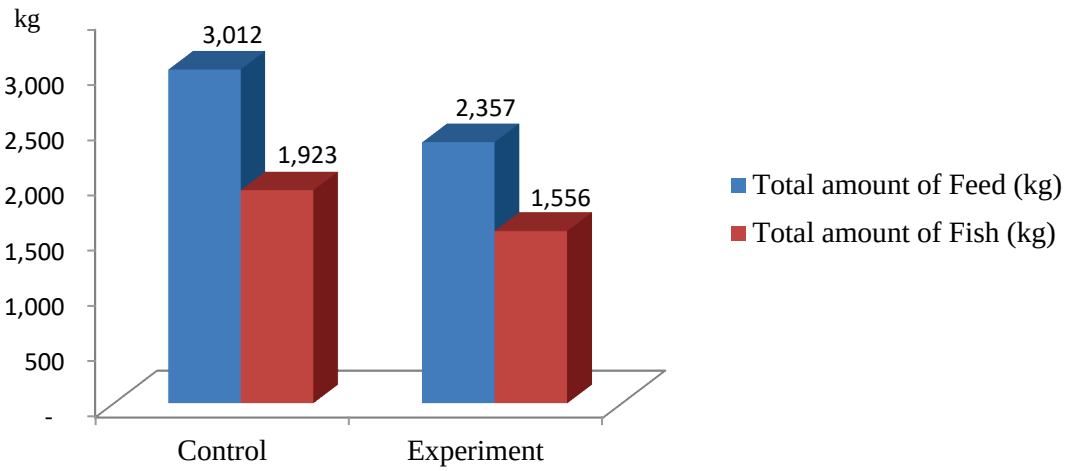


Chart : The comparison about total amount of Feed and Fish

- The food conversion ratio (FCR) was then calculated as:

FCR = dry weight of feed consumed (kg)/ wet weight gain (kg)

FCR $_{\textbf{control}}$ = 3012/1923 = **1.57**

FCR $_{\textbf{experiment}}$ = 2357/1556 = **1.51**

- FCR (Feed Conversion Rate) is the conversion rate in livestock feed. FCR decrease means the efficiency of higher feed conversion. Therefor, the experiment had got better results than control. The good FCR result for tra fish farming is about 1.6.

Comparison about quality of fish

- Measure colour and quality of tTra" fillet by two following methods:

- + **Sensory evaluation**: At the end of the experiment, Tra fish were filleted with 10 pcs/cage to assess the color and flesh quality. Criterias assessment depending on Viet Nam Standards (TCVN 2653:1978).

Table : Comparison of meat color

No.	Name	Age	Meat Color Comparison	
			Control Fish	Experimental Fish
1	Kentaro Uchiyama	40	6 pcs white, 3 pcs pink, 1 pc slightly yellow	9 pcs White, 1 pcs pink
2	Nguyễn Công Kha	36	6 pcs white, 3 pcs pink, 1 pc slightly yellow	9 pcs White, 1 pcs pink
3	Huỳnh Ngọc Dũng	36	6 pcs white, 1 slightly pink, 2 pcs pink, 1 pc slightly yellow	8 pcs White, 2 pcs slightly pink
4	Lê Đức Duy	32	6 pcs white, 1 slightly pink, 2 pcs pink, 1 pc slightly yellow	8 pcs White, 2 pcs slightly pink
5	Nguyễn Trường Quân	30	6 pcs white, 1 slightly pink, 2 pcs pink, 1 pc slightly yellow	9 pcs White, 1 pcs slightly pink
6	Trần Thị Thu Thảo	32	6 pcs white, 3 pcs pink, 1 pc slightly yellow	8 pcs White, 1 pc pink, 1 pc slightly pink
7	Tiêu Quốc Sang	31	6 pcs white, 3 pcs pink, 1 pc slightly yellow	8 pcs White, 1 pc pink, 1 pc slightly pink

Table : Comparison of meat taste

No.	Name	Age	Taste Comparison		How did you evaluated
			Control Fish	Experimental Fish	
1	Kentaro	40		✓	☑ Strong meat ☐ Soft meat
2	Nguyễn Công Kha	36		✓	☑ Strong meat ☐ Soft meat
3	Huỳnh Ngọc Dũng	36		✓	☑ Elastic meat ☐ Soft meat
4	Lê Đức Duy	32		✓	☑ Elastic meat ☐ Soft meat
5	Nguyễn Trường Quân	30		✓	☑ Strong meat ☐ Soft meat
6	Trần Thị Thu Thảo	32	✓		☐ Strong meat ☑ Soft meat
7	Tiêu Quốc Sang	31	✓		☐ Strong meat ☑ Soft meat

Picture . Harvest and compare color of fish fillet

- + **Chemical analysis method**: determine chemical criteria including Crude protein, lipid and acid amin to evaluate the impact of probiotic on fillet quality.

Table : Tra fillet sample analysis results

No.	***Parameters***	***Unit***	**Tra fish sample (control)**	**Tra fish sample (experiment)**
1	Florfenicol	mg/kg	ND	ND
2	Doxycycline (*)	mg/kg	ND	ND
3	Crude Protein (*)	%	17.27	17.5
4	Lipid (*)	%	3.63	3.53
5	*Escherichia coli* (*)	CFU/g	<10	30
6	*Salmonella* (*)	/25g	ND	ND
7	**Axit amin**			
7.1	Alanin (**)	%	1.54	1.52
7.2	Arginine (**)	%	1.12	1.09
7.3	Aspartic acid (**)	%	2	1.95
7.4	Cystine (**)	%	0.04	0.04
7.5	Glutamic acid (**)	%	5.33	5.47
7.6	Glycine (**)	%	0.96	0.88
7.7	Histidine (**)	%	0.36	0.42
7.8	Isoleucine (**)	%	1.04	0.94
7.9	Leucine (**)	%	1.69	1.67
7.10	Lysine (**)	%	1.65	1.61
7.11	Methionine (**)	%	0.48	0.52
7.12	Phenylalanine (**)	%	0.69	0.79
7.13	Proline (**)	%	0.79	0.75
7.14	Serine (**)	%	0.8	0.79
7.15	Threonine (**)	%	0.61	0.6
7.16	Tyrosine (**)	%	0.65	0.64

7.17	Valine (**)	%	0.92	0.92

Note:
(*) : Parameters were accredited by *Vilas.*
(**): Use subcontractor.
ND : Not detected.

- Crude protein and lipid analysis results above can be considered as an evidence to partly explain for why flesh of experimental fish was more elastic than control fish.
- Two samples both were infected *Escherichia coli.* However, that was still in Allow Limited of QCVN 8-3:2012/BYT (5.10^2 – 5.10^3 CFU/g). These amino acids were highlighted in yellow are the essential amino acids.

Comparison of economic efficiency

Table : Comparison of economic efficiency between Experiment and Control

No.	Items	Control (VND)	Experiment (VND)
1	Basic materials and farming tools	17.202.600	14.533.000
2	Pond preparation	4.010.000	4.010.000
3	Seeds	5.000.000	5.000.000
4	Aquafeed	37.736.900	29.758.550
5	Chemical and medicine	1.267.500	1.789.500
6	Labor	3.400.000	3.400.000
Total cost of one crop (6,5 months)		**68.617.000**	**58.533.050**
Total income		1,923kg*17,000 = **32,691,000**	1,556kg*17,000 = **26,452,000**
Profit		**(35.926.000)**	**(32.086.050)**

** Depreciation rate was calculated for 5 years.*

- The total income of two treatments both were lower than the costs because of these reasons below:
  - The first: this experimental project was a very small scales. However, its cost spent for labor, transports, equipments, control, contact… were the same with farmers farming scales. Besides, we also didn't get cheaper prices for feed, medicine and chemical as the farmers have gotten.
  - The second: Experimental fish selling prices (17.000 VND) were cheaper than farmers' prices (22.000 VND) at the same time because of the little fish amount that couldn't be selling to seafoof company directly for export. It was just consumed at traditional markets.
- However, we can see that probiotic using efficiency in this experiment was very good if we have compared the profit between two treatments. The experimental profit was 11% higher than control profit. That is really a impression number in Tra fish farming.

(5) Evaluate the results obtained from the verification activities

- Conclusion: based on the results of water changing ratio, growth rate, FCR and the profit comparision above we can confirm that *Uchishiro* B had a good impact on water quality and growth rate of fish. Specifically, *Uchishiro* B made reduced water changing ratio, improved fish growth rate and reduced FCR farming.
- Recommendation: *Uchishiro* B can be used at fish fingerling stage to improve water quality and growth rate. *Uchishiro* B should be used for shrimp farming (*Penaeus monodon*, *Litopenaeus vannamei*, *Macrobrachium rosenbergii,…)* because it is suitable for less water change farming and it is also suitable for shrimp bottom living habits. Besides that, *Uchishiro* B also should be used for high economic value aquaculture species to help farmers get a good profit.

Fig. ***Comparison of economic efficiency***

No.	Items	Amount (VND)	
		Control	**Experiment**
1	**Basic materials and farming tools**	**17,202,600**	**14,553,000**
	Test Sera kit (DO, $NO2^-$, $NH4^+$)	2,400,000	2,400,000
	pH meter machine handle	250,000	250,000
	Electricity system (power meter, wires…)	540,000	540,000
	Electricity	5,740,800	3,091,200
	Pump system (pump 3hp, pipe…)	812,000	812,000
	Farming system (net, pile,…)	2,509,800	2,509,800
	Composite boat	600,000	600,000
	Banner	150,000	150,000
	Transport	2,400,000	2,400,000
	Labor	1,800,000	1,800,000
2	**Pond preparation**	**4,010,000**	**4,010,000**
	Oil for Pump water	1,080,000	1,080,000
	Weeding	780,000	780,000
	Lime (CaO)	750,000	750,000
	Labor	1,400,000	1,400,000
3	**Seeds**	**5,000,000**	**5,000,000**
	Tra fingerlings	3,750,000	3,750,000
	Transport	1,250,000	1,250,000
4	**Aquafeed**	**37,736,900**	**29,785,550**
	Feed floating (pellet 30% protein)	36,686,900	28,735,550
	Transport	1,050,000	1,050,000
5	**Chemical and medicine**	**1,267,500**	**1,789,500**
	Cuttle oil	-	525,000
	Lime ($CaCO_3$)	650,000	650,000
	Vitamin C	115,000	105,000
	Iodine	120,000	120,000
	Antibiotics	25,000	25,000
	Digestion enzyme	182,000	-
	Hadaclean	110,500	229,500
	$CuSO_4$	65,000	65,000
	Fiba	-	70,000
6	**Labor**	**3,400,000**	**3,400,000**
	Feeding	900,000	900,000
	Harvesting and materials	2,500,000	2,500,000
Total cost of one crop (6,5 months)		**68,617,000**	**58,538,050**
Total income		1,923kg*17,000 = **32,691,000**	1,556kg*17,000 = **26,452,000**
Profit		**(35.926.000)**	**(32.086.050)**

Fig. Experimentation Plan for Aquaculture

			Days	Role of Sub-contractor	Role of Biotechnology Center	PH Test	DO, No2, NH4	TSS, COD
2016	8-Jul	Thu						
	9-Jul	Fri						
	10-Jul	Sat						
	11-Jul	Sun						
	12-Jul	Mon						
	13-Jul	Tue						
	14-Jul	Wed						
	15-Jul	Thu						
	16-Jul	Fri		Preparation Period				
	17-Jul	Sat		(1 week)				
	18-Jul	Sun						
	19-Jul	Mon						
	20-Jul	Tue		Start Construction including Separator				
	21-Jul	Wed						
	22-Jul	Thu						
	23-Jul	Fri						
	24-Jul	Sat			Procure Fingerings (Medium size)			
	25-Jul	Sun			Procure Feed			
	26-Jul	Mon			Procure Probiotics			
	27-Jul	Tue			Training of Operator by Mr. Duy			
	28-Jul	Wed						
	29-Jul	Thu						
	30-Jul	Fri		Completion of Construction				
	31-Jul	Sat						
	1-Aug	Sun						
	2-Aug	Mon			Fill up Water			
	3-Aug	Tue				X		
	4-Aug	Wed	1		Release Fingerings	X		
	5-Aug	Thu	2			X		
	6-Aug	Fri	3			X		
	7-Aug	Sat	4		Start Feeding & Ocular Inspection for Changing Water	X	X	X
	8-Aug	Sun	5			X		
	9-Aug	Mon	6			X		
	10-Aug	Tue	7			X	In case Change Water	
	11-Aug	Wed	8			X	Use Simple Analytical Kid	Send Sample to Labo in Kanton
	12-Aug	Thu	9			X	In case Change Water	
	13-Aug	Fri	10			X	↓	↓
	14-Aug	Sat	11			X	↓	↓
2017	20-Feb	Sun	201			X	↓	↓
	21-Feb	Mon	202			X	↓	↓
	22-Feb	Tue	203			X	↓	↓
	23-Feb	Wed	204			X	↓	↓
	24-Feb	Thu	205		Organize "Meat Quality Test" by Farmers	X	↓	↓
	25-Feb	Fri	206		Obtain Bottom Mud Smple and send to Labo	X	↓	X
	26-Feb	Sat	207			X	↓	↓
	27-Feb	Sun	208			X	↓	↓
	28-Feb	Mon	209		Completion of Experimentation	X	X	X
	1-Mar	Tue	210					
	2-Mar	Wed	211					
	3-Mar	Thu	212					
	4-Mar	Fri	213					
	5-Mar	Sat	214					
	6-Mar	Sun	215					
	7-Mar	Mon	216		Send Analytical Result to Syudensya (Critical)			

Activities related to Output 3:

(1) Discuss the details to verify the effectiveness of the produced fertilizers for agriculture sector with the counterpart organizations

- The Experimental plan of agriculture sector with "UCHISHIRO Fertilizer" was settled under the discussion by AHTP and SYUDENSYA.
- The Experimental plan with 4 kinds of crops was settled, such as; 1. Leaf Vegetable / 2. Egg plant / 3. Chinese Broccoli / 4. Peanut.
- Enough UCHISHIRO Fertilizer was produced for agriculture sector.
- The Experimental plan was agreed by CASRAD, AHTP, and SYUDENSYA on April 6th, 2016.

(2) Select two fields that are under the similar condition in order to compare the results

- Two fields were selected at the site of AHTP, Cu Chi.
- Each fields had 400m2.
- UCHISHIRO Fertilizer spread 100kg for 100m2.

(3) Research the rules and standards for the organic farming in Vietnam

- The rules and standards for the organic farming in Vietnam were researched under the meeting of CASRAD, AHTP, and SYUDENSYA.

(4) Conduct verification activities by feeding the fertilizer on to one of the selected field

- The first comparative experiment was implemented from August, 2016.
- Experimental field had a huge outbreak of insects. Crops got big damage from insect attack.
- The second comparative experiment was implemented from February, 2017.

(5) Compare and analyze the results between the two fields

- Refer to attachment "Agriculture Report"

(6) Evaluate the results obtained from the verification activities

- Refer to attachment "Agriculture Report"

Activities related to Output 4:

(1) Discuss the details to verify the effectiveness of the produced fertilizers for agriculture and livestock sector with the counterpart organizations

- As the result of a discussion by CASRAD, AHTP, and SYUDENSYA, type of livestock is selected to pig.
- The cooperative pig farmer, who agreed to give the feed mixed with UCHISHIRO Feed Additives, were not founded during the term of survey. So, liquid fertilizer was made from ordinal pig urine.

(2) Mix the small amount of the produced feeds to the feedings of the livestock

- Not implemented in this survey

(3) Accumulate the livestock's urine in order to produce liquid fertilizers

- The lagoon for pig urine was built at the site of AHTP on December, 2016.
- Liquid fertilizer was aging, and was produced on February, 2017.

(4) Select two fields that are under the similar condition in order to compare the results

- Two fields were selected at the site of AHTP, Cu Chi.
- Each fields had 100m2.

(5) Conduct verification activities by feeding the liquid fertilizer on to one of the selected field
- Liquid fertilizer was spread on March, 2017.
- Comparative experiment was finished on May, 2017.

(6) Compare and analyze the results between the two fields
- The results were compared between ordinal Chemical fertilizer way and UCHISHIRO fertilizer way.
- The worker appointed by AHTP collect the data, and CASRAD managed and organized data in order to make the report.

(7) Evaluate the results obtained from the verification activities
- Refer to attachment “Agriculture Report”

Activities related to Output 5:

(1) Conduct analysis to understand the present market environment of bio-waste recycling business in Vietnam. The analysis incudes the estimation of the potential demand for the “BUIK SYSTEM”.
- SYUDENSYA concluded the contract between Vietnamese local company on the exclusive distribution right on December, 2016. This sales distribution company target 1. Public Food market, 2. Fishery processing company, 3. General Hospital, 4. Agricultural Experiment Station, and 5. Fertilizer Company. So, the estimation of the potential demand for the “BUIK SYSEM” will be covered on those targets.

1. Public Food Market	It is said that each local authority has their own public market. There are more than 10,000 local authority, and there are 58 provincial public markets. In the estimation, 10 through 20 sets of BUIK SYSTEM will be sold in 5years.
2. Fishery Processing Company	There are 420 small medium company and 15 big company. In the estimation, BUIK-50, 100, 250 will be sold into small medium company, and BUIK-500, 1000, 2000 will be sold into big company.
3. General Hospital	There are about 10 general hospital which has more than 1,000 beds and 13,500 hospital are small medium hospital.1 bigger size of BUIK SYSTEM and 50 smaller size of BUIK SYSTEM will be sold in the estimation.
4. Agricultural Experiment station	Each province has an Agricultural experiment station. 2 BUIK system will be installed in the estimation.
5. Fertilizer Company	15 fertilizer company have around 95% of market share of fertilizer (Fertilizer Industry Report(2015)). Around 60 fertilizer company are registered. 5 BUIK SYSTEM will be sold in the estimation.

Expected Sales (Unit)

	2017	2018	2019	2020	2021
BUIK-50	0	0	5	10	20
BUIK-100	1	2	5	5	10
BUIK-250	0	2	5	5	10
BUIK-500	0	2	5	5	10
BUIK-1000	2	1	1	2	2
BUIK-2000	0	0	1	2	2

(2) Assess potential challenges for disseminating “BUIK SYSTEM” and “sustainable primary industry model” proposed by this Survey

- In order to develop “sustainable primary industry model,” some challenges and risks, such as below, have to be considered.
- Input material, such as, fishery waste, vegetable residues, and any other food waste, need to be properly collected for BUIK SYSTEM. Therefore, owner and operator have to research well about collecting input material in advance.
- Climate risks can be always happened. Therefore, those risks have to be considered and included in the activity plan.

(3) Confirm the procedures required in order to obtain the permission to import the UCHISHIRO Bacteria to Vietnam for a commercial purpose

- The permission to import the UCHISHIRO Bacteria to Vietnam for a research purpose has been issued. The permission for a commercial purpose will be registered after this survey finished with submitting the survey results report.

(4) Carry out events or workshops to introduce and promote “BUIK SYSTEM” and the activities conducted under the Survey

- On August, 11th 2015, when kick-off meeting was held, more than 150 people who relate to Agriculture came from 14 southern provinces. There were so many inquiry from attendance. Some mushroom farmer, aquaculture farmer, and chicken farmer had directly asked about BUIK SYSTEM.
- In several seminars, symposiums, BUIK SYSTEM has been introduced for 15times in Vietnam and Japan. Also, newspaper and TV show report BUIK SYSTEM and this survey for 5times in Vietnam and Japan.
- SYUDENSYA accepted delegation tour of An Giang top leaders in Nobeoka City, Miyazaki Prefecture in Japan.
- President Ichinose from SYUDENSYA got invitation from Japanese foreign affair for the official banquet by Japanese Prime minister Mr. Shinzo Abe and Vietnamese Prime minister Mr. Nguyen Xuan Phuc.
-

Left : President Ichinose (SYUDENSYA)
Right : Prim Minister Nguyen Xuan Phuc

Kentaro Uchiyama
(Project Manager, SYUDENSYA)

(5) Prepare a dissemination plan based on the Survey results obtained
- Guideline of BUIK 100 & 500 has been made during the term of the Survey.
- Dissemination plan for next 5 years has been made by works with ASEAN Vietnam Company

(6) Create a manual to set the standard of the quality to use “BUIK SYSTEM” which would ensure to establish a foundation of the sustainable primary sector
- Vietnamese Manual was created when the training of BUIK-500 held.
- When BUIK SYTEM is sold, it updates again with the customer’s demand.
- It will be updated when BUIK-100 install into Ha Long City under the JICA project managed by Nippon Koei on December, 2017.

REPORT

Study on effect of *Uchisiro bacteria* probiotics used as organic fertilizers on crops, conducted at the experimental area of Agricultural Hi-Tech Park (AHTP), Pham Van Coi Commune, Cu Chi District, Ho Chi Minh City.

Purpose of the study: To study impacts of *Uchishiro* on non-chemical farming and reducing amount of fertilizers used in agricultural production

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I. EXPERIMENT METHODS

Test Bio-fertilizers of *Uchishiro bacteria* on four different vegetables including peanuts, Chinese broccoli, eggplant, and lettuce. Layout method: Each type of plants was divided into 2 plots: experiment plot fertilized with bio-fertilizers (BF) and control plot.

- The area of experimental plot applied with BF for each crops was 60 m^2 and divided into 3 beds.

- The area of control plot for each crops was 60 m^2 and divided into 3 beds.

Method of BF application: After ploughing, turning up, the soil was made beds and then fertilized with *Uchishiro bacteria* bio-fertilizers one time 15 days prior to seeding, with the dose of 1 kg/m^2 by being mixed in the beds.

1.1. Experiment diagram and time of seeding

Control Broccoli Area = 60 m^2	Control Eggplant Area = 60 m^2
Control Lecture Area = 60 m^2	Control Peanuts Area = 60 m^2
Broccoli with Bio-fertilizer Area = 60 m^2	Eggplant with Bio-fertilizer Area = 60 m^2
Lecture with Bio-fertilizer Area = 60 m^2	Peanuts with Bio-fertilizer Area = 60 m^2

Experiment period: from month…../2017 to month…/2017

1.2. Experimental care for each type of plants

Peanut:

Experiment	**Control**
Seed: Local peanuts (Ráng) in Long An **Seeding** Seed treatment before sowing with antifungal.	**Seed:** Local peanuts (Ráng) in Long An **Seeding** Seed treatment before sowing with antifungal.

- Density: distances between rows of 30-40 cm, between trees of 10-12 cm (about 20-25 trees/1m2). - Sow 2-3 seeds/cavity, the amount of seeds needed to sow on 1 ha is 100-150 kg. - Depth of sowing is 3 cm **Fertilizers** After ploughing, turning up, weeding, the soil is made beds and then fertilized with *Uchishiro bacteria* bio-fertilizers one time 15 days prior to seeding, with the dose of 1 kg/m^2 by mixing in the beds. **Taking care** - Weeding: Weed regularly, ensuring weed clean. - Earth up: Turnover and earth up roots when trees are flowering. - Watering: + Lack of water in flowering period will make flowers bloom less and many fall. + Lack of water in fruiting period will make seed be imperfect. + Before harvesting, reduce watering.	- Density: distances between rows of 30-40 cm, between trees of 10-12 cm (about 20-25 trees/1m2). - Sow 2-3 seeds/cavity, the amount of seeds needed to sow on 1 ha is 100-150 kg. - Depth of sowing is 3 cm **Fertilizers** - Dosage of fertilizers: + Basal fertilizing: muck 1ton; lime 50kg; phosphate 50kg; + Flowering stage: manure NPK 50 kg (1000 m^2), divided into two times, 20 days apart **Taking care** - Weeding: Weed regularly, ensuring weed clean. - Earth up: Turnover and earth up roots when trees are flowering. - Watering: + Lack of water in flowering period will make flowers bloom less and many fall. + Lack of water in fruiting period will make seed be imperfect. + Before harvesting, reduce watering.

Eggplant:

Experiment	**Control**
Nursing seedlings - Soak seeds in water for 24 hours, pick up and soak next in warm water 50 degrees C (2 boil, 3 cold, for both killing fungal pathogen and stimulating seeds germinate rapidly) for 1 hour, incubate in moist cloth for cracking then nurse in nursery bags.	**Nursing seedlings** - Soak seeds in water for 24 hours, pick up and soak next in warm water 50 degrees C (2 boil, 3 cold, for both killing fungal pathogen and stimulating seeds germinate rapidly) for 1 hour, incubate in moist cloth for cracking then nurse in nursery bags.

- Seed amount is 40g seeds/1000m^2. - Pull up healthy seedlings with leaves of 5-6, the height of 6-8cm, and the stout body, to plant into fields. **Making soil, fertilizing, planting trees** - After ploughing, turning up, weeding, the soil is made beds and then fertilized with *Uchishiro bacteria* bio-fertilizers one time 15 days prior to seeding, with the dose of 1 kg/m^2 by mixing in the beds. - Density: distances between rows of 60 cm, between trees of 70 cm (about 2000-2500 trees/1000 m^2). **Taking care** - Pruning off branches, setting up pergola: When crops start to flower, prune off branches under the first bunch of flowers to make foots of trees be clear. When the eggplant blooms second batch of flowers, top the plants, inhibit branches, limit height to give more branches with fruits. When the plant starts branching out, set up pergola with bamboo.	- Seed amount is 40g seeds/1000m^2. - Pull up healthy seedlings with leaves of 5-6, the height of 6-8cm, and the stout body, to plant into fields. **Making soil, fertilizing, planting trees** - Plow soil, pick up weeds and make beds with the cross fall width of 1.2 meters, the height of 20-25cm, the furrow width of 30cm. - Basal fertilizing for 1.000 m^2 includes 800kg of decomposed muck + 30kg of super phosphate + 5kg of potassium phosphate + 50kg of kitchen ashes. - Density: distance between rows is 60 cm; between trees is 70 cm (about 2000-2500 trees/1000 m^2). **Taking care** - 1st top dressing (10 days after planting): 5kg of urea fertilizers, 3kg of KCl fertilizers - 2nd top dressing (30 days after planting): 7kg of urea, 4kg of KCl - 3rd top dressing (50 days after planting): 8kg of urea, 5kg of KCl - Pruning off branches, setting up pergola: When crops start to flower, prune off branches under the first bunch of flowers to make foots of trees be clear. When the eggplant blooms second batch of flowers, top the plants, inhibit branches, limit height to give more branches with fruits. When the plant starts branching out, set up pergola with bamboo.

Chinese broccoli:

Experiment	**Control**
Making soil	**Making soil**

- Soil was plowed carefully, picked up weeds, made beds with the length of 1,4-1,5m; the width of 1,1 – 1,2m; the furrow width of 30cm; the height of 25-30 cm. The land is flat, easy to drain.

Seeding, planting

- Planting seedlings: plant at a spacing of 25x35cm/tree or 20x20cm/tree with short-term crops, of 35x25cm/tree with long-term ones

Fertilizers

- After ploughing, turning up, weeding, the soil is made beds and then fertilized with *Uchishiro bacteria* bio-fertilizers one time 15 days prior to seeding, with the dose of 1 kg/m^2 by mixing in the beds.

Taking care

- Watering: water 1-2 times per day early in the morning and in the late afternoon depending on the weather to ensure that soil often gains the humidity of 80-85%.

- Soil was plowed carefully, picked up weeds, made beds with the length of 1,4-1,5m; the width of 1,1 – 1,2m; the furrow width of 30cm; the height of 25-30 cm. The land is flat, easy to drain

Seeding, planting

- Planting seedlings: plant at a spacing of 25x35cm/tree or 20x20cm/tree with short-term crops, of 35x25cm/tree with long-term ones

Fertilizers

- Basal fertilizing: decomposed muck

- Top dressing with chemical fertilizers, divided into three times:

+ 1st time: when the plant has 4-5 leaves, fertilize directly or after 10-15 days after planting.

+ 2nd time: 15 days after 1st time

+ 3rd time: 15 days after 2nd time.

Amount of fertilizers/1000m^2

Type of fertilizers	Total amount fertilized (kg)	Basal fertilizing (%)	Top dressing (%)		
			1	2	3
Muck	1000	100	-	-	-
Phosphate	50	100	-	-	-
Nitrate	200	20	30	30	20
Potassium fertilizers	15	40	30	30	-

Taking care

- Watering: water 1-2 times per day early in the morning and in the late afternoon depending on the weather to ensure that soil often gains the humidity of 80-85%.

- Pest control: if being gotten pests, use bio-pesticides, such as Bt insecticides, BIMA …

Lettuce:

Experiment	**Control**
Seed: lettuce of Trang Nông Company The amount of seeds cultivated (then pulled up to re-plant) for 500m2: 300g **Making soil** - Making beds: make beds with height of 15-20cm, width of 90cm, and furrow width of 30cm. **Fertilizing** After ploughing, turning up, weeding, the soil is made beds and then fertilized with *Uchishiro bacteria* bio-fertilizers one time 15 days prior to seeding, with the dose of 1 kg/m^2 by mixing in the beds. **Density and planting distances** tree x tree = 15-20cm; distances between rows = 15-20cm. Density 16.000-17.000trees/ 500m^2 **Planting** - When the plant has 2-3 leaves, transplant in the late afternoon. After finishing, spray water to firm roots. Additional transplanting: conduct checking and additional planting immediately after transplanting for 2-3 days to replace dead, diseased plants. Plant in the late afternoon, and water as soon as finish. **Pests**	**Seed**: lettuce of Trang Nông Company The amount of seeds cultivated (then pulled up to re-plant) for 500m2: 300g **Making soil** - Making beds: make beds with height of 15-20cm, width of 90cm, and furrow width of 30cm. **Fertilizing** Basal fertilizing: use decomposed muck. Fertilize with the amount of 500 kg/ 1.000 m^2 + 50kg of super phosphate mixed and make basal fertilizing before. **Density and planting distances** tree x tree = 15-20cm; distances between rows = 15-20cm. Density 16.000-17.000trees/ 500m^2 **Planting** - When the plant has 2-3 leaves, transplant in the late afternoon. After finishing, spray water to firm roots. Additional transplanting: conduct checking and additional planting immediately after transplanting for 2-3 days to replace dead, diseased plants. Plant in the late afternoon, and water as soon as finish. **Fertilizers** (for l.000m^2) Decomposed muck, Super Phosphate: 50kg; Urea:12kg; Potassium: 12kg; Basal fertilizing: use all muck or organic fertilizers + 3kg Urea + 3kg Potassium. - Top dressing:

	+ 1st time: (when the plant has 2 - 3 leaves): Apply urea fertilizer with an amount of 3,0 kg /1 .000m^2. + 2nd time: 15 days after planting (DAP): 3kg of urea mixed with water irrigated evenly for 1,000 m^2. + 3rd time: (20 DAP): dilute 3,0 kg of Urea + 3kg potassium irrigated evenly for 1,000 m^2. **Pests** The main pests in the group of lettuce are: green worms *Helicoverpa armigera Hibber*, cavity worms *Spodoptera litura*, silk worms *Plutella xylostella*, green-smooth-skin worms *Spodoptera exigua Hübner*. Use of microorganism insecticides for prevention and treatment: BT, VI-BT, Dipel, Delfin, Amectin, - The main diseases: Dead seedlings, rotten, round spots: use Aliette, COC85, Ridomil, Monceren, and Validacine. Spraying dosages stated on the packages. Pay attention to stop spraying 8-10 days before harvesting.

1.3. Methods of collecting experimental data

For each type of plant, number 10 plants per row to control all indicators from planting to harvesting.

Evaluate the growth and development of the trial crops, level of pest infestation.

Actual yield gained.

Product quality: sensory evaluation on product quality

1.3.1. Lettuce

- Height of trees (cm): measure once a week up to harvesting
- Length of roots (cm), width of roots (cm)
- Number of leaves/trees
- Weight of trees (gr)

- Yield/plot (kg)

- Pest indicator: number of lesions on leaves

- Comment, sensory evaluation of product quality of both BF and control plots after harvesting.

1.3.2. Eggplant:

- Length of TRUNKS (cm)

- Length of ROOTS (cm)

- Branching: number of efficient branches

- Number of fruits harvested/tree/week:

- Yield/plot:

- Size of fruits:

- Pest indicator: number of diseased trees, number of pestiferous trees

- Comment, sensory evaluation of product quality of both BF and control plots after harvesting.

1.3.3. Peanut:

- Length of TRUNKS (cm)

- Length of ROOTS (cm): measure length of ROOTS (cm) 3 times/plot after 1 month, 2 months and when harvesting

- Number of tubers/tree

- Yield/plot

- Pest status (weekly follow-up)

- Comment, sensory evaluation of product quality of both fertilized-BF and control plots after harvesting.

1.3.4. Chinese broccoli:

- Length of trunks (cm): measure length of trunks per week up to harvesting in both fertilized-BF plot and control plot

- Length of roots: Every 15 days after planting, pull out 1 tree/bed for length measurement up to harvesting in both fertilized-BF plot and control plot

- Number of leaves/trunk (leaves): count number of leaves on trunks up to harvesting in both fertilized-BF plot and control plot

- Average weight of trees/kg (g): weigh average weight of trees/kg up to harvesting in both fertilized-BF plot and control plot

- Diameter of trunks (cm): when harvesting, measure diameter of trunks at the foot, the stem and the top of trees in both fertilized-BF plot and control plot

- Yield/plot (kg/plot): when harvesting, weigh 10 kg/plot and get the average for both experiment plot and control plot

- Monitor incidence of pest and disease of trees in experiment plot and control plot: count number of diseased trees, number of pestiferous trees in both fertilized-BF plot and control plot

- Comment, sensory evaluation of product quality of both BF and control plots after harvesting.

1.3.5. Data analysis methods

The data is averaged and the chart is compared by MS excel software.

II. RESULTS OF THE STUDY

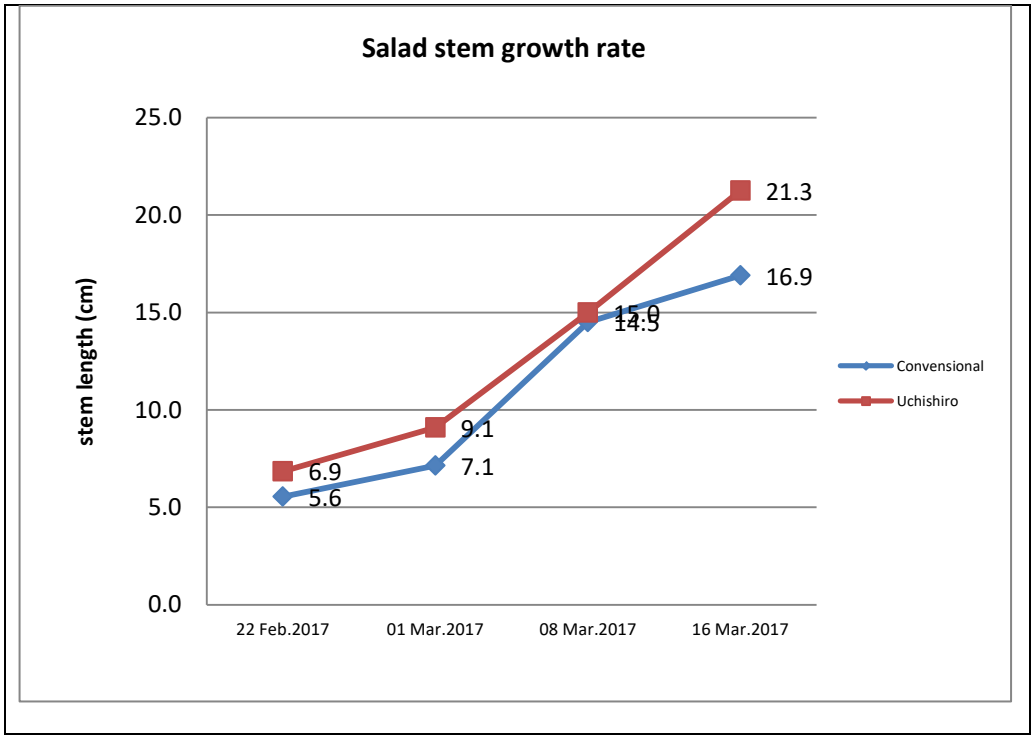
2.1. Comparison of crop growth (weekly measured sizes, number of roots distributed, etc for crops settled by AHTP)

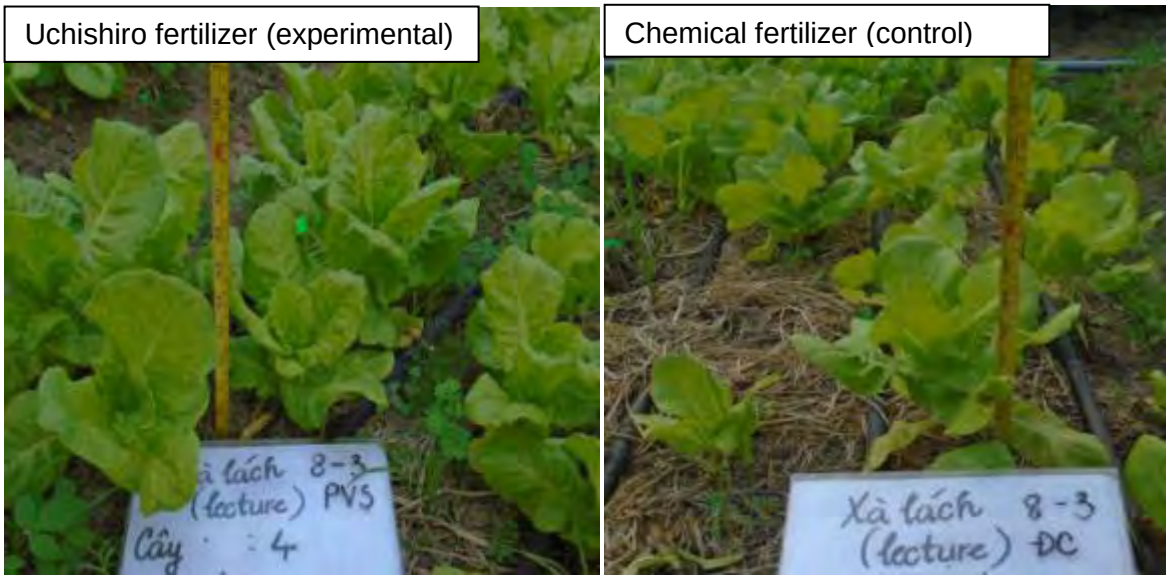
2.1.1. Lettuce

a) Effect of *Uchishiro* fertilizers on growth of lettuce height

The growth chart of the lettuce (salad) heights showed that after planting, the recovery of trees in the plot applied *Uchishiro* fertilizer was better than that of the control plot. One week after planting, height of trees in the experiment plot was 6.9 cm while 5.6 in the control plot. Growth potential of the experiment plot was higher than that of the control plot during growth although the difference was not significant. After 3 weeks of planting, there was a significantly different in growth rate of tree height between the experimental plot and the control. It could be seen that the growth of tree height in the control plot began to slow down, whereas the experiment remained a good growth rate of about 6 cm per week. At harvesting time, 4 weeks after planting, the experimental plot gained plant height higher than the control of 5 cm.

Thus, *Uchishiro* fertilizers exhibited a better effect on growth of tree height, both on maintaining growth of tree height and on growth time of the lettuce, than chemical fertilizers. This means that the protein content in BF is sufficient for well-developed and well-grown lettuce (salad).





b) Effect of *Uchishiro* fertilizers on distribution of lettuce roots

Studying effect of fertilizers on roots of lettuce is based on two parameters: vertical root growth and number of roots distributed horizontally. Lettuce is a plant with fibrous and shallow roots. Hence, number of rootlets generated and distribution of root system horizontally affect significantly nutrient uptake of the plant.

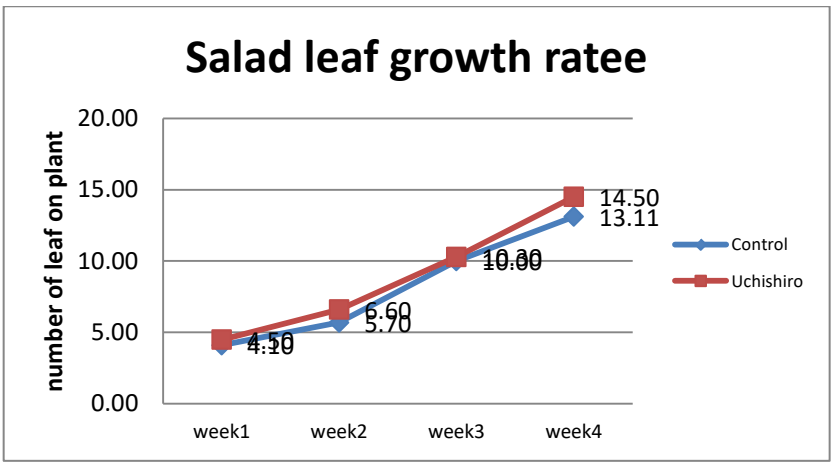
To evaluate this parameter, the team relied on lettuce root images of the two plots. According to the photos, the lettuce roots in the control plot using chemical fertilizers tended to prolong longitudinally with a small number of secondary roots, while in the experimental plot they tended to develop many secondary roots horizontally. Besides, secondary roots of *Uchishiro*-fertilized plants had more small branches.

Growth of root systems is influenced primarily by factors including soil moisture, nutrition and porosity. In terms of these factors, the experimental plot had a more favorable soil environment for growing of the lettuce root system.

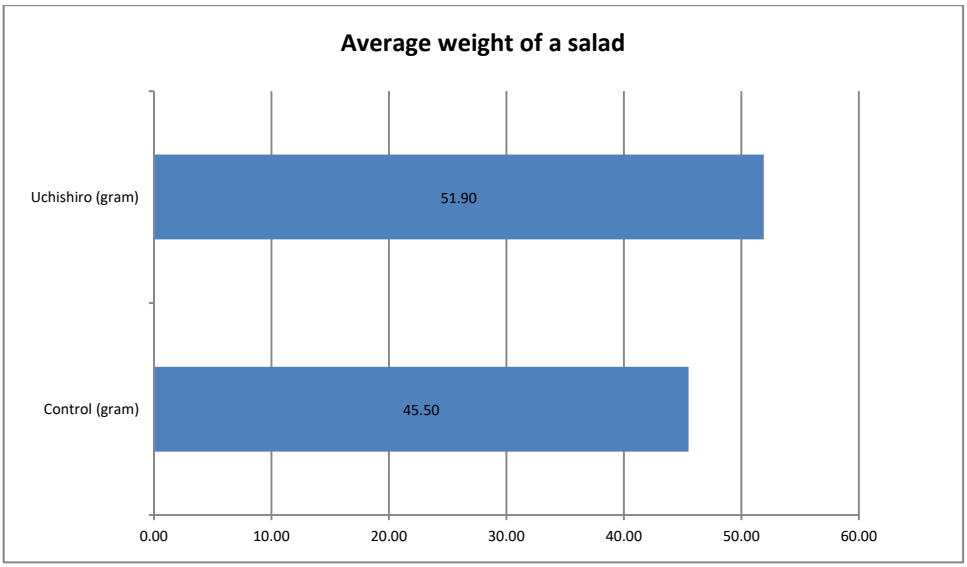
c) Effect of *Uchishiro* fertilizers on rate of lettuce leaf growth

Like the tree height index, the rate of leaf growth reflected the potential of two fertilizers to provide nutrients for crops. The results presented that although there was no significant difference between two plots, *Uchishiro*-applied plants showed greater ability to develop leaves than ones using chemical fertilizers. The leaf growth rate of the experimental plots was always faster than the control of 0.5 leaves.

This demonstrates that nitrogen of BF helps plants grow better than one of inorganic fertilizers.



d) Effect of *Uchishiro* fertilizers on yield of lettuce



Yield is an important factor in assessing effectiveness of a fertilizer on growth and development of crops. According to recorded data on average tree weight, which contributes significantly to yield, the average weight of lettuce in the experimental plot was higher than in the control of 6.4 grams. Thus, counted on the same 1 unit farming area, *Uchishro* fertilizers increased 14% yield of lettuce versus chemical fertilizers.

In general, initial results showed that using BF with dosage of 1kg/m^2 in basal fertilizing one time gave the experiment plot higher yield than the control.

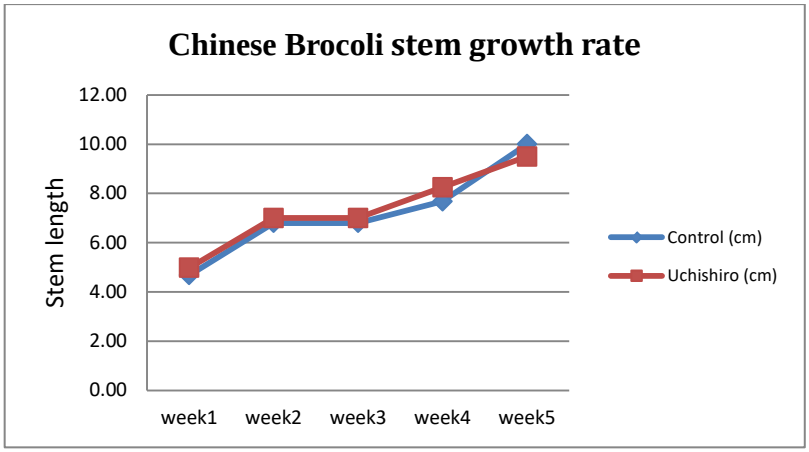
2.1.2. Chinese Broccoli

a) Effect of *Uchishiro* fertilizers on growth of Chinese broccoli height

The height growth chart of the Chinese Broccoli showed that effect of *Uchishiro* fertilizer and chemical fertilizers on developing tree height was not significantly different.

But it also found that *Uchishiro* fertilizer had the same effect as chemical fertilizers on the Chinese Broccoli height growth.

b) Effect of *Uchishiro* fertilizers on trunk diameter growth of Chinese broccoli

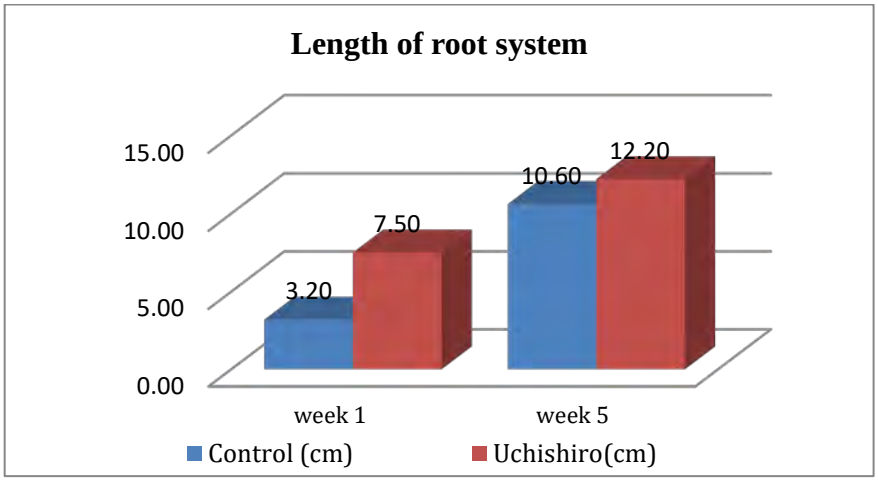


The stem diameter growth chart of the Chinese Broccoli showed that effect of *Uchishiro* fertilizer and chemical fertilizers on developing tree height was not significantly different.

But it also found that *Uchishiro* fertilizer had the same effect as chemical fertilizers on the Chinese Broccoli trunk diameter growth.

c) Effect of *Uchishiro* fertilizers on growth of Chinese broccoli roots

Evaluation of the root growth of Chinese broccoli in two plots presented that after planting, the recovery of trees in the experimental plot was better than that of the control plot. The roots of Chinese broccoli in the *Uchishiro*-fertilized plot were two times longer than in the experimental plot after a week of planting. At the time of harvesting (5^{th} week), the root system of the crops in the experimental plot was also better developed than the control. The average root length of 12.2 cm in the experiment was about 2 cm larger than the length of 10.6 cm in the control.

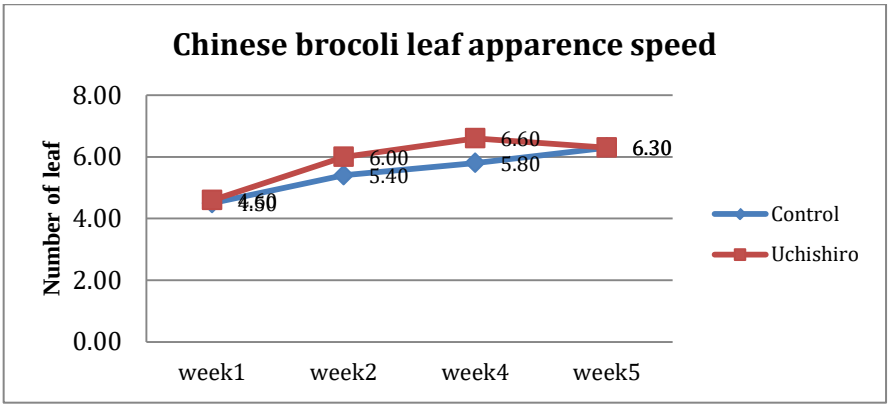


Therefore, *Uchishiro* fertilizers had a priority for growth of Chinese broccoli, which allowed plants develop better than chemical fertilizers.

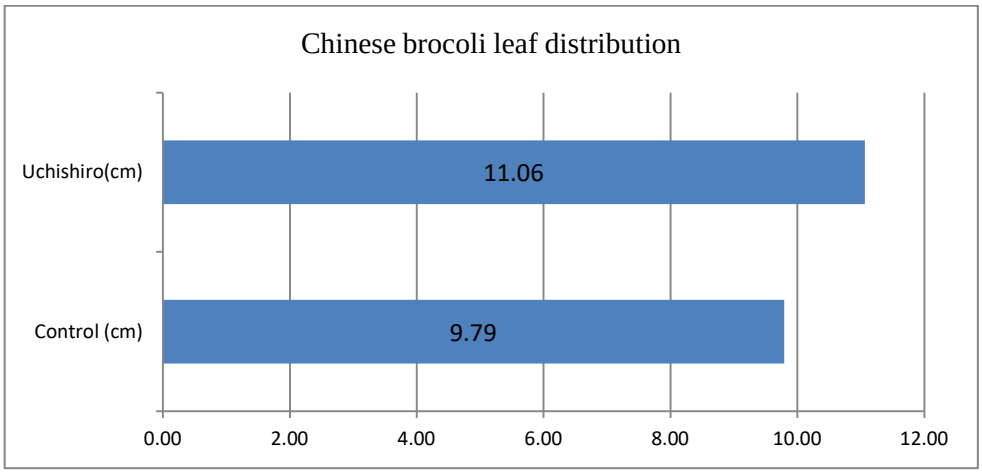
d) Effect of *Uchishiro* fertilizers on rate of Chinese broccoli leaf growth

Due to a higher recovery after planting, the ability of the plants to produce leaves in the experimental plot was also improved. At the second week after planting, the pace of appearing leaves in the experimental plot was faster than in the control plot of 0.6 leaves and 0.8 leaves at the fourth week. At the 5th week after planting, harvest time, plants in both plots finished leaf development and gained around 6.3 leaves per tree.

As a result, *Uchishiro* fertilizers had a positive effect on recovery of Chinese broccoli after planting, which helped plants to grow better than ones using chemical fertilizers.

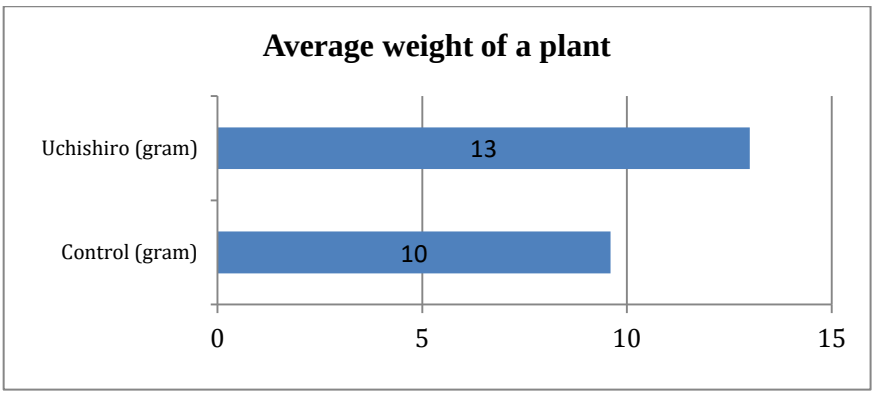


The width of the foliage (tree size) was also an important indicator to access impact of *Uchishiro* on plant growth. Crops with a wide leaf distribution exhibited well-developed leaves, which created a better yield. According to recorded data on the width of foliage, the plants in the experimental plot using *Uchishiro* fertilizers had a larger foliage width (larger tree size) than the control of 1.27 cm.



e) Effect of *Uchishiro* fertilizers on average weight of Chinese broccoli

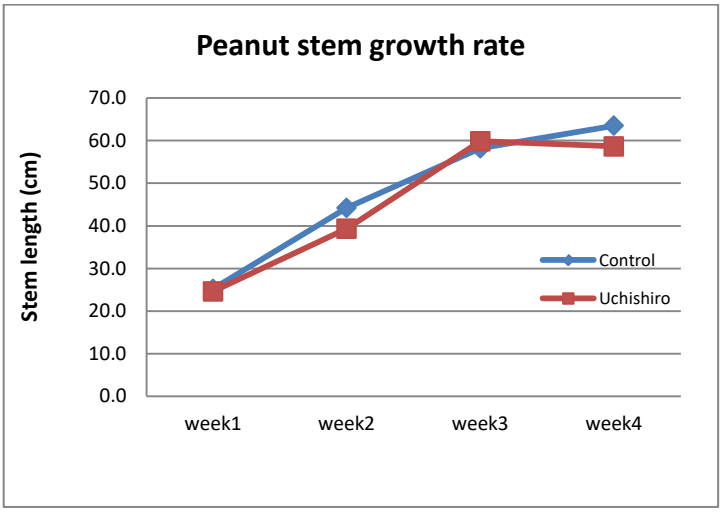
Due to components contributed to a good yield such as tree height, growth of foliage, stem diameter and root system, the average weight of plants in the *Uchishiro*-fertilized plot was higher than in the control plot of 3 grams, also 30%. As the result, *Uchishiro* fertilizers enhanced crop yield by an average of 30% compared to the plot using chemical fertilizers.



2.1.3. Peanut

a) Effect of *Uchishiro* fertilizers on growth of peanut stems

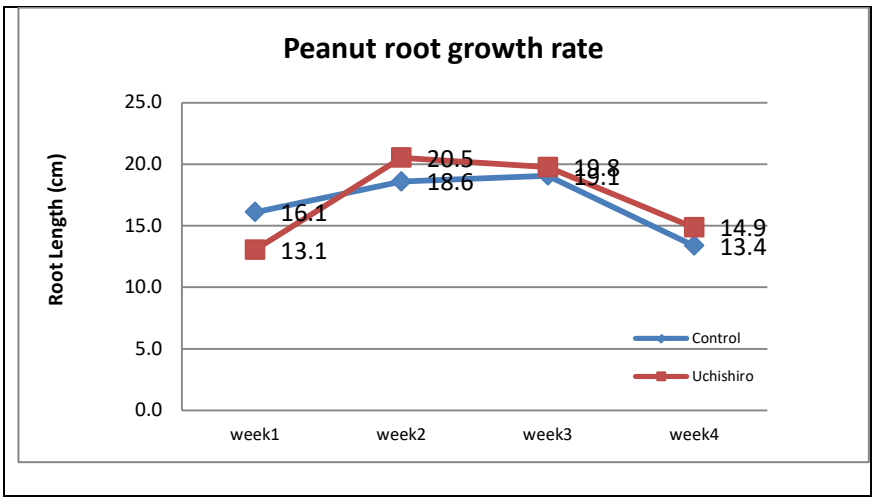
Peanut is a specialized plant with ability to synthesize protein from natural nitrogen, so it could be seen that there was no difference in its stem growth of both plots applied *Uchishiro* and chemical fertilizers, respectively.



b) Effect of *Uchishiro* fertilizers on growth of peanut root system

Peanut is a plant with fibrous roots; thus, its main root will stop developing by the time, allowing secondary and lateral roots to grow. Therefore, evaluation of effect of *Uchishiro* on root systems would be based on two criteria: root length and width of root distribution.

For root length, monitoring at four growth periods of the plant showed that root systems of *Uchishiro*-treated plants developed better, especially during the strong growth stage to create yield. The average root length of the crops using *Uchishiro* was greater than that of control plants of 1 cm.

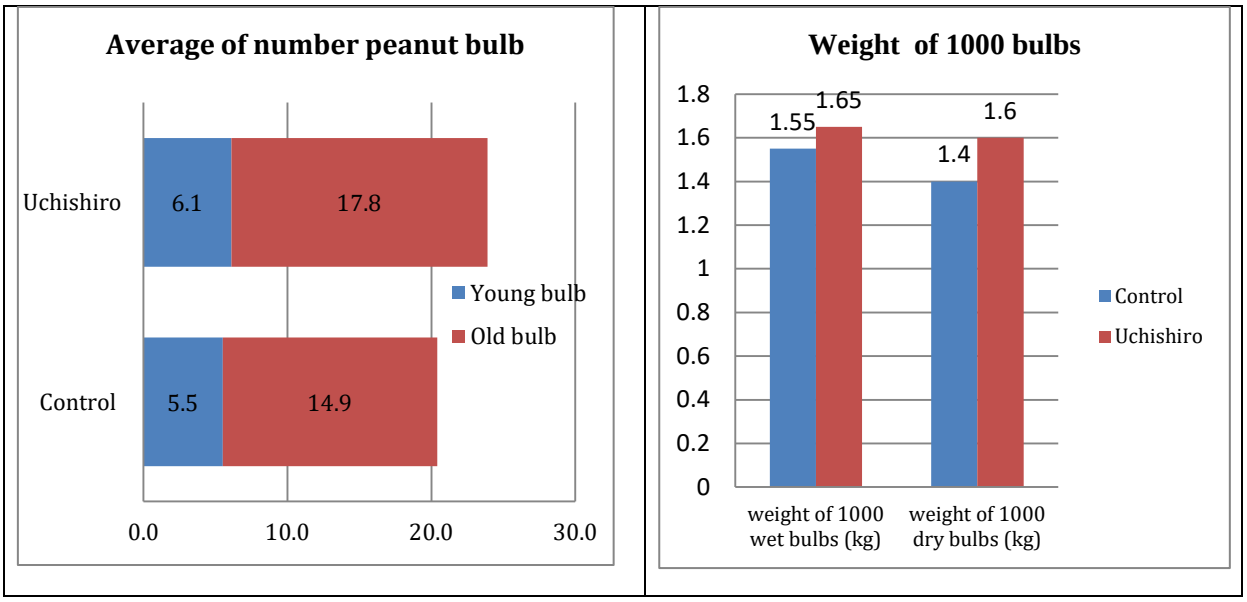


c) Effect of *Uchishiro* fertilizers on yield of peanut

The yield in this study was estimated based on average number of bulbs harvested per tree and weight of 1000 bulbs.

The results indicated that the average number of bulbs per tree in the experiment plot using *Uchishiro* was 23.8, whereas 20.4 in the control plot. In addition, the experiment plot also had a larger number of adult bulbs than the control of 2.9 bulbs.

The weight of 1000 bulbs, in both fresh and dry forms, of the experimental plot applied *Uchishiro* fertilizers was higher than in the control of 100 gram and 200 gram respectively. Hence, the average yield of the experimental plot applied *Uchishiro* was about 14% higher than the control.

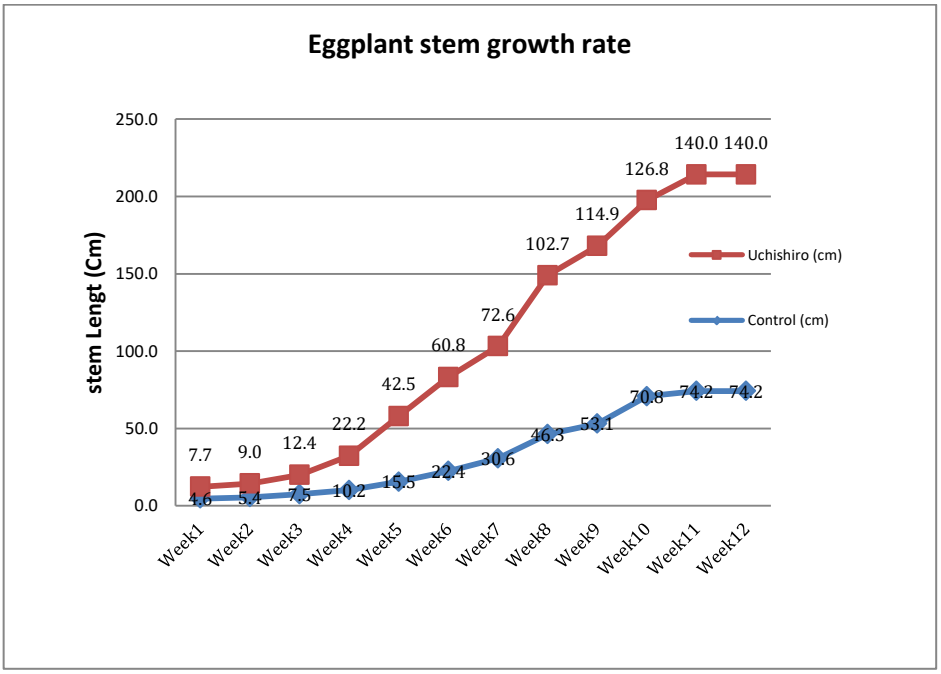


2.1.4. Eggplant

a) Effect of *Uchishiro* fertilizers on growth of eggplant height

The height growth chart of eggplant presented an obvious effect of *Uchishiro* fertilizer on eggplant height growth. The recovery of the crops after planting in the experimental plot was rapid, which demonstrated by the height growth higher 3 cm after 1 week of planting, and 4 cm per week within next three weeks, than the control plants. However, there was a markedly different in height growth recorded from the 4th week after planting, height of the eggplants in the experimental plot using *Uchishiro* fertilizers doubled in the control plot weekly. At the 11th week, the eggplants in both plots stopped growing height, and the maximum height of the plants in the experimental plot was 140 cm, while the height of the control plants was only 74.2 cm.

Thus, eggplants fertilized BF had faster growth than ones applied conventional inorganic fertilizers.



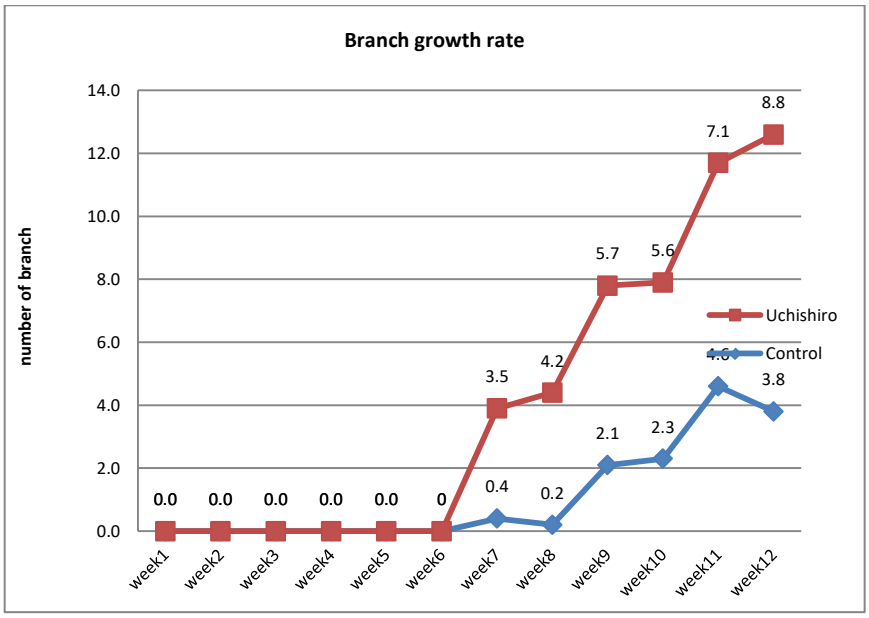
b) Effect of *Uchishiro* fertilizers on growth of eggplant root system

The root image below showed that crops using *Uchishiro* fertilizers had long and widely-distributed root system, large size and widespread roots, while ones using chemical fertilizers had a less development with many shallow rootlets.

c) Effect of *Uchishiro* fertilizers on branching ability of eggplant

The eggplants in two plots began branching in the sixth week after planting. The results of this study exhibited that *Uchishiro* fertilizers not only had a strong effect on the height growth of eggplant, but also influenced significantly on the branching ability. At the 7th week, the *Uchishiro*-manured plants branched out strongly with an average of 3.5 branches per tree, which was threefold the number of branches on the control trees. While the branching process in the control trees was slow and fluctuating, the number of branches appearing on plants of the experimental plot using *Uchishiro* fertilizers increased rapidly and evenly weekly. In the 11th week, the plants in the control plot showed signs of putting a stop to branching and gained the maximum number of 4 stems per tree; whereas the trees on the experiment plot remained branching out and got an average of 8.8 stems per tree.

Consequently, besides the impact on branching of eggplants, *Uchishiro* had effect of prolonging their growth.

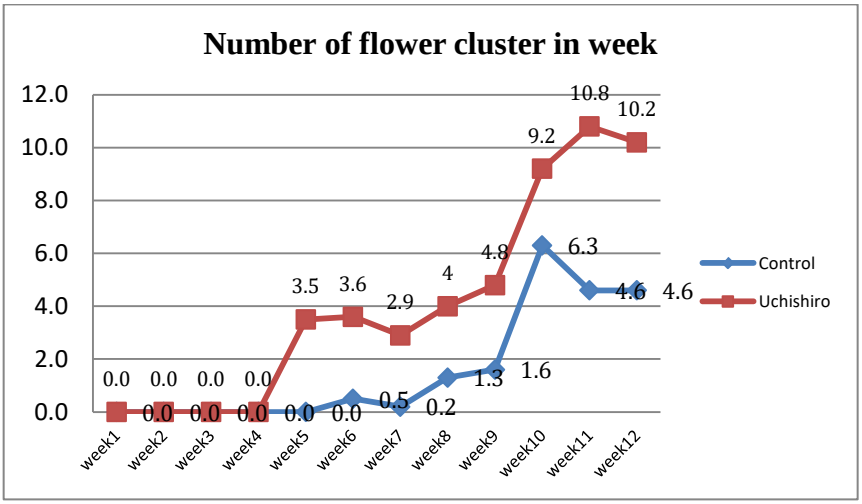


d) Effect of *Uchishiro* fertilizers on process of flowering on eggplants

Research on flowering of the eggplants in both plots showed that plants using the *Uchishiro* fertilizers had not only rapid growth in height and strong branching but also ability to form flower buds earlier than plants in the control plot for 2 weeks. Monitoring of flowering indicated that flowers on plants using chemical fertilizers appeared slowly and the average number of flowers was only 1.6 flower clusters per tree at the 9th week, while at that time, experimental plants were achieved with an average of 4.8 flower clusters per tree. The number of flower bunches in the control plants reached the highest value at the 10th week with 6.3 bunches per tree, then decreased gradually and kept 4.6 bunches per tree in the 11th and 12th weeks. From the 10th week, the *Uchishiro*-fertilized plants also had a rapid increase in their number of flower bunches. In the 11th week, the number of flower bunches doubled

compared to the 9th week and reached the value of 10.8 bunches per tree. From the 12th week, the number of flower clusters per tree tended to decrease slightly but still maintained over 10 flower clusters per tree.

Especially, for eggplants applied *Uchishiro* fertilizers, besides appearing flower bunches early with large number of flowers on trees, the flowering periods lasted and maintained longer than the plants in the control.



2.2. Comparison of taste (participate in the process of comparing vegetable flavor)

Characteristics of object groups in quality assessment

Dishes	Group I					Group II				
	Good taste									
Fresh Eggplant	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	10	1				3	9		
	Color									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	6	5				3	9		
	Soft									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	7	4				7	4	1	
	Good smell									
	Very	good	Normal	bad	worst	Very	good	Normal	bad	worst

	good					good				
	1	6	5				1	11		
	Good taste									
Boiled Eggplant	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
		8	4				4	7	1	
	Color									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
		4	8				1	11		
	Soft									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	2	5	5				2	9	1	
	Good smell									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	8	3				6	3	3	
	Good taste									
Grilled Eggplant	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	5	6				3	8	1	
	Color									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	2	3	7				2	10		
	Soft									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	7	4				5	7		
	Good smell									

	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	11					9	2	1	
	Good taste									
Fresh peanut)	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	4	6	2			1	2	9		
	Color									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	5	6				5	7		
	Greasy taste									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	3	7	2			1	6	3	1	
	Good smell									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	2	5	5				6	6		
	Good taste									
Fried peanut	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	7	4			1	4	6	1	
	Color									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	6	5				4	8		
	Greasy taste									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	6	5				4	7	1	

	Good smell									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	2	4	6				3	8	1	
	Good taste									
Fresh salad	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	2	5	5				3	8	1	
	Color									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	4	4	4			1	6	5		
	Brittle									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	9	2				4	8		
	Good smell									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	2	2	8				2	10		
	Good taste									
Boiled salad	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	5	6			1	1	8	2	
	Color									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
	1	6	4	1		1	4	4	3	
	Brittle									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst

		6	3	3			2	8	2	
	Good smell									
	Very good	good	Normal	bad	worst	Very good	good	Normal	bad	worst
		4	7	1			11	1		

The table exhibited the number of good and very good comments in the group using *Uchishiro* fertilizers more than the control group. This means that the taste of the product from *Uchishiro*-fertilized plot was better than the plot applied chemical fertilizers.

2.3. Anti-diseased ability test (NA)

Describe the methods of research, care and treatment in two experimental and control plots to give an evaluation of anti-diseased ability of plant in the experimental plot.

Brocoli

		Case of damage	**Number of plan Damaged**
1st week	**experiment**	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**3/100** **14/100**
	Control	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**5/100** **15/100**
2sd week	**experiment**	**None**	
	Control	**None**	
3rd week	**experiment**	**- Insect (***Spodoptera exigua*)	**6/100**
	Control	**- Insect (***Spodoptera exigua*)	**8/100**
4th week	**experiment**	**None**	
	Control	**None**	
5th week	**experiment**	**- Insect (***Spodoptera exigua*)	**8/100**
	Control	**- Insect (***Spodoptera exigua*)	**6/100**

Lettuce

		Case of damage	Number of plan Damaged
1st week	**experiment**	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**21/100** **7/100**
	Control	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**31/100** **7/100**
2sd week	**experiment**	**None**	
	Control	**None**	
3rd week	**experiment**	**None**	
	Control	**None**	
4th week	**experiment**	**None**	
	Control	**None**	
5th week	**experiment**	**None**	
	Control	**None**	

Peanuts

		Case of damage	Number of plan Damaged
1st week	**experiment**	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**13/100** **7/100**
	Control	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**15100** **10/100**
2sd week	**experiment**	**None**	
	Control	**None**	
3rd week	**experiment**	**- Insect (***Spodoptera exigua*)	**7/100**
	Control	**- Insect (***Spodoptera exigua*)	**8/100**
4th week	**Experiment**	**- Insect (***Bemisia tabaci)*	**6/100**
	Control	**- Insect (***Bemisia tabaci)*	**6/100**

5th week	**experiment**	**None**	
	Control	**None**	
6th week	**experiment**	**None**	
	Control	**None**	
7th week	**experiment**	**- Insect (***Spodoptera exigua*)	**8/100**
	Control	**- Insect (***Spodoptera exigua*)	**3/100**
8th week	**experiment**	**- Insect (***Bemisia tabaci)*	**12/100**
	Control	**- Insect (***Bemisia tabaci)*	**7/100**
9th week	**experiment**	**None**	
	Control	**None**	

Eggplant

		Case of damage	**Number of plan Damaged**
1st week	**experiment**	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**3/100** **11/100**
	Control	**- Fungi (***Rhizoctonia solani)* **- Insect (***Spodoptera exigua*)	**5/100** **15/100**
2sd week	**experiment**	**None**	
	Control	**None**	
3rd week	**experiment**	**- Bacteria (***Pseudomonas solanacearum)* **- Insect (***Spodoptera exigua*)	**6/100** **12/100**
	Control	**- Bacteria (***Pseudomonas solanacearum)* **- Insect (***Spodoptera exigua*)	**9/100** **22/100**
4th week	**Experiment**	**- Bacteria (**Pseudomonas solanacearum**)** **- Insect (***Bemisia tabaci)*	**9/100** **34/100**

	Control	**- Bacteria (**Pseudomonas solanacearum**)** **- Insect (***Bemisia tabaci)*	**11/100** **31/100**
5th week	**experiment**	**None**	
	Control	**None**	
6th week	**experiment**	**None**	
	Control	**None**	
7th week	**experiment**	**- Insect (***Spodoptera exigua*)	**11/100**
	Control	**- Insect (***Spodoptera exigua*)	**15/100**
8th week	**experiment**	**- Insect (***Bemisia tabaci)*	**44/100**
	Control	**- Insect (***Bemisia tabaci)*	**31/100**
9th week	**experiment**	**None**	
	Control	**None**	
10th week	**experiment**	**None**	
	Control	**None**	
11th week	**experiment**	**- Insect (***Bemisia tabaci)*	**55/100**
	Control	**- Insect (***Bemisia tabaci)*	**45/100**
12th week	**experiment**	**- Insect (***Bemisia tabaci)*	**78/100**
	Control	**- Insect (***Bemisia tabaci)*	**77/100**

2.4. Effects of *Uchishiro* on soil

III. CONCLUSIONS

Test *Uchishiro bacteria* bio-fertilizers on four different vegetables including peanut, Chinese broccoli, eggplant, and lettuce. The results showed that:

1. For lettuce:

Uchishiro fertilizers exhibited better effect both on maintaining the height growth and the growth time of the lettuce compared to chemical fertilizers. This means that the protein content in BF is sufficient for well-developed and well-grown lettuce.

Nitrogen from BF helped plants grow better than nitrogen from inorganic fertilizers. The leaf growth rate in the experimental plot was always faster than in the control plot of 0.5 leaves.

Using BF with dosage of $1kg/m^2$ in basal fertilizing one time gave the experiment plot higher yield than the control..

2. For Chinese broccoli:

Uchishiro fertilizer had the same effect as chemical fertilizers on the Chinese Broccoli height, diameter growth. There was no significant difference in the height and diameter of the trees in the experimental and control plots.

Uchishiro fertilizer stimulated the growth of the Chinese broccoli roots, which helped plants to grow better than plants using chemical fertilizers. The root system of the trees in the *Uchishiro*-fertilized plot was twice as long as those of the control plants after a week of planting.

Uchishiro Fertilizer had a positive effect on recovery of Chinese broccoli after planting, which made plants to grow better than ones using chemical fertilizers

The average weight of plants in the *Uchishiro*-fertilized plot was higher than in the control plot of 3 grams, also 30%. Therefore, *Uchishiro* fertilizers enhanced crop yield by an average of 30% compared to the plot using chemical fertilizers

3. For peanut:

The use of *Uchishiro* fertilizers and chemical fertilizers did not create differences in stem growth of peanut.

Root systems of *Uchishiro*-treated plants developed better. The root length of the crops using *Uchishiro* was greater than that of control plants of 1 cm.

The weight of 1000 bulbs, in both fresh and dry forms, of the experimental plot applied *Uchishiro* fertilizers was higher than in the control of 100 gram and 200 gram respectively. Hence, the average yield of the experimental plot applied *Uchishiro* was about 14% higher than the control

4. For eggplant:

Eggplants fertilized BF grew faster than ones applied conventional inorganic fertilizers. The maximum height of the plants in the experimental plot was 140 cm, while the height of the control plants was only 74.2 cm.

Crops using *Uchishiro* fertilizers had long and widely-distributed root system, large size and widespread roots, while ones using chemical fertilizers had a less development with many shallow rootlets.

Using *Uchishiro* had effect of prolonging their growth besides the impact on branching of eggplants. In the 11^{th} week, the plants in the control plot showed signs of putting a stop to branching and gained the maximum number of 4 stems per tree; whereas the trees on the experiment plot remained branching out and got an average of 8.8 stems per tree

For eggplants besides earlier-appearing flower bunches, large number of flowers on trees, applying *Uchishiro* fertilizers had longer-lasting and longer-maintaining time of flowering than the plants in the control

For eggplants applied *Uchishiro* fertilizers, in addition to appearing flower bunches early with large number of flowers on trees, the flowering periods lasted and maintained longer than the plants in the control. This might indicate that the yield of eggplants using *Uchishiro* fertilizers was higher than ones using chemical fertilizers

The sensory evaluation also presented that using *Uchishiro* fertilizers provided better tastes than using chemical fertilizers.