JADAM

JADAM Organic Farming

The way to Ultra-Low-Cost agriculture

Written by **Youngsang Cho**
Translated by **Rei Yoon**

A revolutionary farming method based on oriental philosophy

Everything you need to know to:
Go completely organic
Boost quality and yield
Save huge, huge, HUGE costs
Make all-natural fertilizer, pesticide and microorganism inputs yourself

en.jadam.kr

JADAM

About the author and founder

Youngsang Cho was born in 1965 in Hwaseong, Gyeonggi province, Korea. He graduated from Suwon Highschool and Aju University (chemistry), and completed master's degree in horticulture at Chungnam University. After completing his military service at the 706 Special Forces, he started organic farming and raised animals himself from 1991 in Asan, Chungnam province. He went on to establish "Jadam Organic Farming" and started to promote this farming system through books and website (www.jadam.kr). He established "Jadam Natural Pesticide Institute" in 2002 from where he continued his research while integrating knowledge from many experienced farmers which led to the completion of the system of ultra-low cost Jadam organic farming. He invented and developed many technologies for natural pesticide which he voluntarily did not patent but rather shared through books and website. His "Natural Pesticide Workshops" teaches the essence of ultra-low cost Jadam organic farming. Lectures, too, are disclosed on Jadam website and Youtube.

Major inventions by Youngsang Cho

- Jadam wetting agent (made without heating)
- Jadam sulfur (germicide)
- Jadam liquid fertilizer (made without sugar or molasses)
- Jadam microorganism solution using potatoes
- Fertilizer program for crops
- Jadam natural disinfectant for rice bakanae disease
- Jadam natural pesticide for powdery mildew, downy mildew, fungus
- Jadam natural pesticide for canker
- Jadam natural pesticide for aphids, mites
- Jadam natural pesticide for tobacco moths, beet armyworm
- Jadam natural pesticide for stinkbugs, thrips
- Jadam natural pesticide for slugs
- Jadam natural pesticide for chicken lice
- Jadam natural pesticide for coffee berry borer
- Naphthalene pesticide

JHS: JADAM herb solution. Made by boiling herbs in water and is used mostly for its insect-controlling effect.

JHS pesticide: Pesticide made with JHS + JWA.

JMS: JADAM microorganism solution. Made by culturing microorganisms from leaf mold in water, feeding them potatoes (or other medium). It is a powerful soil quality improver and can also be used for keeping pathogens in check.

JMS pesticide: Germicide made with JMS + JWA

JMS-JHS pesticide: Pesticide made with JMS + JHS + JWA

JMW: JADAM mineral water: Made by immersing leaf mold in water with rocks in it.

JNP: JADAM natural pesticide. Made by combining JWA, JS and JHS.

JS: JADAM sulfur. Made by melting sulfur in caustic soda with water, combined with red clay powder, phyllite powder and sea salt. It is a powerful germicide.

JS germicide: Basic pesticide made by combining JS and JWA.

JS-JHS pesticide: Pesticide made with JS + JHS + JWA

JWA: JADAM wetting agent. Made with canola oil, caustic potash and water. The most important ingredient in making pesticides.

JWS: JADAM water softener. This machine changes hard water to soft water. You must use soft water for pesticides and foliar application.

About the translator and principal researcher

Rei Yoon believes that farming is a means to empower people and heal the environment. He studied in Seoul National University and worked in the Foreign Ministry and Defense Ministry of Korea. He is in Canada, in charge of international operations of JADAM. He practices Tai Chi.

This book is available in different languages in e-book at amazon.com

Or you can order paper books at our homepage: en.jadam.kr

Join as member at en.jadam.kr, you can access information, share your findings and ask questions.

JADAM

Organic Farming

The way to Ultra-Low-Cost agriculture

WRITTEN BY YOUNGSANG CHO

TRANSLATED BY REI YOON

Farm at $100 per acre a year

A revolutionary farming method based on oriental philosophy

EVERYTHING YOU NEED TO KNOW TO:
GO COMPLETELY ORGANIC
BOOST QUALITY AND YIELD
SAVE HUGE, HUGE, HUGE COSTS
MAKE ALL-NATURAL FERTILIZER, PESTICIDE AND
MICROORGANISM INPUTS YOURSELF

en.jadam.kr

JADAM ORGANIC FARMING:
The way to ultra-low-cost agriculture

Written by Youngsang Cho
Photos by Youngsang Cho, Hyunho Cha and Deog-kee Park
Translated by Rei Sungseo Yoon
Corrected by Rei Sungseo Yoon, Hyunho Cha and Sunhwa Ju
Advisors: Seung Suk Lee and Hoon Park
Reviewed by Attila Kamras, Pinnacle English Service
Edited and designed by Youngsang Cho and Sunhwa Ju
E-book Edited by Sungwoo Cho
Cover designed by Rei Sungseo Yoon and Youngsang Cho
Office assistant: Sung-eun Cho
Printed by Bojinjae

First Korean edition printed on January 31, 2012
First English edition printed on May 15, 2013
Second English edition printed on January 2016
Published by Youngsang Cho JADAM

Address: 311 Migun 2-B, 187 Techno 2-ro, Yuseonggu, Daejeon, Republic of Korea, 34025
Phone: +82-2-1899-5012
Fax: +82-704667-2955
Email: jadamorganic@gmail.com
Website: www.jadam.kr
Publisher registration: May 29, 2000
Registration number: No. 20-1-41

ISBN 978-89-89220-13-8 13520

Printed in Korea
ISBN 978-89-89220-13-8 13520

Printed in Korea

Please help us spread ultra-low cost Jadam organic farming method all over the world. Sponsor us through **paypal: vnt0226@naver.com**

*JADAM's ultimate objective is to bring farming back to farmers.
Through JADAM's method, farming can become ultra-low-cost, completely organic, and farmers can once again become the masters of farming.
Farmers will possess the knowledge, method and technology of farming.
When organic farming becomes easy, effective and inexpensive, it can finally become a practical alternative.
Farmers, consumers and Mother Nature will all rejoice in this splendid new world we wish to open.*

Foreword (for English readers)

Welcome to JADAM organic farming

What does "JADAM" mean? It is short for our Korean full name *Jayonul Damun Saramdul*. This name means "people who are like nature." Yes, we are the nature-like people who believe in and follow the wisdom of nature. In nature's wisdom lies the path to high yield, high quality and low cost. We have specialized in the search for the method that makes possible farming at ultra-low-cost. Traditional farming was based on common sense and simple knowledge: anybody could follow with ease; all necessary material were available from near; and what were readily available were valued. This is how ultra-low-cost in farming was made possible. Farmers had control and leadership over farming.

All over the world, agriculture is leaving the hands of farmers as fertilizer and pesticide companies take more control over it. Farmers now buy all farming necessities from the marketplace – seeds, seedlings, fertilizers, pesticides, microbes, etc. – which in the past were self-sufficient. Farmers now rely on the experts; experts tell the farmers how to use fertilizer and pesticide, what to do when. What farmers have lost has been passed on to the business – the control over farming. This is so in conventional and organic alike. One might have dreamt of a harmony between farmers and business in this new order but the profits are not being fairly shared; rather it flows only in one direction.

For the past 20 years, JADAM has studied ultra-low-cost agriculture. JADAM believes that this knowledge can advance the independence of farmers. Farmers should not be mere consumers of products and technologies developed by the agricultural corporations, they need to reclaim what they have lost: knowledge; the will to knowledge; and control over their own fate.

The system of agriculture that JADAM has managed to build is so simple and easy that anybody could follow. The really exciting part is that the cost of farming would be ten to one hundred times cheaper than conventional farming. JADAM's methods include microorganisms, liquid fertilizers, mineral water, cover crop and much more but its two greatest inventions would probably be JADAM wetting agent (JWA for short) and JADAM sulfur (JS). JWA is an environment-friendly wetting agent (surfactant). You need wetting agent in order to have the specific substance fully wet (envelope, coat) the target. JS is a powerful germicide that can be made simply. Both inputs can be made by the farmers by following simple instructions; both use ingredients permitted under organic production. JADAM has chosen not to patent these knowledges but instead opened it to public so that all farmers of the world can benefit. Through easy DIY (do-it-yourself), growers will be able to save huge, huge, HUGE costs. JADAM method can be applied in all types of agriculture: conventional agriculture, hydroponics, commercial farms, large-scale plantations, even home or urban gardens.

JADAM has been at the forefront to reverse the tide of our times, where farming is being taken over by the input manufacturers and their agents. We want to bring farming back to the farmers. All farmers of all nations must bring back their farming. People might think this is a romantic dream of idealists. But the big secret is that this path is not more expensive, difficult or impossible but actually cheaper, easier and more effective than conventional agriculture. In fact, we have, over the decades, developed a method of farming that lowers the cost to an ULTRA-low-level while increasing yield, improving produce quality, soil quality and ecological harmony. Here, in our ultra-low-cost agriculture, farmers and consumers can help each other and co-exist. That is what we want to bring forth. JADAM system has been proven by thousands of farms across the country. If it didn't work, JADAM would have perished but instead JADAM has thrived for nearly thirty years and now is being invited from all over the world.

The JADAM system is constantly evolving. It is not only about techniques; it is a methodology, a principle, a philosophy, or more precisely a spirit. Anybody who agrees can join the movement. Anyone who joins this movement can share and contribute. The person should not seek to monopolize knowledge but rather to mutually share and open. Also, one should remember to resemble, respect and love nature rather than conquer, destroy and exploit it. There is so much more to learn from nature than any human teacher can teach.

My journey

I had four near-death experiences before finishing middle school: I nearly drowned; my whole body suddenly became paralyzed; I came down with scarlet fever; and I had a ruptured aorta. Later, when I joined the military, I was assigned to the Special Forces where the training gave me a vivid and compelling understanding of the thin line separating life and death. Now as I run JADAM, I drive 70,000 to 80,000 kilometers (43,000-50,000 miles) every year, a distance equivalent to two circles around the globe. I have seen many accidents and myself was involved in a serious rollover. I have lived with the smell of death. It is sad in a way but it gave me lessons. I acquired a habit of not holding on to what I have. I chose not to patent my knowledge but instead to share with others; so that especially those who are poor and excluded may benefit.

But this path of sharing was choosing to depart from wealth. I and my family lived through times of extreme hardship. All along, two heroes gave me strength: Jesus Christ and Karl Marx. I love these two great men. For long, I have delved into the Holy Bible; for years, I repeated reading Marx's biography. The two might seem much unrelated, but to me they converged in perfect harmony, for they were common in their immense love for humanity.

Then I met Gustavo Gutiérrez and Leonardo Boff through books. Liberation theology inspired me. The book titled "We Drink from Our Own Wells" gave me a clear vision in my time of wandering. Boff's ecological theology was a turning point in my life; I chose to abandon university and start organic farming. How I do vividly remember that moment of choice 28 years ago. I was determined to save agriculture from the exploitation of capital and bring farming back to farmers. Then I met another teacher: Laozi (老子). I was too strong and stiff; Laozi taught me to relax. My burning aspiration gained the softness of water. Laozi taught me to make JADAM organic farming like water; so that ultra-low-cost method will seep into farmers. Water does not conflict yet it conquers. So I decided that JADAM's system should be SESE (simple, easy, scientific, effective). Were it not for these teachers, JADAM would not have been born. Farming, for JADAM, is not an inanimate entity, a collection of techniques; it is a living, feeling thing that grows on the soil of religions, philosophies and humanities.

Making farming simple and easy might look like a harmless effort. But it is not. When knowledge becomes simple and easy, people will acquire it. When people acquire knowledge, they seize power. This is not something that the power group would want. I have fear, rather not of my demise, but of this knowledge being lost or destroyed. My life's passion is focused in giving this knowledge life; so that it will live on without me. In books, workshops, lectures, articles and internet, I have, without reservation, shared everything. This book is by no means perfect but has meticulously collected up-to-date information and knowledge; they have been proven on the fields; everything is a heartfelt record of our struggle, our life.

Our website en.jadam.kr has collected huge information on thousands and thousands cases of success. JADAM's methods might not be presented in a scholarly fashion, but they are practical enough; they are powerful. Our JADAM office consists only of a small number of staff, but the network of JADAM is huge; we have tens of thousands of farmers on the field, experimenting, searching, developing, reporting back and sharing their knowledge. That is how we advance. Farmers are the experts in farming; not PhDs or professors.

How the state treats agriculture is critically important in determining the industry's position. If the state sees farmers as people in need of help, state will have to increase spending and farmers lose their self-supporting capability. Such policy will only increase the cost of farming. I have seen too many cases where taxpayers' money would flow into the pockets of fertilizer, pesticide and machine companies, and still leave farmers poor and excluded. Government is eager to put on awesome names for their policies but they seldom benefit farmers. We have wasted too much time, so many opportunities. State should protect the agricultural industry and farmers; but farmers should not rely on the state. Farmers have the responsibility to cultivate the power to survive on their own. Risk presents opportunity; find and drink from the well in you.

What JADAM ultimately wants to do is to bring farming back to farmers. If the method of farming that we propose were too difficult, our cause would not hold. But JADAM organic farming is simple and easy. What is simple and easy will be received by many; number means power. I hope this number will grow across the borders of nations. I dream that the whole world will finally see a change where the excluded regain their rights, the weak seize power, and farmers become the masters of farming.

There is no perfection in art. Farming as presented here in this book is truly original and unique, but is not perfect. That is why we seek your participation and feedback. Join as member in our homepage (en.jadam.kr); take what you need and give back what you can; share your findings. We want the farmers of the whole world to network, to share and help each other, and together advance this knowledge.

One thing I have to note is that because the book was originally written for Korean readers, some parts might appear irrelevant to readers of the English version. I have considered deleting those portions, however, decided to leave most of them because I felt that they would be useful for farmers from other countries to read about, and empathize with the plight of their Korean counterparts; likely, you will notice that the situation in Korea in some ways resembles your own because we are all in the same system. However, I have done my best to make pertinent adjustments and revisions so the book is suitable for English readers. I thank Rei Yoon, director of international operations of JADAM and also -a principal researcher, who has dedicated enormous time and effort in translating and adjusting this book into English with particular attention to precisely converting agricultural terms.

From deep in my heart, I welcome you to the JADAM movement. Let us go together to a more beautiful world where people are once again in control of their own farming, save themselves and nature from exploitation, and become more nature-like.

January 2016
Youngsang Cho

Foreword (original)

When we are sick, we entrust our health, well-being and even life to the medical experts. Farming has become somewhat similar. Now, farming necessities, inputs, fertilizer, and pest control all have become the exclusive domain of so-called experts not farmers. Farmers have become consumers who buy commodities. The regression of farmers into consumers is the primary reason behind the rising cost of farming. Higher cost means poorer farmers; farms are going bankrupt, but nobody seems to be raising social or political questions.

Governments are not fully aware of this problem. They do not understand that only robust agriculture can support the self-reliance of a nation. Wide ranging policies of support and subsidy seldom benefit farmers. Money flows into the pockets of manufacturers, distributors and retailers, not to farmers. This in turn only deepens farmers' dependence on outside technology and worsens their profitability. "Organic farming," the term fashionably coined recently, is not something new to the Korean people. However, some claim that organic farming is something freshly imported from abroad, very sophisticated and scientific; so difficult that no farmer should dare try for themselves. So-called education, training and exhibitions all contribute to depriving the confidence away from the farmers.

Since the founding of our first kingdom in 2,333 BCE, we have practiced organic farming for some 4,300 years. Why do we not pay attention to the traditional organic farming of Asia that has for so long successfully fed the people in a sustainable way? The word "sustainable" is a fad nowadays, but in Korea farming has been sustainable for millennia, turning the soil richer and richer every year. If Koreans had been as exploitive with soil as modern conventional farming, people would have starved to death long time ago. Which one is more productive? Why do we try to import some advanced Western organic farming and transplant it into our soil? Any organic farming that relies on buying inputs from the corporate sector will face a rising cost. The resulting expensive products can then only serve the very few wealthy. Majority of consumers (and farmers) will eventually turn their backs.

I am skeptical that our current system of agriculture will have any future beyond the next ten or twenty years. Organic farming has become too expensive and if we cannot reverse this trend, organic farming will have no role in empowering farmers, fostering a healthier way of producing food, or rehabilitating the environment. JADAM's utmost priority has been to lower the cost of organic farming so that it can become viable for everyone. After decades of research and experiments, JADAM has not just lowered the cost marginally; instead, we have lowered it radically to an **ULTRA LOW** level, hence the name "Ultra-low-cost Agriculture (ULC)." Our production cost now stands at 100 dollars per acre a year.

This book introduces you to the world of JADAM agriculture. In this world, the farmers themselves make all the farm inputs they need. I have explained everything in detail so that the reader can learn how to make them. **You will learn many useful new methods including increasing microbial diversity and population, boosting soil minerals, tackling soil compaction, reducing salt level, raising soil fertility and more. This book also shows you how to make natural pesticides that can replace chemical ones.** What is amazing is that not only are they cheap and effective, but they are remarkably simple and easy to make.

When farmers begin to make their own inputs, farming can finally declare independence from the corporations. Ultra-low-cost farming is possible only when farmers are the masters of their farming. It is a tragedy for nations and indeed all of humanity if agricultural technology is monopolized by big businesses. JADAM is not simply about lowering farming costs; it is the product of my life-long contemplation and reflection on the historical, philosophical ecological aspects of agriculture. It is JADAM's goal to bring forth a change in the world with the ultra-low-cost agriculture system. Agriculture shall change at individual, national and global levels. Organic farming will be popularized; both farmers and consumers will be happy; humans will live in harmony with the nature.

We have been operating our website www.jadam.kr for 14 years now. Ultra-low-cost agriculture became quite well-known in many countries. We are receiving many questions. JADAM organic farming has its root in

Korea; it was founded and developed on Korean soil. This means that for it to be transplanted to other countries, it would need some adaptations and adjustments. But I can assure you that JADAM organic farming will be a powerful tool in other regions, because fundamentally JADAM does not advocate individual material or inputs; it is methodology, principle and spirit. Over 20 years passed since JADAM started its activity. Members registered in our website and those who finished our workshop count nearly 60,000. I am grateful that many people have shown interest. I especially thank our sponsors who supports us with 10 dollars or more every month; it has helped us immensely through our periods of hardship. Without sustained help, JADAM would not have stood through the decades. JADAM would not have been able to produce this original vision of “ultra-low-cost agriculture.” Thank you!

Many farmers also helped JADAM by providing invaluable knowledge that they gained from life-long experience and their experiments of JADAM method. I deeply thank them. This book and the website www.jadam.kr are testimony to what great a result can be achieved when farmers come together to share wisdom.

Collaboration with the Korean Rural Development Administration (RDA) enabled us to present a detailed numerical analysis of JADAM inputs. I thank Dr. Hyeongjin Ji, former Organic Farming Division Director, and Nanhee An of the RDA. Special thanks also to: Dr. Chunu Nam of National Institute of Horticultural & Herbal Science who included me in his research to help organize JADAM system in a scientific fashion; Jongseo Bak, president of National Environment-friendly Farmers Association who helped greatly in promoting ULC; Director Gwanggu Yi and Jaebeom Na of the Buyeo National Agricultural Products Quality Management Service; Jiyeon Jo of Gangjin district office; Sangwon Yi of Buan district office; Nakdu Choi of the Sangju Agricultural Technological Center; Jaun Gu of the Yesan Agricultural Technological Center; Myeongsan Bak of the Gapyeong Agricultural Technological Center; Gyeongchan Ha of Cheongsong Agricultural Technological Center; Eunhi Yi of Wando Agricultural Technological Center; Hyojin Bak of Hwasun Agricultural Technological

Center; Sugon Gim of Gokseong Agricultural Technological Center;and Byeongmu Yu of the Korea Forest Service.

If it were not for the achievements made by Han-kyu Cho, my father, JADAM system would not have been born. He has devoted his entire life in promoting natural farming and built a strong foundation for the ultra-low-cost agriculture system of JADAM organic farming. I thank Jeongho Gim of Bongha village who audaciously attempted JADAM organic farming on a scale of 330 acres and led that to a success. He proved that JADAM system can be used on large-scale farms. My appreciation also goes to Dae-hong Chae, ex-president of Suncheon Agricultural Cooperative; Seung Suk Lee, Chairwoman of Advisory Committee; Donggeun Choi, president of the Korean Federation of Sustainable Agriculture Organizations; Dongchun Choi of Buan. I thank my JADAM family, who have withstood the ordeals with me: Myeongsuk Gim, Geol Yu, Gyeonghi Yi, Won-gyeong Yi, Sanghi Yi, Gyeongho Gim, Muncheol Yu, Hyunho Cha, Rei Yoon, Sunyoung Cho, Sung-eun Cho, Sungwoo Cho, and of course my wife Sunhwa Ju, who gave me so much advice in writing this book.

Youngsang Cho
President of JADAM

Recommendation by Hankyu Cho, president of Cho's Global Natural Farming

About Hankyu Cho
Born 1935
Author of "Cho Hankyu's Natural Farming"
Author of "Making Natural Farming Inputs"
His books have been translated into English, Chinese, Japanese, Thai, Hindi, etc.
Technical consulting in 14 countries
Environment Award from Chosun Daily
Friendship Award from Chinese government
Friendship Award from Jilin Province, China
Foreign Expert Award from Yanbian Korean Autonomous Prefecture, China
Dosan Education Award

Chemical agriculture introduced half a century ago devastated Korea's traditional method of farming. Chemical pesticides and fertilizers began to contaminate our beautiful land and waters. Synthetic fertilizers at first "boosted" crop growth, but when the other side of the coin – soil degradation – revealed itself, productivity had begun to wane. Traditionally, all farming households had cows, pigs or chickens where the feed was completely self-sufficient. Animals were treated as farmers' friends and family. Again, factory farming of animals that was introduced as the "modern" took away animals from the bosoms of the farmers and threw them into hellish living conditions. In traditional animal husbandry, 100 percent of the feed was prepared at home and animal manure was used as valuable fertilizer. This system was replaced by a system that imports commercial feed and emits waste water that cause serious water pollution if not treated. For a long time, I have strongly advocated for the rights of animals; that it is not only human rights that is important. For pigs, there is a way of life that they need. Chickens too shall be allowed a life that tends to their nature.

As heavy machineries rolled across our tender soil, rock-hard layer of compacted soil was formed. Roots, air and even rainwater cannot penetrate this layer. The land of Korea, when farmed in the hands of our wise ancestors, became more fertile every year; rarely was there incidents of soil degradation. These diseases named soil salinity, soil compaction and monoculture disorder are all results of modern Western chemical farming. Only recently did scholars of the West start talking of "sustainability" but what more evidence of sustainability is there than the history of our people's survival?

Since the 1960s, when the entire Korean people were infatuated with anything "modern" and started replacing everything with anything from the West, I objected to the exploitative nature of chemical agriculture and started promoting Natural Farming. Like many other people who opposed government policy at that time, I too was accused of being an anti-government criminal, communist, fanatic idealist or a simple psycho. I organized a group that specifically studied the way to saving cost and getting high yield at the same time. I searched for an alternative to the conventional chemical agriculture and started to teach farmers of the knowledge. I began my own demonstration farm in 1965; dug into the soil and arduously worked for this cause. This method gradually came to be called "Natural Farming" and it continued to develop through the years. Knowledge I gained from traveling to and fro Japan numerous times also played a vital role.

I believed that farming should not harm the nature. I believed so since the time where nobody knew of concepts such as "natural degradation" or "environmental protection." Then the task for me became how to achieve good results in an environmentally-friendly way without using hazardous material. I developed many inputs such as indigenous microorganism, fermented plant juice, oriental medicine plant tonic, lactic acid bacteria input, natural calcium, natural phosphorus to mention a few. I believed that farming should not promote the commercial capital's enslavement of farmers. I was ever asking "How can farmers be more than mere consumers? How can farmers farm without needing money? How can farmers make effective inputs with cheap and easily available material?" My life was in devotion to solving these questions.

That was the spirit of Natural Farming. Now, it is my utmost pleasure to see the same spirit being inherited and developed by Youngsang Cho of JADAM. Youngsang Cho, my son, has worked for a long time with me and understands the bone marrows of Natural Farming. After studying chemistry in university, he chose a life on the soil, raised plants and animals himself and trained himself to become an expert in both theory and practice. I wish to express my, perhaps wildly outdated, pride, thanks and respect to my son who, at a time when even the progressive people did not know the value of eco or farming, audaciously jumped into the countryside, into the farmers.

Youngsang Cho has established "JADAM" in 1991 and has successfully led the organization for over 20 years where members now count nearly 60 thousand. JADAM constantly interacts with the member farmers through the internet; providing information, guidance and answers through smartphones or other devices. His slogan is "ultra-low-cost (ULC)." In JADAM method, almost all inputs are made by farmers themselves. This phenomenally saves costs. He has now officially announced that it is possible to prepare pesticide and fertilizer at 100 dollars an acre (0.4 ha) per year. I believe this is the direction that can benefit farmers and bring hope to farming. There are two ways to make profit: to increase revenue or to reduce cost. The latter is safer and more logical for the farmers; too many farmers put themselves in danger of bankruptcy by investing large sum of money and trying to sell at a high price. JADAM organic farming is, just like Natural Farming that I pursued, friendly for the planet, empowering the farmers and is ultra-low-cost (ULC). Another very important thing is that **it works**. Its yield and quality is not less than that of conventional agriculture. Any farming should at first be "economic" to be able to spread across the globe.

JADAM has inherited and developed Natural Farming. In particular, it shares the fundamental spirit of environment-friendly, farmer-empowering and ultra-low-cost. However, although Natural Farming provided some foundation, Youngsang Cho has gone far beyond that. His creativity and perseverance greatly advanced the farming system, and he has gathered collective knowledge from farmers from all regions. That he, my son, has organized a system of farming in line with his father's yet took it a step further, and that he shall put it into a book which is translated into many languages, is my life's fortune. I could not be more proud. I wish to pray for the success of not only my son but all those who come together in the spirit of Natural Farming and JADAM.

This book, which I am writing a recommendation for, is the result of Youngsang Cho's over 20 years of hard study and experiments. It is the culmination of his search for an organic farming that works. In the view of my own experience and learning, there exists nowhere in the world any system like JADAM organic farming. I forecast that the making of wetting agent (surfactant) and pesticide at home with organically permitted substances will be a global sensation. This book has been published many times to provide guidance for farmers on the fields and in their ideas, and has stood the test of time. I congratulate JADAM that it now enjoys multitude of invitations from abroad and it is being translated into many different languages. This book not only explains the technical aspects that make ultra-low-cost organic farming possible but also provides a profound insight into how to perceive nature, agriculture and farmers. I ask the readers to keep it close, read repeatedly so that they may have the experience of a sudden opening of their eyes in both skills and spirit.

I had written preface for my own book in 1995; it is after 20 years that I write one for my son's. Like such, life was such, that now 80 long years have passed and I, having completed so many journeys, come back to sit at my desk to look back at what short a life it has been. Life of long suffering now shines like a pearl, like a teardrop.

January 2016
Hankyu Cho
Cho's Global Natural Farming

Table of Contents

Part I.

Vision

"We drink from our own wells"
Gustavo Gutierrez

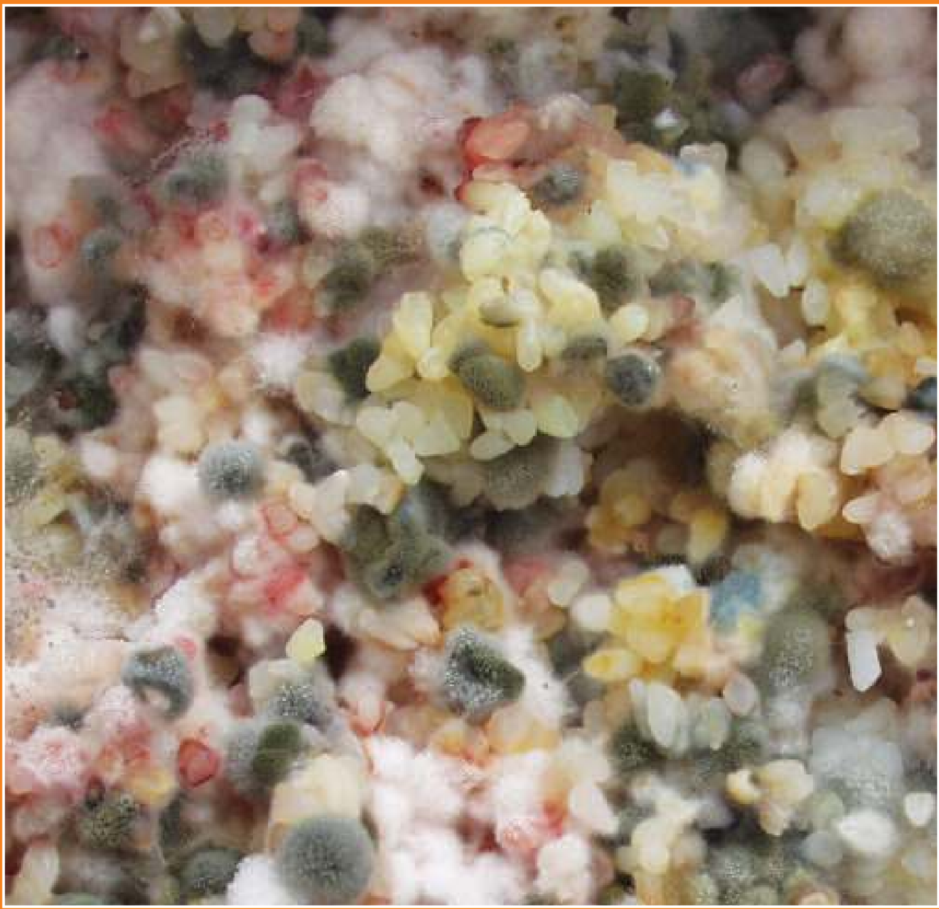


Photo: Youngsang Cho

A high-cost organic farming will impoverish farmers and destroy the foundation of the agricultural industry of a nation.

Today's organic farming has evolved into a strange system where you have to "buy expensive things from afar" instead of "valuing what is near and cheap."

1. Four aims

From JADAM's perspective, a technology does not qualify as "organic" just because it excludes chemicals. If organic farming cannot compete with conventional farming in terms of productivity and price, not many people will choose to practice organic farming. Many people say you have to do organic farming for the environment and people's health, but people will choose to do organic farming only when it is profitable. To be profitable, it has to be simple and doable, cost-saving and cheap, scientific and effective.

Only then will organic farming replace conventional farming. If organic farming keeps being something that you "should" do because it is something good "despite" the high-cost and difficulty; then it will forever be something practiced by a minority. It is time organic farming take off its two drawbacks: being difficult and being expensive. Try JADAM organic farming that is easy and low-cost. JADAM promotes four aims:

- **S**imple: principles are simple
- **E**asy: easy to make
- **S**cientific: methodology is scientific
- **E**ffective: process is highly effective and low-cost

JADAM has striven to create an agricultural system based on SESE because we believe that only when a system of farming has achieved SESE will farmers embrace it voluntarily and in significant numbers. JADAM organic farming-SESE was made possible because the foundation was laid down by the pioneers of organic farming and a knowledge was shared by many organic growers that supported JADAM. SESE holds the key to high-quality and high-yield.

2. “I” am the farming expert

When there were no chemical pesticides or fertilizers, all farmers practiced organic farming. Farmers used what was freely available around them; they did not particularly need money. Everything around them – in nature, byproducts of farming, any organic matter, etc. – was highly valued and treated with respect. Organic farming is not new to us. For thousands of years, farming belonged to the farmers. Historically there were almost no instances when a farmer could not farm because he had no money. A man with no means of living should at least be able to live off the land. One should be able to resort to farming when one has no money. But nowadays, one should already have money in order to do farming. There are so many things to buy, invest and equip.

Organic farming today has evolved into a strange system where you have to “buy expensive things from afar instead of valuing what is near and cheap.” Why? Because manufacturers, distributers and retailers of farm inputs were behind the development of organic farming to shape it into its current form. Their profit-seeking motivated the development of agricultural technology.

Organic farming is not something new. It is still vivid in our memories. The method practiced by our ancestors holds the key to solving the problem of high-cost modern organic farming. It contains an entire system of utilizing microorganisms, liquid fertilizers and doing pest control. We are open to new methods developed by members. New methods and techniques are being continuously incorporated into the JADAM system to shape an organic farming that is much lower-cost, easier and simpler than conventional farming. Koreans should be proud as the founders of organic farming. Stop looking for answers in “modern Western” agriculture and neglect the thousands of years of our organic farming history.

Let us bring farming back to the farmers. Nobody else but "I" should be the farming expert. Only then will you recover the viability of your farming. Let us stop increasing cost with the dream of selling at high prices and making big money. Viability means that you should still be able to make ends meet after selling at market price because you have succeeded in reducing the cost to an ultra-low level. I firmly believe that ULC will provide hope for farmers of all countries in this age where trade of agricultural products are becoming more and more free, price competition is becoming more intense.

3. Challenges facing agriculture

Below are some of the difficulties that we could face in ten or twenty years. Colossal changes will take place in our environment and the economy. The agricultural sector will become more and more important; it will become a national priority. This poses both challenges and opportunities for farmers.

- Global free trade in agricultural products will expand; high-cost and high-price products will not be able to compete. Farmers have to be able to compete both in price and quality. Quality should be of international standards. JADAM's primary focus is to lower cost and increase profitability for farmers with ULC.

- Energy-dependent systems of agriculture will fall into crisis. The cost of oil and electricity will rise, so it will be more and more costly to operate tractors, vehicles, cold storage, machines, etc. JADAM strongly urges a break-away from energy-intensive agriculture. Methods of production, processing, storage, and transportation should all change drastically.

- Grain prices will rise in times of global food crisis and importation of these food staples will become difficult. Climate change, desertification, soil erosion, and other environmental degradations will decrease the total available area of arable land and reduce productivity. Cultivation of staple food crop – rice, wheat, beans and other grains – will become more important.

- Rising sea levels could threaten vast areas of farmland. Melting ice from the polar regions and Greenland contributes to this danger. Some forecasts predict that the sea level will rise as high as seven meters (23 ft). Just one meter (3.3 ft) of elevation will devastate over 80 percent of rice paddies in the Philippines, Vietnam and Thailand. Half of Bangladesh will go underwater. 1/6th of the world population is living at 1 meter (3.3 ft) or less above sea level; the rising water will prove catastrophic. Fertile, arable land will become more and more valuable. The land you own will be your wealth.

- Global financial markets will become more volatile and economies will be stuck in low-growth. The global economy is losing its orientation. There could be massive inflation in the short-term, low-growth will become a trend in the long-term, and the value of assets will fall. Stocks, bonds, insurance, pensions and typical real estate may no longer serve as safe forms of wealth. Running and investing in businesses including farms based on debt is also dangerous. Arable land that returns continued produce and profit will be more valuable. Let us do a farming that is free from money; ultra-low cost; and self-sufficient.

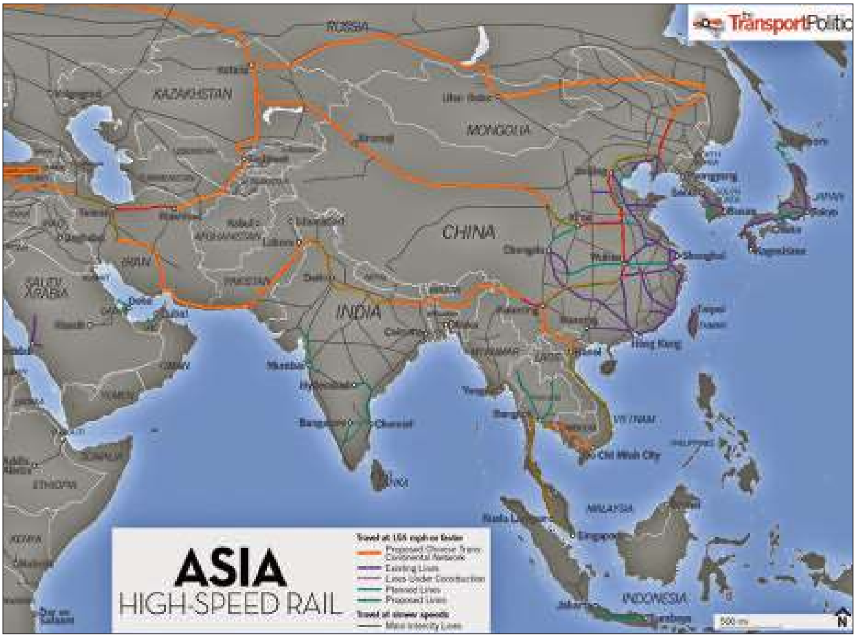
4. Farmers can sell throughout Asia

High-speed railways are being built across the Asian continent. As countries open their borders to more free trade, moving of agricultural products between countries become easier. A new era is approaching where a person in any country can purchase produce from any other country. The most important thing is the product to be competitive. If it is competitive, it will sell all over the world; if not, there will be nowhere to go.

China's agricultural products are massive in quantity; it has the potential to devastate neighboring countries that import its produce. China produces 41% of world's apples, 61% of pears, 32% of rice and 60% of fruity vegetables (Korea Rural Economic Institute). But the upside is that China's neighboring countries are now faced with the opening up of Chinese market where access has become easier with the operation of ports and high-speed rails. China's agricultural market will pose risk and opportunity at the same time. The agricultural sector of surrounding countries will be impacted by the influx of China's cheap food, however, some of their food will find golden opportunity in Chinese market; if only they have acquired the competitive edge. Bullet trains in China have connected its major cities in 1-day travel zones. It will not be long before Korea's processed and dried – possibly even fresh – foods are delivered to China. China's largest internet shopping mall "Alibala" announced that it will shorten its delivery time to 3 days to any place in China. Distance and borders are no longer as big an obstacle. Online shopping malls like Alibaba and Amazon will allow the sale of local produce to all over the world.

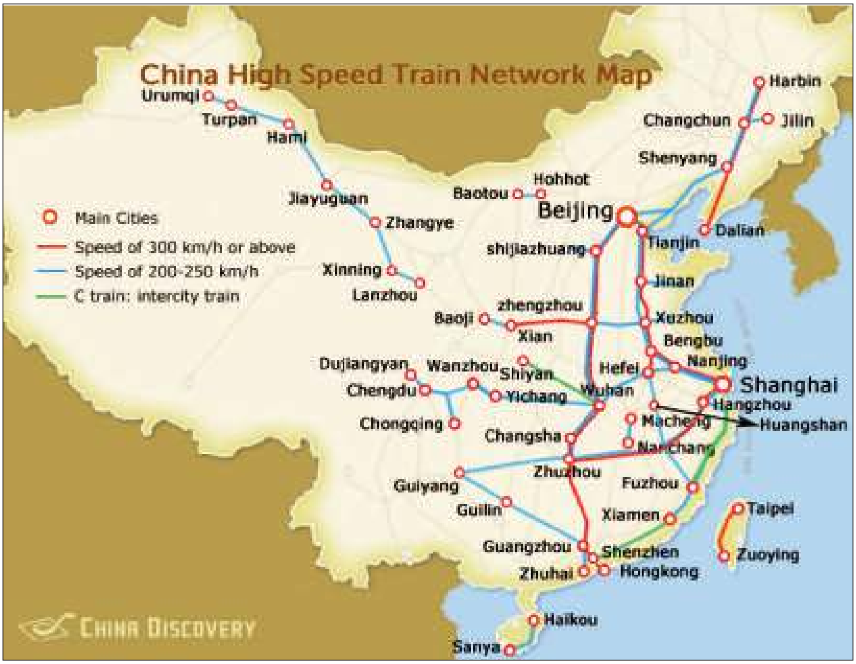
It has already become common for a company to sell its product all over the world; it will also become common for a farmer to sell his/her produce globally. Organic food market is particularly growing fast in China as cities are expanding and wealthy people are counting tens of millions. China is turning into the

TAR, Trans-Asia Railway is nearly complete. This network connects the continents by traveling from Asia across Russia to Europe. Trade in agricultural products will increase. Bullet trains will be linking Seoul to Beijing in 8 hours, Beijing to Moscow in 30 hours.



Entire China is connected with bullet trains with speed of 250-350 km per hour (155-373 miles per hour). It takes 8 hours from Beijing to Guangzhou. Korea's organic produce can reach Chinese organic markets in its major cities in 3 days.

China is emerging as the largest organic market in the world. Korea is in the fastest and easiest position to access it. For farmers who are ready, future will open unimaginable opportunities.



China will become world's largest consumer of organic produce

Organic ginseng selling in one of premium organic shops in China. They are packed in different sizes.

Under the name "Organic Ginseng" you can see many certifications from quite a number of renowned organizations. Chinese organic farmers are aiming not only at the Asian market but the whole world.

Organic grains corner in a large store.

Organic vegetables corner.

Greenhouse farming in Qingdao, China, running completely fuel-free in the winter

Just one hour's flight from Incheon Airport and you can see these greenhouses. They are sitting 1 meter (3.3 ft) below the ground.

Pile up the dug-out soil so as to make a slanted wall and sit the greenhouse on it. The slanted soil wall will collect heat during the day and emit it during the night. This keeps the house over 12°C (53.6°F) in the winter.

This is not in an experimental stage. It was popularized over 30 years ago and practiced by numerous farms. Compare that to Korea where we neglect these kinds of simple, cheap and effective technology but pursue energy-consuming and costly methods such as solar-powered or underground heating systems.

biggest organic food market in the world. How shall farmers prepare for this change? They must obtain organic certification that proves the international-standard quality of their produce. If they can further manage to lower the price, it will be even better.

Already, premium organic markets in China are selling at prices higher than Korea. Price gap is narrowing rapidly. China should be seen as a rising opportunity.

5. Where is our agriculture headed?

The system of organic farming full of wisdom practiced by our ancestors for thousands of years is still vivid in the memories of Koreans. However, it is difficult to find that kind of wisdom in the "modern" organic farming. Agriculture technology is becoming more and more complicated. Is it so because it truly needs to be? No. The reason is to **scare** the farmers. It should appear very difficult because only then will the farmers give up trying to understand it all and trying to be in control of farming. So-called education, workshops, seminars, exhibitions and the like all make farmers more confused. They deprive farmers of their confidence. Then the microorganism product producers, liquid fertilizer factories, and pesticide companies can claim the position of true experts, and start selling their products with confidence.

Approximately 2,000 years ago, the teachings of Jesus and the Buddha were based on people's everyday lives. They spoke words of common sense for common people to understand. Truth melted into the followers' soul so that their bodies became churches and temples. There was not even the thinnest barrier between God and I. But what happened as religions "developed"? They established sophisticated doctrines and made truth inaccessible to any individual who sought guidance. Religions, that have survived and evolved to this modern day, are so complicated and difficult that a seeker will never find the truth despite a life-long search. Farming is turning into something similar. So is modern medicine. Religions actually inhibit people from being able to stand up strong in the world; medical professions actually deter people from acquiring the ability to take care of their own health; agricultural practice actually blocks farmers from becoming masters of their own farming. In this capitalistic world, no human activities are left un-devoured by commercial interests. Life is becoming tougher and more expensive. It is no coincidence that farming costs keep rising.

I believe this fundamental structure has to be destroyed if there is to be any hope for farming. It is the essential spirit of JADAM's ULC to object to this capitalistic world order and reclaim dignity for farmers who have become nothing more than consumers.

How can agriculture reclaim viability? The key is technology. If a certain system of technology incurs high-cost, it cannot be an alternative. Even well-designed national policies will not be successful without a good technology. To promote an agriculture with viability, the state has to pay special attention to the system of technology. When technology loses practicality, agriculture that stands on that technology loses viability. Under the capitalistic system where corporations have persistently sought after profit for centuries, input market thrives whereas farmers continue to lose their knowledge. No wonder why farming nowadays is so costly, farmers all over the world are going bankrupt.

The fundamental dilemma of the commercial medical profession is that if people actually become healthy, they lose money. It is not that the individuals are "bad" people; it is the structure they are in that prohibits them from truly working to improve people's health. Their goal is to increase the number of patients. Well, farming is the same. Since corporations have taken the lead in agricultural technology, farming has become more difficult, more costly and less productive. Why? The reason is simple. If farming was easy, self-sufficient and productive, the manufacturers would not be able to sell their fertilizer and pesticides. Why would they be interested in developing a system of technology that does not bring profit to them? This inherent problem in health and farming leads to the depletion of nation's budget. Health and agriculture are two areas closely linked to public welfare; it is risky to leave them in the hands of private corporations.

JADAM seeks to bring farming back to the hands of farmers. Farmers should again be the master of farming. JADAM wants to establish a system of farming that can be practiced at ultra-low cost and with inputs all self-made. Ultra-low-cost agriculture will increase the viability of organic farming and finally make it powerful enough to replace conventional farming. I believe it has the potential to change the agricultural landscape of the world. Let us be free. Let us be finally released from the grip of the market; begin a new farming that is fun, creative and where you are in lead.

6. Farming in the post-2020 era

The twenty years to come will be dramatically different from the previous twenty. Crises upon crises will inflict chaos upon our economy, agriculture, energy, environment, food and resources sectors. Wisdom is called for; more desperately than ever. Challenge always entails opportunity. It will be tough for agriculture in the short-term but in the long-term many doors of opportunity will open. But the door will open only to those who are ready. What should you do to prepare for the post-2020 era? Below are some of my contemplations:

Do not depend on cash; go back to simple life

Global financial crises, continued low economic growth for many countries, and tight budgets aimed at reducing national deficits are some of the trends that will continue; economies will no longer thrive. More currency will be issued which leads to hyper-inflation, interest rates will rise and farms running on debt will suffer severely. The influx of foreign agricultural products coupled with low growth will certainly deliver a heavy blow to farmers' income. Just making ends meet will be tough enough. There is a desperate and urgent need to lower the cost of living. Remember how our grandmothers and grandfathers lived: they were the epitome of saving and frugality. Reduce your consumption to a minimum and save cash to prepare for the unpredictability of the future.

Imagine your cash flow stops just for three months. Can you survive that? Are you prepared? Phones, power, gas, fuel and all necessities of modern life will be cut off. Take this matter of "cash flow" seriously and start planning ahead. Save cash so that you can be prepared. Our lifestyles as of now are much too luxurious and wasteful. Crises that befall do not destroy everybody. Some companies that are prepared and moneyed will weather the storm and change the crisis into an opportunity. The same holds true for farmers – those who have the cash will survive and then thrive.

Raise your children to be farmers; a job with no retirement

When I tell farmers to save money and reduce spending, some farmers think that reducing the education expenses is too much. As parents, they want their children to do well in school and grow up to be fit for a successful life in the city. But as parents, you have to look practically into 10, 20 years into the future of your children. I want to remind you that farmer is one of the most promising jobs according to most futurists. Why not raise your offspring to be excellent farmers?

Let the school have the primary responsibility of teaching your children. At home, teach them how to do farming. When they are ready to graduate from high school, they will be trained well enough to be able to manage a farm. That is certainly another form of excellent education. If your children have the same dream, then let them go to a college or university where the tuition is not so high and they can study agriculture. There are postgraduate courses where you only have to go to school once a week; your children can even get a PhD.

Let's have a new dream, a new vision. Raise your children to be great experts in farming. Do away with the low self-esteem some farmers associate with their occupation. Too many students finish high-level education without gaining any practical means to live in this world.

Drop your farming cost to 100 dollars per acre

It is time we seriously reconsider and discard both high-cost organic farming and conventional agriculture. For conventional farmers, the prices of chemical fertilizers and pesticides will rise further. Enter the whole new world of ultra-low-cost agriculture (ULC) as advocated by JADAM.

JADAM's ultra-low-cost agriculture can be applied to all types and forms of farming. Using the JADAM system, you can make almost everything you need for farming – even pesticides. If JADAM method was difficult then it would be a problem, but it is easy. If JADAM method was expensive it would be a problem, but it is cheap. If it was ineffective it'd be a problem, but it works. These conditions are critical if we are to popularize a farming system so that the majority of farmers may practice it. JADAM was not launched to do some minor improvements to the environment. Ultimately, JADAM aims to change the fundamental way the human race does farming; make right what is wrong. National and global agriculture all need to change.

For decades, JADAM has strived to make farming simple and easy. We cook and eat rice every day. We wanted farming to be as easy as that. We wanted to reduce the barrier so low that a whole mass of people could do farming easily. All such efforts have crystallized into the "JADAM natural crop protection workshop" – available on en.jadam.kr. Today, the average cost of organic farming for an acre is around 6,000 dollars. Bring it down to 100 with JADAM.

You can replace synthetic pesticides with natural ones.

Costly farming is just not competitive. If farmers can produce at 100 dollars per acre for the cost of fertilizers and pesticides, they can have confidence. Agricultural products are being sold across the borders. If your farming gains viability, secures high quality and produce at ultra-low costs, you will be able to sell all over the world. JADAM will show you the way.

Your wife plays the central role

If you are a husband, the changes that are occurring is not simple; it cannot be handled by yourself alone. You need the participation and support from your wife. Your wife will actually be playing a central role in your farming. In terms of the work she does, you will not be able to have a better partner. Without her, you would probably have to hire a worker for over $40,000 per year to do all the things she is doing. Without your wife or life mate, it is impossible to break into the post 2020-era. Divide and give out your wife's household chores to your children. If that is not enough, you yourself should actively help her with her chores. Your wife is your best partner. Train her to be an expert in farming who can manage the farm without your help.

Pesticides are probably the most expensive part of your farming. Make your wife into a JADAM pesticide expert who can make natural, cheap and effective pesticides by herself. She will be a treasure to your farm.

Devote and commit 8 full hours per day to farming

Traditional farmers went out to work when it was still dark before sunrise. They worked in the fields eating a small breakfast and big lunch. They came home only after sunset. Farmers nowadays are also busy, but not with farming. They are busy attending meetings, tours, seminars, workshops, trainings, gatherings, parties, and other unnecessary events. The remaining time, they spend on their cellphones.

If you are a farmer, devote yourself to farming at least 8 hours per day: from sunrise to 4pm, work at least 8 hours, focusing on farming. Work hard and think innovatively. Seek improvements and develop new methods. Always experiment, study and learn. If you are not devoted, your family may not respect you; your customers will not be impressed with the products you grow. Devote and commit. That is the only way to produce the best quality and high yield.

Times have changed. A company can market its product to markets of the world; it is now same for individual farmers. Global internet shopping malls like Amazon and Alibaba are coming into Korea. Once you start selling through those malls, your sales will soar. China will become the largest organic market in the world. Korea can access this market with the greatest ease and speed. To change risk into opportunity, what the farmers need to do is to secure certification of quality and low price. For well-prepared farmers, the future will open up immense opportunity.

7. Transition from conventional to organic

The market for organic food looks quite promising. It is sold at relatively higher prices and is touted as healthy. However, a transition from conventional, chemical farming to organic farming should be carefully planned. Errors can be made and this will lead to financial losses. Seasonal crops could be a little easier to work with, but perennials need more care. You might have succeeded in reducing pesticide application significantly to 2-3 times per season, but doing completely without it is very different. Farming purely organic can be challenging; technical blunders can be made. Applying your experience in conventional farming to organic farming can sometimes make further mistakes.

You do not truly know organic if you haven't started farming with organic. At first, I suggest you start out by applying the JADAM method to one tenth of your total cropland. That way, you can start more safely and failure will not bring as big an impact. Master the basics of JADAM organic farming through soil management and fertilizer application. Then, learn the more advanced methods of tackling pests and diseases. You can gradually expand the proportion of your land once you gain confidence.

Here are some things you need to think deeply before going organic:

- Are you confident you can use indigenous microorganisms and manage the changes in your soil?
- Have you solved the problem of soil compaction?
- Do you trust the effectiveness of wild grass as organic fertilizer?
- Can you formulate the appropriate fertilizer program for each crop?
- Are you confident you can grow field crops without chemical fertilizers?
- Do you trust the effects of natural calcium phosphate and calcium liquid fertilizers?
- Do you trust the effects of natural nitrogen liquid fertilizers?
- Can you control aphids and mites with natural pesticides?
- Can you control tobacco moths, cabbage white butterfly caterpillars, and scales with natural pesticides?
- Can you control powdery mildew and canker (anthracnose) with natural pesticides?
- Are you confident that your yield will not decrease after going organic?
- Are you confident you can keep up the quality after going organic?

Many people fail in organic farming because they cannot control aphids, mites and powdery mildew. Learn how to make and apply JADAM natural pesticides, and train yourself to become a successful organic farmer. Try some organic pesticide products from the market and compare them with your natural homemade ones to further your study.

In organic farming, seeds, seedlings, and saplings are very important. In modern commercial agriculture, seedling growers try to make their products look gorgeous, and sapling growers often use chemical fertilizer to boost appearance. The complete, big picture of the plant's overall lifecycle is often neglected. JADAM recommends you grow your own seedlings. If you cannot grow your own for seasonal crops, make sure that you make your own for at least the perennial crops and fruit trees. Saplings should be grown and prepared the JADAM way to ensure their health for at least 1-2 years.

❒ Healthy living with JADAM's SESE ❒

1. Eat brown rice (instead of white) mixed with other grains together with more than three kinds of greens. Chew well.

After a week, you will feel better in digestion and bowel movement. A few weeks after that, you will start to feel your abdomen become warm and comfortable. With warmth, healing will begin. Eat fruits with their peels intact. Again, do not eat white rice.

2. Drink plenty of water until your urine turns clear.

The amount of water you drink is absolutely crucial to health. Toxins follow the urine to be excreted from the body. Just drinking water can heal many illnesses. Eat small amounts of sea salt too.

3. Do not apply cosmetics to places other than the face and hands.

Cosmetic products are a mixture of hundreds of different chemicals. When absorbed through the skin they accumulate in the body. Minimize the quantity you put on. Try refraining from using soap.

4. Get rid of shampoos, soaps, bleach, fabric softeners, antimicrobial products, air fresheners, etc.

Dispose of chemical products in your house and your car to protect you and your family's health. Use JADAM wetting agent to wash your hair, body, dishes and clothes. This is particularly important for infants and children.

5. Use sun-dried sea salt instead of toothpaste.

Toothpaste is made of numerous chemicals. To have healthy gums, keep away from toothpastes. After a few weeks, your gums will be stronger. Do not drink too much alcohol.

6. Keep your skin healthy through exercise and bathing.

Skin is a major detox organ. Exercise and sweat regularly for better detox. Lower-body warm bathing and hot/cold alternate bathing will strengthen your skin. Avoid smoking.

7. Keep your spine healthy; maintain a good posture.

If your back muscles are weak, you will have back problems. If you have a sway back, eventually you will develop problems in your internal organs. Every day, do sit-ups 30 times. If you have a backache or if your back is bent, roll a towel and lie on it for 20 minutes.

8. Keep your shoulders free from stitches and stiffness.

Holding on to and hanging from a horizontal bar is a good remedy for stitches in the shoulders. Hold on to the bar for 30 seconds every day. Repeated exercise will put your bones in the correct position and keep your shoulders pain free.

Part II.

Principles

"Highest virtue is like water."
Laozi

Photo: Youngsang Cho

Crop rotation or fallowing is against the laws of nature.
It is not something we observe in nature.
"Rotation farming" is a strange concept made up to conceal an erroneous method of farming of removing crop residues.
Organic farming is:
treating nature as your teacher ("Do as nature does");
understanding crops by understanding my body ("I and others are one");
and living without leaning to any biases ("Good and bad are one").

1. Do as nature does (道法自然)

Modern agriculture has completely excluded the "emotional" part of farming where the love and communication between humans and plants are of great importance. Agriculture has become a form of mechanics, where you deal with life as if it were inanimate. Just like you entrust everything to the engineers if you do not know about machines, farmers entrust the ABCs of their farming to the so-called experts. Farmers let these outsiders diagnose, judge and treat their own plants; they might as well ask these experts to love the plants for them. Modern farming is similar to modern health care. People are not, or rather have given up, taking care of their and their families' own health. They let doctors tell them what to do. Farmers, too, are nothing more than consumers who farm as they are told by the "experts" and use products touted by manufacturers. Farmers have fallen from master to slave. Science became the vanguards of corporate interest. It has become an area completely alien and inaccessible for the people. But remember that Einstein said "The whole of science is nothing more than a refinement of everyday thinking."

Just like super-advanced science and medicine scare and convince us that we are ignorant and feeble beings incapable of taking care of our own health, modern, advanced, and complicated agronomy robs farmers of their confidence. The tragedy is that all the while "profits" will flow to only one side, resulting in one clear-cut winner and one loser. Farmers have little or no say in the making of technological advances. Why is it that costs keep rising; and rising in both conventional and organic farming? This is not coincidence or simple bad luck.

If you examine carefully the so-called environment-friendly farming that has started to proliferate recently, the phenomenon is very strange. Why is everybody forgetting that great civilizations have farmed organically for many millennia? Why is nobody seeking wisdom from the tradition? Before chemistry, all were organic.

Why is everybody so excited, shouting that “finally, organic farming is here!”? Watch closely. Look who is benefiting from this development. A market, serviced by “experts” promoting a plethora of conventional farming inputs in the past, is similarly now being flooded with organic farming inputs with “experts” claiming that the farmer must use their products for best quality organic products. Farmers are nothing but a tiny disposable dot in this huge agriculture system.

The organic farming practiced by our ancestors valued what is around us, what is easily available and cheap. They did not rely on a system where you had to have money to farm because everything around them could be turned into valuable resources, ingredients and tools. What does the “modern, sophisticated, and aristocratic” organic farming teach us today? They tell you to throw away everything around you because they are wastes, dirty and unscientific, and to go to the marketplace to buy all the neat, cool, scientific products. JADAM takes this situation very seriously. If it cannot be reversed, changed, or radically improved, there will be no future for farmers and farming. One side is exploiting the other; this is unfair and unsustainable. Farmers need to awaken, recover their innate ability to work and innovate, and once again become the masters of farming. This is what JADAM aspires for. JADAM tries to restore the creativity farmers once had. JADAM ULC is the result of such efforts. It is not simply a “cheap method of farming”; it is a farming that aims to restore the ownership of the farmers. JADAM ULC was born out of deep and long contemplation about the economic, social, philosophical aspects of modern agriculture.

Without a clear understanding of what is really going on, one cannot establish a sound vision for farmers and farming. Technology needs to be supported by a clear philosophy – a system of thought that is nature-loving and farmer-loving. There are many different kinds of “environmentally-friendly agriculture” and they are taught to farmers across the nation – but they lack philosophy. Sometimes you see a farmer who is all the more confused because he/she received too much education. What is worse, most of these forms of education and training programs and seminars finish with the same conclusion: "That is why you have to buy our products."

As a farmer, you must establish your philosophy and base your technology on that. This philosophy of how you perceive crops, life, the interaction between lives, and nature is critical. Your belief system needs to be clear, practical and common-sense. Allow me to introduce to you the philosophy of JADAM.

It is said "The Way (Dao) resembles nature" in chapter 25 of Laozi's Dao De Jing (a Chinese classic written around 6th century BCE loosely translated as "Way and Virtue"). It teaches us that the way a person shall live, the wisdom which he/she shall follow is readily found in nature. Consequently, we, as organic farmers, should be thinking "the way I shall farm, the wisdom of farming that I shall follow is found in nature." The greatest teaching and wisdom are in nature.

The way nature farms and the way we farm are fundamentally the same. Life is born, grows and dies. The only difference is that humans have a purpose: to make money. Nature has been farming for billions of years; without any idea of making money. Trust her; she is much more experienced than you. Let's consult nature when we find ourselves in trouble. You will begin to understand nature, how she works, and gain a deeper insight into farming.

Ask nature about soil degradation from repeated monoculture

One of the toughest problems farmers face is soil degradation due to repeated monoculture. Let's ask nature intimately, as if she were a close friend, "Do you have such problems?" Problems associated with monoculture arise from growing one type of plant on the same land repeatedly, year after year. Basically, that one type of plant will absorb from the soil the types of nutrients it needs or prefers; so after repeated cultivations, those nutrients will be depleted from the soil. Ultimately, monoculture leads to decreased yield and unhealthy crops. The solution offered by modern agriculture is to rotate crops.

But in reality, it is not easy to simply change what you have been growing. Farmers know that the repeated growing of one crop is the source of the problem, but cannot do much about it.

JADAM has a deep-rooted suspicion about this widely-accepted idea that repeated monoculture causes problems. After all, go out to the mountains, fields, grasslands and ask nature, "Do you grow plants in rotation?" The answer was unequivocal: "No. I do not farm in rotations. I plant the same species in the same place again and again."

There is no such concept as **rotational growing** in the wild. A seed can fall in a place and the same species can grow 10 or 100 or even 1,000 years. Its offspring in turn will cover the area after being born, and then reborn many times over. Additionally, there is no such problem as **repeated monoculture growth disorders**. In fact, the soil becomes richer and richer; an untouched land will fill itself with life and establish a beautiful forest. How green a planet earth has become! Nature is always young, fresh and vigorous. A forest 1,000 years old is still vibrant. True organic farming has the same vitality and permanence as nature.

Then why is it that nature's monoculture thrives but the human version is beset with problems? We have to look at how minerals are recycled. In nature, leaves, branches, trees, roots, and fruits – i.e. the whole body of the plant – fall down to be disintegrated by microbes and are returned to the soil. The roots from a tree reach deep into the earth, grabbing and pulling up the minerals that are needed to build the bodies and sustain metabolism of the tree. When these fall back on the soil, the minerals previously held are released. Occasionally, the wind might blow the leaves away, animals might consume fruits, but eventually the lost minerals end up somewhere at the bottom of another tree. They have **moved** but have not been **removed**. The deeper the roots reach, the more supply of minerals is brought up into the daylight. That is how the forest becomes greener and healthier over the years.

What's happening with human monoculture? We are doing exactly the opposite. What's even worse, after taking away the fruits, we eliminate all crop residues. Crop residues contain valuable nutrients that should be released back to the soil so plants can grow again. Rotational cultivation is offered as a panacea but completely misses the point.

JADAM does not perceive crop residues (branches, leaves and any remaining parts of the plant) as a source of disease; it sees them as a source of nutrients. Use this as fertilizer; you must put them back to soil. Only then, will you start to solve the problem of monoculture disorder. Crop residues become the perfect fertilizer for crops. If you want your farming to be awesome, you must give awesome food for crops. Crop residue is the substance with the best nutritional balance for the crop. If someone starts convincing you that you should not give crop residues to your crops but throw them away, and that you should buy fertilizer to provide the best nutritional balance, who does it benefit?

These experts teach you that you should completely destroy all crop residues because they are the source of canker, powdery mildew and other diseases. Most farmers diligently follow such instructions. If canker and powdery mildew bacteria were very rare organisms, it would make sense to destroy or quarantine them like the experts say. However, these organisms are so common that it is impossible to get rid of them by burning crop residues. They are everywhere in the soil. Just one spore can propagate into 1 billion in 10 hours. Clearly understand that such diseases cannot be prevented by eliminating crop residues. Cold virus, too, is everywhere and we cannot kill them all. We don't take pills every day; it is wiser to stay healthy. Same applies to farming.

Please look at canker and powdery mildew as athlete's foot fungi. People that walk barefoot never get infected with athlete's foot because their feet are always full of a **diversity** of microorganisms. If athlete's foot fungi co-exist with other microorganisms, they cannot have the food (the foot!) all by themselves. Because of the competition, these disease-causing fungi cannot become prevalent. This is an innovative approach to defeating disease. Treat canker and powdery mildew in the

Growing kiwi with organic farming. True organic farming is high yield. Chanmo Gim's farm in Goseong.

same manner. Increase the population and diversity of microorganisms in the soil, then disease-causing organisms will not gain dominance. **Change from disinfection to diversity.** Do not fear disease; use the crop residues as fertilizers. They are the best nutrient for your crops.

Rotational planting is not something you find in nature. This strange method was created to cover the grave error of eliminating crop residues; but it is just not good enough. JADAM supports organic farming but not crop rotation; it is neither appropriate nor necessary. True natural farming will thrive even with repeated cultivation of a single variety. This is evidenced by the numerous case studies seen in our website. So, we were able to cure this tenacious headache instantly by querying nature. There is something to learn from nature about every topic related to farming. We should emulate nature as closely as possible, not oppose it.

Ask nature about salt accumulation

Next, let's deal with the problem of salt accumulation in soil. High salinity is a serious issue in many farmlands. Unfortunately, this also provides great opportunity for the business to intervene since nearly every farmer is struggling to deal with high salt concentration. Again, we pose the question to nature: "Do you have issues with high salt content?" Of course, she answers that she has none. How is it possible that the soil receives acid rain with all its pollutants but still none accumulates? Acid rain is destroying land in farms but not land in nature. Let's observe what happens in nature. Unlike cultivated soil, when acid rain falls on natural soil, the moisture seeps in deep. As it does so, it meets a huge number of various microorganisms which act on the pollutants and purify the water. Rain water becomes cleaner and cleaner as microbes break down pollutants. Purified water then flows into aquifers, reaches rivers and oceans, then goes back into the sky. Natural soil is completely different from ours. Sky and soil, heaven and earth are mutually open and interact seamlessly. The soil is in contact with the sky. In nature, because material circulation is functioning properly, even if pollutants enter the soil, they cannot accumulate. The process is designed not to have salt accumulation.

What about our fields? The operation of heavy vehicles has compressed the soil. Repeated application of antibiotics, chemical fertilizers, pesticides, and herbicides has left these substances accumulated in the soil. A compacted soil layer is formed. Both heaven and earth are blocked. Roots from crops cannot penetrate through the solid compaction layer (this layer will be explained later). When rain falls, water is trapped by this compacted soil layer. It does not flow down but rather stagnates at a short depth below the surface, slowly evaporates and leaves salt behind. Repeat this a few times and you have salinized soil even when all you have done was allow your field to receive rain. When acid rain evaporates, it leaves behind pollutants and heavy metals in the soil.

What is the root cause of soil salinization? Why is it not so in nature but ubiquitous in our fields? The answer is what is not in nature but is readily found in cultivated areas. The **layer of compacted soil** is the culprit: just dig 15 cm (6 in) down and you will meet this hardened soil. Unless you eliminate this layer, soil salinity will always be a problem and farming will become more and more difficult as the years go by. Now we have learned from nature that to solve the problem of soil salinity, you have to get rid of the compacted soil layer.

Ask nature about the correct method for applying fertilizer

This time let's ask how nature applies fertilizer. As farmers, we know that there are so many different and complicated methods of fertilization. Observe nature's soil and you will see that in autumn, leaves accumulate on top of the ground. Every year leaves pile up and are broken down, making the soil richer and richer by the year. In nature, 3 rules govern fertilizers; fertilizers (leaves and other debris) are: (i) fresh, (ii) fall on the soil surface, and (iii) applied in autumn.

Compare this to what we learn today which steers us in the opposite direction. Proponents of conventional agriculture say if you apply fresh material instead of decomposed material then it will give off harmful gas. They say if you apply fertilizer too early (autumn) or on the surface, nutrients will leach and hence fertilizer efficiency lost. They also say "bad" microorganisms should be kept out of the process.

Yet, the "fresh, surface, autumn" method is a proven one. For thousands of years this was the traditional method of organic farming. For millions of years this was how the forests have become full of life. When fall came, traditional farmers scattered cow dung and other organic matter onto the fields which would break down throughout the winter and would have fertilized the soil by spring. Our ancestors did not need fancy compost bins or engage in arduous "turning" of the compost or calculate the green to brown ratio or worry about mixing oxygen into the heap; but still did excellent farming.

Modern scientific agriculture suggests exactly the opposite: that fertilizer should be "fully fermented" and applied "deep into the soil" in the "spring." This, again, is not for the benefit of farmers. The usual experts espouse that during the entire process of making fertilizer there should be no smell and no maggots should form. The big farming industry sets up difficult and complicated conditions which are impossible to attain by ordinary farmers. This guarantees a robust sale of fertilizer. Since the experts stress that the fertilizer has to go deep, expensive machines have become a farming necessity without which, it is impossible to mix the fertilizer deep into the soil.

I have worked in the field of agriculture for many years; the degree to which our economic structure has transformed technology from that which should be for farmers into that which is entirely for business never fails to shock and dishearten me. Korea has over four thousand years of experience in organic farming but it is being dismissed, denigrated and destroyed.

If the power of the market is left unrestrained, the current high-cost, inefficient system will become so firmly established that it will never be reversed. Manufacturers of inputs and their sales agents will continually conspire to maximize profits.

Ask nature about microorganisms

If you partake in any farming education or workshops, they always teach you the benefits of microorganisms. Businessmen disguised as lecturers come to explain how beneficial their selection of microorganisms is; their workshop always finishes with a promotion of their products. No wonder farming becomes more costly.

Again let's ask the nature about microorganisms. We can see that leaves and other organic matter that were on the soil are slowly decomposed by small animals and microorganisms until everything completely vanishes. On nature's soil, this solid organic substance is decomposed by microorganisms and transformed into liquid form. Why are we interested in microorganisms in the first place? The reason is because we want to emulate nature. Like nature, we want microorganisms to decompose organic material to produce fertilizers that provide nutrients for plants. In nature, wherever a dead plant or animal falls, it decays on the spot without the extra input of microorganisms. Can you not see? "Beneficial" microorganisms are everywhere because "all" microorganisms are beneficial.

As is always the case, nature comes to you and whispers, "I have what you need everywhere. Take all you need." Yes. Take it. That is all you need to do about microorganisms. Take them from nature. Bring them to your fields. The secret is in the soil formed from leaf mold. It is abundant in the hills and fields around our house. Just take it and use it. Leaves have piled up for hundreds of years and decomposed into "black gold." Indigenous microorganisms that have adapted in that environment – environment most similar to your fields hence making the best workers – are teeming in them.

Few years ago, I visited Japan and asked Japanese organic farmers if they were also using a Japanese microorganism product that was making a big hit in Korea. Their answer was simple. They said that that particular microorganism product was made in a hot and humid region of Japan so it was not suitable for their fields. They said they use **microorganisms collected from their local environment.** Microorganism is the input that should not be commercialized be-

One grape tree has an astounding 3,000 fruits on it. One tree is covering 900 sq. meters (nearly 10,000 sq. ft). Deokhyeon Do's organic grape farm in Gochang cause the microorganisms that are effective for the agriculture of a region can only come from that region.

Sometimes there are self-claimed experts who claim that they have a special strain of bacteria that can break down a particular substance. They describe in pedantic languages and show off their patents; whatever they do, their goal is to sell to the farmers. Where did their precious bacteria come from? Since they are not creators, it must have come from the nature. In nature, leaf mold is the best collection of all types of precious bacteria. They are the super-versatile worker. Give them a particular substance and there will be a particular strain that feed on it. Give them beans and bean-decomposers will start working; give them barley and barley-eaters will begin responding. In the leaf mold exist particular strains that can decompose particular proteins, particular fats and particular substances. It is rather easy to obtain the microorganism you need. If you need bean-decomposers, throw beans into the leaf mold.

If you live in an area without mountains or cannot find leaf mold, the second best method is to make artificial "leaf mold." Find a clean, unpolluted space of soil; cover it thick with cut grass; apply water to keep it moist. After some time, you will observe that the soil beneath the grass turns soft. This is sign of indigenous microorganisms propagating. Use this soft soil as starter for microorganism culture. You can see how JADAM method can be used anywhere in the world.

Ask nature about the secret of optimum fertility

What is optimum soil fertility to grow perfect crops? Many farmers wrestle over this issue endlessly. They are always thinking about how to use rice bran, perilla seeds pulp (what is left of perilla seeds after oil is extracted) and press cake as organic fertilizers (these are the most common choices in Korea). Growers also speculate whether they should add blood powder or shell powder or bone powder. Then, just how much should they add? They have asked these questions for the last few decades but still have not found the answer. Growers have the habit of confusing themselves and others. We'd rather ask: why are things getting all the more confusing? This is because you do not have a philosophy, a criterion, a perspective to make sound judgments. Here is my advice: always look at the issue of fertilizer from the **nutritional balance** perspective.

So you heard that organic farming is good. You stacked up your warehouse with environment-friendly products and did your best every year. But still, something does not seem right. Every year your crops suffer from early flowering, chilling and freezing. When spring rain arrives, they produce copious water sprouts. Despite your best efforts, problems continue to plague your fields. Is it the same for nature? Is it so difficult for nature too? Does nature suffer from the same problems as you? When I look at the mountains I see no early flowering, no chill damage, and no frost damage whatsoever. What is more surprising, despite the plentiful amount of organic matter in the soil, when spring rain comes, there are no water sprouts after normal, new sprouting has finished. The answer to optimum soil fertility is, again, in nature.

Nature does not use rice bran, perilla pulp or press cakes in achieving optimum fertility. Then how is it done? Let's look at how the soil that is in contact with tree roots is formed. Leaves fall in autumn. They are the product of photosynthesis of nutrients, water, sunlight and air. Grass and other wild vegetation wither and fall too. This colorful scene that we see every year is how nature acquires the organic fertilizer it needs. Then what about the inorganic nutrients that crops need for growth? If you dig below a tree, you will pass a layer of dark brown, leaf mold soil and reach grains of coarse sand and rock sediments. They will be moist and have a strong "microbe-ish" smell – the microorganisms are working on the rock, breaking it down into mineral nutrients, which are food for the plants. Once again it is surprising how simple yet effective the solution is. This is the secret of nature that frees you from the problems of early flowering, chill and frost damages, and water sprouts caused by excessive nitrogen uptake.

Apply this part of nature's cycle to your soil. All of your **crop residues** should be given back to the soil. Add extra nutrients by providing the soil with **wild grass** and **minerals**. So nature comes again to you and whispers, "Stop thinking of things like rice bran and oil cakes. Just follow me!" True organic farming is not about adding rice bran, perilla pulp or press cakes. Find the correct way in nature and follow it. If you want big fruits and plentiful grains from your crops, then you cannot expect such results by providing fertilizers made from husks, peels, skins and pulp; they are the leftovers from fruits and grains. From the soil, you demand fruits yet you give peels! Farming does not become organic by merely putting in organic matter into your soil. Organic matter comes in all qualities. If you add organic matter that does not have a balanced nutrient composition (such as pulp or husks), the overuse of it will break the nutrient balance in the soil. This in turn will lead to increased incidence of diseases. Creating a nutrient imbalance is in itself a form of soil contamination.

Environment-friendly agriculture is not something you learn only from books. The greatest book and teacher is nature; you have to be an ever-inquisitive student, humble and honest. Learn from nature and "do as nature does." Think this over carefully. Once you accept from your heart that nature is the greatest teacher, then farming will start becoming easy; you will finally understand its secrets. Nature's farming costs almost nothing. Large yields and high quality will all become possible. If this radical change of thinking is not comfortable for you, don't pressure yourself; just relax and have a drink!

2. I and others are one（自他一體）

This concept entails thinking of myself and others, my life and others' lives, as one. In Korean there is an expression: "our body and the soil are one (身土不二)." In English, they say "you are what you eat." My body is from the soil – it comes from water and food that came from the soil. Crops are soil too. Crops, soil, and I are all one. All life forms are the same. If I know myself then I also know you. When I thoroughly understand one Dao ("Way") then I understand millions of other Daos. In chapter 41 of "Dao De Jing (道德經)", Laozi said, "I see the world without going out the door."

My becoming sick and your becoming sick can be perceived through the same lens. Crops are sometimes healthy and sometimes sick. Try to understand them as we understand our bodies. The principle behind "my health" and the "health of soil and crops" are inseparable. Modern humans have so many illnesses afflicting their bodies. Why is this so? People think they are personally helpless against failing health. As a result, they rely more and more on "experts" to determine what is wrong and what should be done. Let's try understanding our own bodies. Let's study ourselves to keep our own health. Typically there are two main reasons why we lose our health. One is bad food. Second is bad blood circulation.

Interestingly, these hold true also in farming. Why are our crops sick? Bad fertilizer and bad circulation are the main culprits. Bad fertilizer is equivalent to bad food. The compost that come from animal manure often contain antibiotics. Chemical fertilizers, pesticides and herbicides poison the soil. Excessive input of nutritionally unbalanced fertilizers – such as press cakes – disrupt the plants' healthy diet. Bad circulation refers to the soil compaction layer that prevents the proper circulation of air, water and nutrients. How do we recover our health? Change our diet to "good" food with balanced nutrition, drink enough water and do exercises to boost circulation. It is the same for farming and for all living forms. Stop the use of bad fertilizers and eliminate the compacted soil layer. Your farming will gain a new momentum. Just like we solve our health problems, use the same approach to solve soil problems.

It is estimated that our bodies have approximately 100 trillion cells. Each cell needs to be provided with nutrients and cleansed of waste every day. To that end, the body is equipped with an extremely sophisticated circulatory system of veins and arteries. Arteries deliver nutrients and oxygen to cells. Veins remove the excretions. The total length of blood vessels in a human body is approximately 96,000 km (60,000 mi) which is longer than two trips around the globe. Blood coming from the heart cycles the body 1,000 times a day. A crucial factor determining the normal function of this circulation is an adequate absorption of water; this is directly linked to our health. You must drink until your urine is no longer yellow. How much water you drink is critical to how much toxins you remove from your system. Drinking water alone will improve your health. Bathing and light walks will further help. The life span of our cells is said to be shorter than six months. Every day 10 billion new cells are born. These cells are made of the water and food we ingest daily. Change water, change food, change your mind; then, your body will change too. This is "natural healing."

This is the same for plants. What you put into the soil has an enormous impact on the formation of new cells in plants. The quality of water and fertilizer will decide the crop's health. Health is not a coincidence; healthy crops do not come to you by chance. 70 percent of the human body is water. For our brains and internal organs, up to 90 percent are made of water. It is safe to say over 70 percent of human health is decided by water. For plants the figures are even higher. Water takes up around 95 percent of a plant's structure. Just like humans have to choose good water for optimum health, you must give good water to your crops. Water is the starting point of all health. It is advisable that you drink mineral water (spring water) rather than purified water. Most of the purified water that is filtered from tap water cannot sustain the life of fish. Water where fish cannot live cannot be good for your health. For farming, I strongly suggest you use JADAM mineral water.

Next most important to water is a **balanced diet**. For crops, that means balanced fertilizer application. We often overlook the importance of balance. Eating food with unbalanced nutrition is bad for human health. The same holds true for plants. What is nutritional balance? Simply put, it is the balance between organic and inorganic nutrients. How do we achieve balance? Eat peel and fruit together; this is a simple and easy way of seizing the balance of nutrients designed by nature. Humans are used to eating fruits only and discarding the skin. We take the kernel but not the husk. We polish rice to strip the skin (bran) off and eat "white" rice. We peel off the skin of fruits and eat the inside. This harmless looking act is in fact a major threat to human health. The peel (husk) actually is full of inorganic nutrients and vitamins.

After Koreans chose to eat only white rice and discard the bran, disease figures began to rise. We were eating too much carbohydrates which made us susceptible to diseases. Our bodies will release calcium from the bones to correct chemical imbalance of the system caused by too much sugar, which in turn results in an increase of osteoporosis. This then is a direct cause of diabetes. Eat fruit with its skin. Eat kernels with their bran. This is a powerful way to free us from disease. Stop eating white rice and change to brown rice. Eat a few kinds of different green vegetables. Eat fruit without peeling it. The same rule applies in farming.

Actually, modern organic farming has been going in the opposite direction of the human diet. Humans eat too much of the inner part (fruit) and not enough of the outer part (skin). But in farming, we are applying too much outer-part fertilizer. The result is equally bad in that the result is unbalanced nutrition. Upsetting the balance is a cause for unhealthy soil. Rice bran, perilla pulp and press cakes are all skin or peel-type fertilizers. They should not be the main fertilizer because they are not balanced in nutrition. Consequently, they

A pear tree nearly a century old has as many pears as young trees. This is the result of soil management using microorganisms. Gwangik Gim's pear farm in Anseong.

have a clear limit in their ability to revive the soil and feed the crops.

Think more of "body farming" (the maintenance of your body's health) and crop farming as sharing a common principle. Farming technology should not be designed for different life forms disparate from our own. Understand body farming thoroughly and then you will understand crop farming. My health and crop health are one. Farming is no longer separable from my life; it is in me, inseparable. How I farm is how I live. My contemplation of farming and my findings over the years have coalesced into my philosophy of life. At last, I have become the master of my farming. Over the decades I was fascinated by the idea that The Dao (way) of farming and The Dao of life are one. This is why farmers are called the "great root of the world" (*famous Korean saying).

Free lunch programs using organic agricultural products have become available in schools throughout Korea, which is a very good sign. This is giving a boost to organic farmers. However one thing that remains to be improved is that schools have accepted white rice as the main staple. Say no to white rice; this must be replaced with brown rice plus mixed grains. Many people, especially kids don't like brown rice and other tough grains because of the coarse texture; however, taste can be improved by finding a good ratio between the ingredients. Eating organic produce alone does not guarantee health since nutritional balance is also essential. Dr. Qi Sun of the Harvard School of Public Health reviewed four research papers that studied 350,000 people in China, Japan, Australia and the US for 4 to 22 years and concluded that white rice is a direct cause of diabetes.

A reduction in medical expenses will be essential in maintaining a sound national budget. I suggest that the following can drastically reduce medical expenses: first, make brown rice and mixed grains the staple food. People will be able to intake various nutrients through this diet, thereby eating less and also having less desire for meat. Bodies will then be revitalized. Second, replace toothpaste with sun-dried sea salt. This will prevent most gum disease. People can feel their gums getting healthier in several weeks. Lightly wet the toothbrush and apply a small amount of salt. Brush as normal. Third, drink lots of water – until the urine turns clear. Water is a core factor for healing. Sufficient intake of water can heal most diseases. It is crucial to the health of the circulatory system. Just these three changes can prevent most modern diseases and reduce health costs drastically. Indifference to preventive measures, and focusing only on prescription medicines will threaten both our health and our nation in the long term. These small steps can certainly change the world.

Is there any country that has more clinics and hospitals than Korea? The number of hospitals and doctors keep increasing but strangely the number of patients also keeps increasing. Something must be wrong. Failure in agricultural policies and health policies are one. The government has unconscionably forsaken prevention in favor of prescription. People's health and the nation's finances have become victims of commercialized medicine and the pharmaceutical industry.

I have come from soil and to soil I will return. Let's look at plants as I look at myself. That is not too difficult. I do not need rocket-science to do that. I can feel others and help them. I will become sick when the nutritional balance of my body is disrupted. Plants will be diseased when the soil loses its nutritional balance. The recognition that body farming and crop farming are one will guide you to a completely new world of farming.

3. The good and the bad are one（聖俗一如）

"The good and the bad are one" can be used to mean that what is sacred (religious) and what is secular are one and inseparable. It can further mean that good and bad, right and wrong, good and evil, heaven and hell are actually one. The inference is that there is no absolute value in this world. It negates the dualistic, separate view of light vs. darkness or good vs. evil. If you understand this thoroughly, you will part from many of the philosophical and religious values that are based on dualism. Dualism means that there are two independent and different forces that form the world. The opposite, monism would say that "the good and the bad are one."

"The good and the bad are one" principle is more familiar to us than we think. We know that "too much medicine (good) is poison (evil); a little poison (evil), however, can be medicine (good)." Look around nature and this rule holds true. Among the 118 elements that exist on earth, heavy metals are usually harmful to humans but even they are not exception to this rule.

Oxygen is a necessity for sustaining life but if you intake excessively, active oxygen will form in the course of metabolism which may inflict serious damage on your cells. Water is an absolute need for plants but too much will drown them. Anything that is good will turn bad if not applied in the appropriate amount. This holds true for everything. Soil nematodes are not always bad, as adequate number of them helps maintain soil health. Ladybugs are not always good; too many and they will become pests. A moderate number of apple snails in rice paddies control weeds but when they over-populate, they become a nuisance. This pattern is seen everywhere in the wild. No life can be labeled good or evil; this is the mystery of life. Do not look at nature through the lens of dualism – labeling this as good and that as evil. Look at nature with the view that "the good and the bad are one."

Sadly, humans like to look at the world through the eyes of dualism. People prefer to draw a line between good and evil, not knowing that such line does not exist beyond their concepts. This division of good and bad has always been behind the history of human kind. Wars between religions and nations never went on without labeling "us" as good and "them" as evil. Tyrannies in the world use dualism to support their power. Separation of good and evil has an inherent nature of justifying war and violence.

The same thing is happening in agriculture. Suppliers of various products such as pesticide, fertilizer, microorganisms, etc. are all touting them as the answers in the battle between light and darkness, good and evil, and beneficial and harmful. This dualistic way of thinking has entered deep into the minds of the farmers, causing serious and profound harm. Almost always, what is labeled good is what is in the corporation's hands. Whatever farmers make for themselves is labeled bad, risky, unscientific and uncertain. Science is always introduced to provide stronger logic and evidence to support the corporation's claims. What we are seeing is the victory of dualistic farming over monistic farming. Our ancestors have farmed for thousands of years based on the thought that the good and the bad are one, that there cannot be a "good" life and an "evil" life.

Technology is rooted on philosophy. If the way of thinking that provides the foundation for the technology is undermined, then it can no longer stand on its own. Technology is not in itself objective; it is dependent on a system of thoughts, set of values, and view of the world. Technology is like a backbone; it cannot stand without the muscles – the philosophy. Those who have studied modern science and imbibed Western thoughts have become recognized as the true "experts." As they rose in their status and influence, our traditional farming came to be regarded as something obsolete, unscientific, and unverified. In reality, its efficacy has been proven over millennia. Despite this track record, "organic farming" has been taken from the hands of farmers. In a bizarre twist, farmers are no longer experts at farming.

The current group of experts are negating the value of our traditional method of farming. The weapon they use is the dualistic view of dividing good and bad. This philosophy itself has to be overcome if we are to bring farming back to the farmers. It is not simply a matter of skill, methodology or technology. Traditionally microorganisms, compost, and liquid fertilizer were all made by farmers. This was standard practice for thousands of years. Now this traditional knowledge is labeled "unscientific" and farmers have been pressured to give it up and forget all about it. What do farmers make for themselves now? They are deprived of farming tools, methods of farming and finally of confidence in farming.

Dualism was the preferred philosophy of the corporations; it would not be coincidental that it was also supported by science and backed by the government. Proponents kept parroting that "traditional microorganisms, liquid fertilizer, and compost are not verified scientifically," eventually, farmers believed the lies and gave in. Only 40 or 50 years ago, everything was still in the hands of the farmers. Sadly, this is no longer the case.

What is science? Science is not an objective and unchanging entity; it is a constantly changing thing. Science seeks the truth but it is not independent from society. Where does the funding come from that supports scientific research? What kind of researches and research results do the financial supporters prefer? Is there objectivity here? The global trend is that research funded by governments is decreasing and more is being delegated to the private sector. There is less and less room for studies that serve the public interest.

The fall of Korean traditional farming began with the introduction of Western thoughts (epistemology). We were helpless against the powerful influx of Western influence. In our pursuit of modernization and industrialization, we voluntarily admitted the superiority of Western culture. This trend, combined with the emergence of group of corporations that sought profit in the sales of agricultural inputs, systematically destroyed our traditional farming. I cannot stress enough the importance of philosophy over technology.

The type of organic farming we are learning and incorporating today is not ours. Organic farming that is popular worldwide is not something we had been doing; nor is it objective or innocent. It is completely alien to our traditional philosophy of "the good and the bad are one," which JADAM is trying to bring back. I have searched worldwide and examined the various agricultural systems and have finally concluded that the traditional Korean method is the best. Korea will have to open its agricultural market to global competition. Cheap and good produce will inundate the Korean market. We will face competition as never before. Our farming is currently one of the least competitive in the world: labor is expensive, costs are high, the mechanization rate is low, large-scale farming is not easy and brand power is low. What we need the most is ultra-low-cost agriculture, and the key to ultra-low-cost lies in our traditional farming. High quality, high yield and low cost are every farmer's dream. Answer to these all lie in our traditional farming.

I wish we would stop hailing Albert Howard, Rudolf Steiner and J. I. Rodale as the "founders" of organic farming. How can organic farming have been "founded" in the 1920s and 30s? This is a total neglect of our long-standing tradition. Regrettably, few people question this inaccurate version of history. *Fan Sheng Zhi Shu* ("The Book of Fan Sheng Zhi") clearly explains the ancient farming of China at the end of the Western Han Dynasty (206 BCE – 8 CE). *Ji Min Yao Shu* ("Important Arts for the People's Welfare"), a book on comprehensive Chinese farming, was written around 530 CE. In Korea (Joseon Dynasty), during the eleventh year of King Sejong's reign (1429 CE), the book *Nong Sa Jik Seol* ("Straight Talk about Farming") was written. All these times there were no chemical fertilizers or pesticides. It was a world with zero pollution; organic farming was practiced in its purest form.

In 2333 BCE, the first Korean state of Gojoseon was established. The found-

This persimmon farm has been practicing cover crop method with rye and hairy vetch for nearly 20 years. These fruits rank as number one in Korea. Jaegwan Yu's farm in Hadong.

ing of a state meant an establishment of a taxation system. There was something to tax: agricultural produce. Gojoseon's ancient law ("the Eight Prohibitions") states that those who injure others should compensate with grain. What was agriculture like at that time? There is a very interesting book vividly illustrating the agriculture of Asia before the advent of modern Western agriculture. Franklin Hiram King, chief of the Division of Soil Management, Bureau of Soils, US Department of Agriculture wrote "Farmers of Forty Centuries, or Permanent Agriculture in China, Korea and Japan" after visiting those countries in 1909. It is a good book that summarizes and explains the agriculture of Asia at that time. If you read this book, you will realize that the famous Masanobu Fukuoka's farming method is nothing new. King was deeply shocked to witness farming methods practiced in Asia. He bitterly criticized European and American farming methods which contaminated, exploited and destroyed soil in less than 100 years. He recognized that the true founders of organic farming were China, Korea and Japan and stressed that the West should learn the oriental farming methods. King considered Korea's traditional farming method as the best. It is still remembered by those older than 50. Agriculture is the vital foundation for the existence of a nation and its people. Unless Korea breaks from the high-cost structure that relies on purchased agricultural inputs, its agriculture might collapse as it opens the market to foreign produce.

I have critical thoughts about modern agriculture. I do not believe discussion on technology alone is enough; philosophy has to come before that. We need to restore the view that "the good and the bad are one." Only when our agriculture stands on this recognition will ultra-low-cost farming be possible.

Bacteria which independently produce nutrients through carbon assimilation using light are called photosynthetic bacteria. This microorganism is one of the most popular "beneficial" microbes. It is tempting for us to simply think that if we put these bacteria into our soil then there will be no need to apply organic fertilizer. However, this notion must be tempered by the recurring principle that "the good and the bad are one." In other words, **too much of them and they will cause harm.** There is no way for us to control the proper level. Bacteria that independently make nutrients by fixing nitrogen from the air are called nitrogen-fixing bacteria. They are also a very well-known type of beneficial microbe. Farmers think that if they just put that strain into the soil then there will be no need for nitrogen fertilizers. But again, too much of them and they will turn into poison. Say you heard human manure is good for your soil; would you fill up your field with it? JADAM believes that the power of microorganisms lies in their diversity and indigenousness. Conversely, the agriculture of today prefers to use microorganisms selectively. People think that organic farming is about putting in beneficial bacteria as much as possible into the soil. Such "good" bacteria include yeast, lactobacillus, actinobacteria, hay bacillus and bacillus natto.

Over 99 percent of soil microorganisms are unknown to us. This is not a vague guess. It is a reliable figure that can be construed because less than 1 percent of microorganisms can be cultured by technology used by modern science. This means that whatever is sold on the market can at best represent one percent of the total species of microorganisms. What is sold has to be less than one percent because they are the ones that can be put into product form. So even though companies might tout their product as being "good" bacteria, it can only represent a fraction of the total diversity available in nature. This is where modern science is at. As for bacteria that are teeming in the soil, we can barely identify their outer shapes, let alone their internal structure, even with the most powerful electron microscopes. What is more, we know almost nothing about the relationship between the different species of microorganisms. It is also noted that science's advancement cannot keep pace with the evolution of microorganisms.

JADAM has strongly insisted on the use of leaf mold which is an absolute treasure trove of microorganisms. All sorts of microorganisms including protozoa, algae, mold, fungi, bacteria and viruses exist in it. If you use leaf mold as a starter for your home-made microbial input, I can guarantee that the effect will not be less than commercial ones. The information on the internet and other sources would give the impression that if you just put in good microorganisms, your farming will be a great success. Again, you have to see microorganisms from the perspective of "the good and the bad are one." Too much of a good thing will end up being a bad thing.

It might sound more scientific and advanced if one was to claim that one can selectively use the good microbes and exclude the bad ones. This in fact only disrupts the balance of soil nutrition which can lead to increased disease in crops. You should not use microorganisms selectively because change in microorganism composition leads directly to change in nutrients. **Microorganisms mean nutrients**. The substances microbes produce are food for crops. That is why the principle of "the good and the bad are one" holds true not only for microorganisms but also for nutrients. It is easy to believe that some substances – calcium, phosphate, germanium, selenium, silicate, etc. – are "good" so putting them in your soil is good. But organic farming is not this simple. You will never succeed in farming with this method of "selecting the good and putting it in."

"The good and the bad are one" has an important implication for the technical aspect of farming. It tells us to find the "balance" instead of tilting to either good or bad. If you do not know the importance of balance in farming, you know nothing. This is the same in human health where balance is the key to well-being. What do I mean by balance? There are two types. One is the balance of microorganisms. There should be a **wide variety and abundance** of microorganisms. Second is the balance of fertilizers. Fertilizer that you apply should be balanced in its nutrients so that it gives the best food for the microorganisms. "Underground optimization" is the JADAM's name for soil management strategy employing these two balances. If we add "aboveground optimization" then we have a complete system of growing crops.

Then how do we achieve this "balance of microorganisms" and "balance of fertilization"? This might look difficult but in fact I have already provided the answer in the Chapter "Do as Nature Does." To achieve "balance of microorganisms" the answer is to "take it (leaf mold)" from local mountains. To achieve the ideal "balance of fertilizer" simply "follow nature (fresh, surface, autumn)." Imagine Mother Nature whispering to you, "follow me." These "take it" and "follow me" tenets clearly explain the core principles in soil management. This approach will bring high quality and yield – what all farmers strive for. Leaf mold contains indigenous microorganisms that are most similar to the ones in the soil in your field. These microbes have been living in an environment similar to your field for thousands of years. If you use leaf mold, "balance of microorganisms" will be easily achieved. So "take it" from the mountains. If you just copy nature – how it applies fertilizer – then you will also achieve "balance of fertilization." So just "follow it."

You may be disappointed with my conclusion of "take it" and "follow nature" for being too simple after the long-winded explanation of "SESE." But is not easy so much better? Natural farming should be easy because, after all, it is the nature doing the work for you. Farm like nature, smooth and easy like the flow of water. Once you are comfortable with the simple yet powerful world of JADAM farming, you will never look back! There is a fine line between how nature farms and how I farm. Nature grows non-commercial plants of all kinds; I choose to grow money crops. They are basically the same in that both involve growing plants. But remember that nature is millions of times older than any person and has trillions of more experiences. Learn from her!

What better teacher than nature? Organic farming is to respect nature as the best teacher: "Do as nature does." Observe your own body and extend your insight outwards because "I and others are one." Walk the middle way of farming without tilting toward any imbalances because "the good and the bad are one."

The meaning of "the good and the bad are one" is comparable to the concept of the "Middle Way" ("中庸", also translated "Doctrine of the Mean") of Confucianism. It is living your life in a blameless and flawless manner, without imbalances, without excess or want. To follow this path of wisdom, we must cleanse ourselves of our pre-existing ideas and knowledge first. The way of life, the way of farming, and the way of nature all come together as one. A true farmer is qualified as a sage. Walking the path of farming is no different from walking the path of a noble life.

A farmer who walks the Middle Way will be always mindful and not become attached to something good; s/he will also not blindly reject something labeled bad. S/he does not depart from the Middle Way, a healthy dynamic balance. When s/he comes across a new fertilizer that everybody hails as full of nutrients, s/he will not lose caution of the potential danger of overusing it. This wise farmer is aware that too much of any "good" thing will be "bad"; and will always be on the Middle Way. As this farmer ages, s/he gains more wisdom from farming; that wisdom penetrates through all other facets of life. Knowledge in farming directly becomes knowledge of life.

Cover crop method dramatically improves soil quality.

4. Co-existing with wild grass

It is high time to seek a symbiosis with wild grass, or weeds. If we do not succeed in transforming our relationship with wild grass into a symbiotic one, farming will be forever a pain. It is about time we do away with our flawed and partial understanding: that weeds absorb all the water and nutrients that should go to the crop and that weeds cause diseases. Not that this understanding is wrong per se. It could be true in the short-term like one or two years. But observe four or five years; then the result will be different. You will find that when there is wild grass on your soil, it will be much moister, more fertile and have less disease. These are the findings of recent studies.

The ground is already covered with green before leaves of persimmon trees have fallen. This is cover crop method using hairy vetches and oats. (Mr Sangchae Ra's farm in Damyang)

There is no grass on the ground of the orchard. Consequently, early flowering and chilling/freezing injuries are frequent because, soil being bare, its temperature fluctuates.

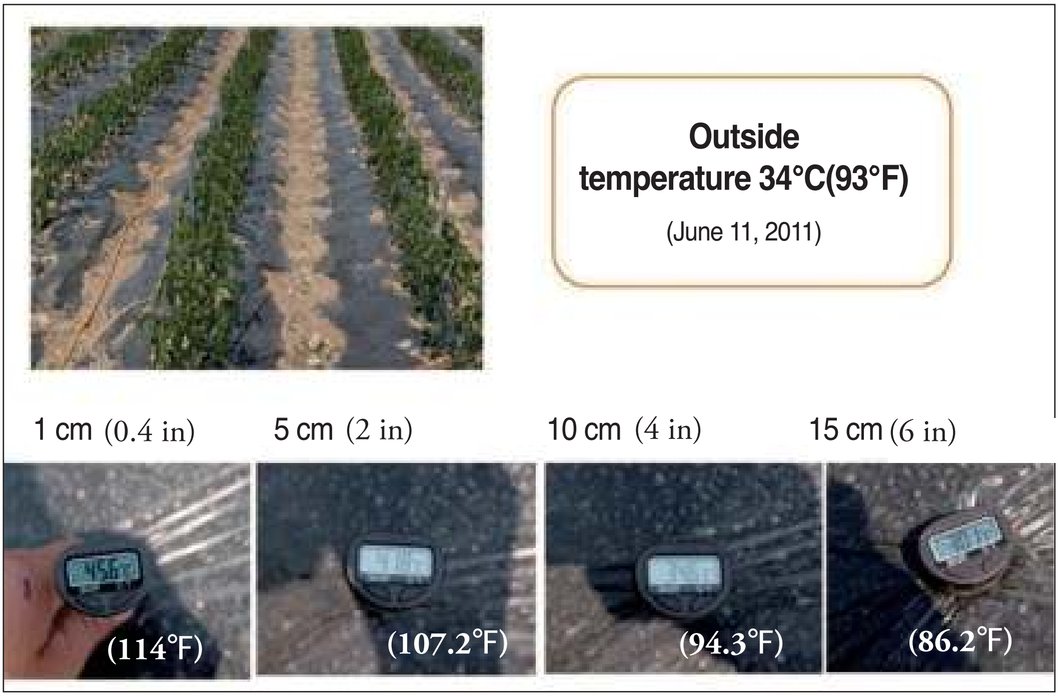
There are serious technical problems which have recently arisen due to global warming: "early flowering" of fruit trees because of rapid rise in temperature in the spring; "freezing and chilling damage" because of rapid temperature drop in winter or spring; and "very high soil temperature" because of the continued ultra-high temperature period in the summer. In addition, frequent rain from the spring worsens leaching of soil nutrients, thereby stunting growth and weakening flower buds. Global warming has made farming much more difficult. It is not like in the old days when one-time fertilization lasted through to fall. The key to solving these problems is to seek a "co-existence with wild grass" and use them as cover crop. Maximize the benefits of symbiosis then you will overcome the above problems. Abundant organic matter that the wild grass provides plays a vital role in preventing leaching of soil nutrients.


Many farms nowadays use black plastic to suppress weeds. But farming will never succeed without a healthy soil.

Cover crop prevents "early flowering"

Why are fruit trees across the country suffering from early flowering? The reason is because temperature in the spring rises much faster than it did in the past. The sizzling sun that starts in spring heats the earth. Then roots of fruit trees think that summer is coming and flower in a hurry. This results in poor quality pollen which leads to poor pollination. The fruit farms suffer losses. Everybody is struggling to overcome the problem of early flowering. But it can be solved simply by growing cover crop. As usual, the solution does not lie in something complex and difficult. Wisdom in farming always begins with something easy and simple.

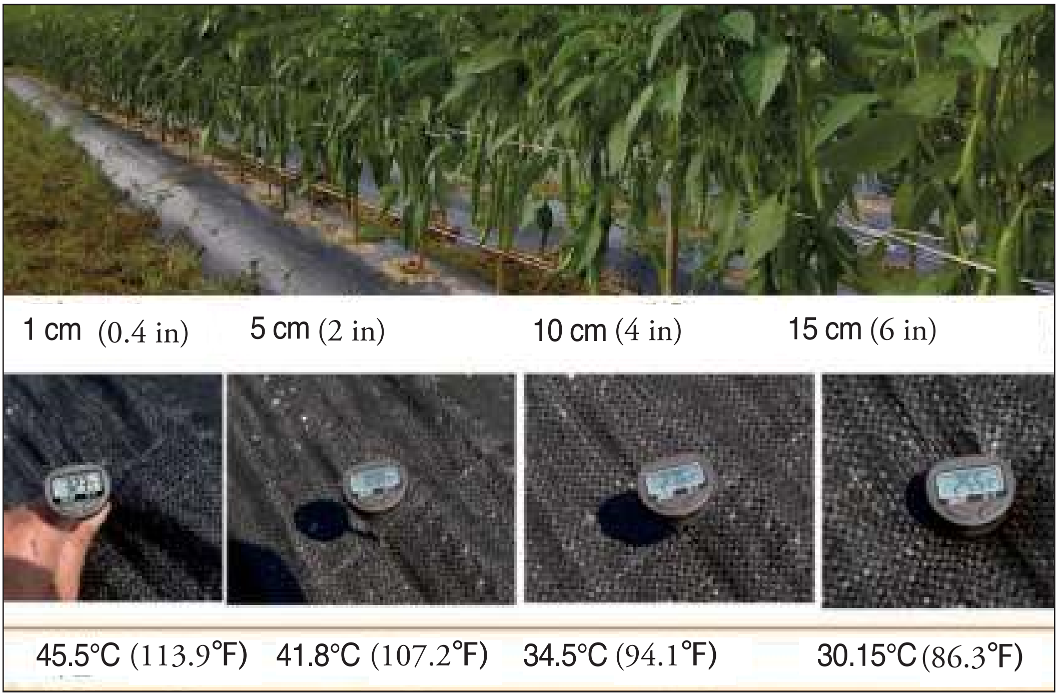
Try this method: around October before the fruit trees drop their leaves, sow grass seeds in the field. Grass will sprout before the leaves fall, so that once leaves fall, they will be caught in between the grass. The leaves are the essence of all nu-



I measured the temperature of the soil in different depths inside the black plastic mulch at 2pm in a day in early spring. It is extremely hot. What makes it worse is that after sunset the temperature will drop to below 10 degrees Celsius. The soil temperature continues to experience rapid rises and falls

trients sucked up from deep inside the soil by trees for one year. If you have grass to trap the leaves, you will not lose this precious source of nutrients. If the orchard is without grass, fallen leaves – the essence of nutrition – will be blown away. Do not forget that this is a tremendous loss of nutrition. Most fallen leaves fixed by grass will be broken down by soil macro/micro fauna and microorganisms in one year and go back into the soil.

Your orchard will be totally green before winter comes. When the ground thaws after winter, the grass will grow even taller and cover the bottom of the whole orchard. The grass will also protect the soil from the glaring spring sun, keeping the soil warm but not too hot. This leads to a smooth rise in temperature as the season progresses. This is how you address the problem of early flow-



Temperature measured at the same time on the same day for weed mats (above). Compared to the plastic (below), temperature rise was much smaller in weed mats. Weed mats have small holes that allow the passage of air; hot air does not stay. It is UV-coated and can be used for 5 years

ering. You will be able to see that the orchards that do not grow grass will suffer from early flowering whereas those with grass will not. Cover crop grass cultivation not only provides soil with organic matter but also prevents early flowering.

Cover crop prevents chilling and freezing damages

Incidences of chilling and freezing damage surge because of erratic changes in the weather patterns caused by global warming. People normally blame nature, but it is human activity that caused the climate change and the suffering that arose from it. How shall we address the chilling and freezing problem? Chilling or freezing means that trees have been damaged or killed by a sudden cold. You will be inspired by looking at how a tree grows. The tree is taking a "lower-body bath." Their lower part is in the soil and their upper part is outside. We know that even in winter, we don't feel cold if we immerse only our lower-body in warm water. So the water for us is the soil for the tree. That means the soil temperature becomes vitally important. This is the key to solving chilling and freezing damage. What is important is the temperature of the soil layer where the roots of our crop are located. Then what determines the temperature of the soil where the roots are?

Again, look at nature. Find a leaf mold in adjacent mountains and see whether it freezes in winter. It almost always stays unfrozen. That is partly because it is covered by organic matter but more importantly because the microbial activity in the leaf mold raises its temperature. Soil temperature is affected by the temperature of the microorganisms. Cover crop cultivation raises soil temperature. Grass provides plenty of nutrition and air to the ground, increasing the number of microorganisms in it. This in turn results in a rise in soil temperature that allows crops to endure the winter without chilling and freezing damage.

I measured the temperature of the soil in different depths inside the black plastic mulch at 2pm in a day in early spring. It was extremely hot. What makes it worse is that after sunset the temperature will drop to below 10 degrees Celsius (50℉). The soil temperature continues to experience rapid rises and falls.

A rise in soil temperature allows roots of fruit trees to continue absorption of nutrients; the wood sap continues to flow smoothly. As a result, sugar content (Brix) of sap increases which in turn raises the freezing point of the sap. This is how the tree equips itself physically against chilling and freezing. Cover crop cultivation is certainly conducive to getting trees prepared for winter conditions. I will explain more about autumn-winter-spring cover crop method later.

Cover crop suppresses soil-overheating in summer

When the soil temperature reaches 40°C (104℉), most crop roots stop to function. How hot is it beneath the black plastic mulch in summer? Loot at the picture. Just a few hours after the ambient temperature hit 34°C (93℉), the temperature of the top 1 cm (0.4 in) layer of the soil rose to a staggering 45°C (113℉). Dig deeper to 15 cm (6 in)-depth but still the temperature is above 30°C (86℉). And, this is in early June – not even summer!

Many farmers use black plastic mulch. This is quite effective in keeping weeds out. It also helps the crops in their early growth stage because it keeps the soil warm and holds moisture and nutrients. But that is until early spring. When the hot season begins, things are completely different. The plastic sheet chokes the roots and drives the plants to ill health. It's like being locked up in a black car. They have to live in it for five months: from June to October. Remember that I said repeatedly that "I and others are one." In this condition, I (human) will not be able to stand for just 10 minutes. The temperature shoots up to 45°C (113℉) in the daytime and plummets down to 15°C (59℉) at night. In the middle of summer, when there are "tropical nights" phenomena, the soil temperature raised during the day stays high throughout the night.

Modern farming is highly flawed from the basics. The cause for failure in farming does not lie in something very complicated or sophisticated. Observe with a loving eye and think with common sense. What do you expect from crop growth when the roots are tortured with heat? Put yourself in the crops' shoes (or roots, should I say). Remember that "I and others are one." Look at the fields, do you not see the desperate struggle of plants? Farming has lost its direction. Soil is suffering from compaction, suffocation and contamination. Roots are left to grow in hideous conditions. Farmers, who should be their loving carers, are ignorant of their plants' suffering. When they are not happy with crops' growth, they start applying chemical fertilizer, herbicide and pesticide. Strangely, it is almost as if current farming practices are inviting disease so that the business can sell more products. Suppliers are the winners but the farmers and soil are the losers. Farming has to go back to its roots.

The best method to control soil temperature and suppress weeds is to mulch the field with hay or plant materials. But this traditional method might prove difficult over too large an area. You might be forced to rely on the convenience of plastic mulching. You can also consider the use of weed mats for a smaller scale. They are good for keeping a steady soil temperature and keeping weeds at bay. The mat has small holes that lets hot air through; it does not raise the soil temperature that much. It also has the advantage of being able to apply water and liquid fertilizer onto the mat. It can be used for about 5 years compared to plastic that are good only for a year.

This is how you grow pepper when you are not interested in health of its roots but only in money. These plants will not survive after autumn.

Here, Mr. Kim secured enough space between the rows and planted hairy vetch to seek symbiosis with wild grass. This gives much higher yield. (Mr. Yongsan Kim, Taean)

I am not completely against plastic mulching. However, you have to use it wisely. As shown in the picture, when the hot season begins, make holes on the left and right sides and at the top of the plastic mulch to prevent sharp temperature rises. Also do not block the hole where a nursery plant is planted. It is a good idea to intentionally grow grass in the furrow to fight the super-high heat during the hot season. If you have grass in the furrow it substantially lowers soil temperature and consequentially helps the roots continue absorb nutrients throughout the hot season. This symbiosis with wild grass even reduces the incidence of pests and diseases. Leave ample space between crop rows so that the grass growing in between the rows will not compete with the crops for water and nutrients. Basically, you will be cutting the grass and covering the soil 3 times a year. That way you can succeed in soil temperature management. Use a sickle for small fields; for bigger plots, use a mower. Cut 5 cm (2 in) high; go straight and don't worry about some parts that are not cut. 2-3 hours of work and you will be able to cut a few acres. Trying to be perfect; trying to cut every single grass will make you tired and rob you of your will to farm. Some remaining uncut grass is even useful. The reason why JADAM suggests leaving 5 cm (2 in) of grass is because they help stop the spread of aphids and mites. Do not hand pull weeds as that farming is just too damn exhausting!


If you have to use plastic mulch, give full attention to the temperature problem. Make holes in the left, right and top parts to prevent temperature rise.

Temperature management is the key to success in summer farming. To keep temperature preferred by the crops, you have to use cover crop. If you succeed in temperature management, you will get big yields because during the summer, crops' roots will keep growing and prosper in the favorable condition. Stronger and vigorous roots mean stronger resistance against pests and diseases. Remember: big yield comes from big roots; big roots come from good soil temperature management. Take the grass along with you in your farming.


Mr. Park shifts weed mats from one place to another. This is an easy way to suppress weeds and yet keep the soil healthy. (Mr. Ilju Park, Damyang)

Cover crop mitigates soil compaction and increases mineral content

Grow a few different kinds of grass in your orchard. Cut them down two or three times from spring to autumn and they will turn into excellent fertilizer. This method will increase both the organic and inorganic (mineral) content of the soil. Wild grass with vigorous growth will stretch roots deep into the earth – more than 1.5 times the above-ground height – and pull up the minerals from deep down. The roots eventually diversify the mineral content of the surface soil and make it available for crops. For example, the root of rye will penetrate two to three meters (7-10 ft) below the surface, enriching deep soil with organic matter and pulling up inorganic nutrients from the same sub-sphere. Such powerful root activity will ease soil compaction.

Many say that weed control is the greatest challenge in organic farming. This is too simple a conclusion. It is derived from too simple a view of looking at wild grass only as a competitor of crops. Controlling weeds might require more labor but you must remember that there are more benefits from symbiosis with wild grass. If you start to treat grass as enemy, your farming will become very, very painful. Let your crops grow together with them; it is more natural, healthy and beautiful. Grass is not your enemy; it is your partner. Nature clearly demonstrates this.

Rye was broadcasted in autumn; by the time persimmon starts to sprout, the rye will cover the whole field. It provides 20 tons (44,000 lb) of organic matter for 0.1 ha (1/4 ac). Jaegwan Yu's farm in Hadong.

Part III.

Soil Management

"The truth is that the vast majority of bacterial types remain completely unknown, with no name and no hint of the means needed to detect them."

Edward Wilson

Photo: Youngsang Cho

Conventional farming cannot solve the problem of soil compaction.
You might be frustrated by this fact, but nothing can be clearer: continuing conventional agriculture and bringing back life to soil are not compatible

1. The current state of our soil

Soil contaminated by antibiotics, chemical pesticides and fertilizers

According to Ministry of Food and Drug Safety (Korea) and Organization for Economic Co-operation and Development (OECD), Korea is classified as heavy-user country in terms of antibiotics for livestock, and pesticide and chemical fertilizer for crops. Major Asian countries are similar. Antibiotics, synthetic pesticide and fertilizers have seriously degraded the soil. Roots of all types of crops have great difficulty settling in the soil. But agricultural policy promoting the use of chemical fertilizer and pesticide does not change. Some renowned agricultural experts and columnists defend conventional chemical agriculture and launch attacks on organic farming citing various reasons. How can they be not concerned about the chemicals poured into the soil and their impact?

Soil degradation is global; it is fast bringing the death of agriculture. Agriculture should look one hundred years into the future. Conventional farming simply is not sustainable. Any farming that degrades soil will destroy the future of farming. Soil contamination is linked to human contamination. If soil is diseased, so will humans. If soil dies, so will we. We must change the current chemical-intensive farming. Stop using toxic substances!

Chemicals accumulate in surface soil due to soil compaction

If antibiotics, chemical pesticides, herbicides and fertilizers that are used every year were diffused and decomposed in soil, the problem would not be as serious. Unfortunately, the fact is that they actually accumulate in the 15 cm (6 in) belt below the surface because of a layer of compacted soil. Use of heavy machinery is a direct cause of soil compaction. Tractors are the main culprit. The heavy wheels of a tractor press down on the soil and their effect can be measured as deep as 7 meters (23 ft). Repeated use of heavy vehicles turns the soil layer at 15 cm (6 in) depth rock-hard. Because of this compacted soil layer, the agricultural chemicals cannot penetrate deep into the soil and enter a break-down cycle. Instead they will linger at the 15 cm (6 in) sub-surface level after water has evaporated. This residue is highly detrimental to crop roots. JADAM recommends you to stop using heavy tractors but use light vehicles instead and minimize the use of chemical material. Come down from the heavy machines. If you have to use tractors, then take the extra care so that the wheels will not run over crop-growing area.

What is visible (crop aboveground) represents the invisible (root condition)

Elderly people will remember that just a few decades ago it was common to grow pepper and harvest until the autumn frost. The farmers of old days did not have microorganism products, synthetic fertilizers or get education on scientific pepper cultivation like their modern counterparts, however, they easily grew wonderful peppers. Today, farmers have an abundance of products to choose from; they have abundant opportunities to get education. Ironically, not many farmers nowadays manage to grow and harvest pepper until the frost. The situation has become such that some farmers would say that pepper is the most difficult crop to grow on open fields. But for our ancestors, pepper was one of the easiest. Why did it become like so? Is it because canker and other soil-borne disease became rampant? Then, we must ask again, why did it become rampant? **The root cause is in the roots.** Root of peppers are not settling properly into the soil. In the past, peppers would grow so robust that farmers could not pull it out with hands; they had to use sickles to chop them down. Now, a small tug will pull the pepper roots out of the soil right away. 30-40 years ago, pepper plants used to extend their roots 1.5 m (5 ft) into the soil.

You can judge the quality of the soil by looking at how the crop roots are doing in it. In good soil, the root extends wide and deep; this guarantees high yield and high quality. It is common sense – if roots settle well with increased surface area, more water and nutrients become available for the crop. Somehow in modern agriculture, soil management became a question of "what fertilizer should I put in?" This view promotes the sales of fertilizers and similar products; but fundamentally soil management is much more than that.

Only a healthy, sustainable and back-to-the-basics mode of farming that tends to the roots and the soil can survive the age of climate change. Super-high temperature and abnormal rainfall are posing significant challenges to farming. Instead of expecting and relying on technological break-through, let us go back to the basics of farming. Farming starts with soil management.

Chinese cabbage farming has also become difficult. The problem is the same. Roots show the same coiling as the pepper.

If you continue to use factory-produced livestock manure containing antibiotics, chemical fertilizer and pesticide, soil contamination will get worse, productivity will drop and farming will become increasingly difficult. It has become a norm to use hormones and antibiotics in raising animals. Excrements from these

Now most peppers' roots are coiled up. These roots were desperate to stay in the nursery soil. Pepper farming has become difficult because of soil degradation.

animals are turned into manure and supplied to farms. The price is very cheap because of government support. When antibiotics build up in the soil, they destroy the microorganisms. This leads to further hardening of soil. Any form of farming should be judged based on its **ability to sustain production**. It is a compromising of our future to continue this form of farming that contaminates the soil with chemicals.

Supported by the US Department of Agriculture (USDA), scientists from the University of Minnesota conducted a study into whether crops grown

Crystalized chemicals are clearly observable. They come from continued application of chemical fertilizer, pesticide, herbicide, etc. on top of a hardened layer of compacted soil. The plow pan is formed by use of heavy machines. (Photo: Jim Richardson) with compost containing antibiotics accumulate the chemical within their tissue. The observation was that the antibiotics do move into the plants and the concentrations became higher as the use of manure increased. In particular, root vegetables such as potatoes, carrots, and radish that come into direct contact with soil were far more vulnerable to antibiotics contamination. Use of antibiotics in the livestock industry is not only contaminating the soil but also putting the health of the crops and consumers at risk. That is why organic farming bans the use of such livestock waste. Food going into my mouth determines my health; manure going into the soil determines the health of the crops. Eat whole foods for your body and apply wholesome fertilizers for the crops.

2. Roots represent the soil condition

From buyer to farmer

There are many education programs on soil management but they seem to miss the point. Students are invariably left more confused than before from the deluge of misinformation. Proper soil management is not difficult, complicated, or expensive. It does not require a multitude of corporate-produced and promoted inputs and machinery. Let us begin from the basics. If you look at a plant, you have the aboveground part and the underground part. You can see that the space they take up can be put into a ratio. The essence of soil management is making this ratio of underground part to aboveground part higher than one. That means if the aboveground part is one, the underground part has to be larger than one. The underground, invisible part should be bigger, larger and more vigorous. **The total area of the root extension** decides crop health; it is the basic condition for high yield and good quality. In other words, root area equals money. Soil management and ensuring good root growth is your best bet, particularly in this era of climate change.

Check the compacted soil layer

Check the presence of soil compaction with a simple method. First, dig about 40 cm (8 in) vertically into your soil. Take out a chunk from 20 cm (16 in)-depth. If that chunk contains a lot of roots (see picture), it means the soil is free from soil compaction. If you cannot find any roots in soil deeper than 20 cm (8 in), then check a few more spots. If all spots return the same result, you can conclude that a layer of compacted soil is covering your entire field. Another method is to use a sharp iron rod. Stick it into the soil. If you cannot push it in, it's likely you have soil compaction. If you have confirmed soil compaction, take this seriously. Make all efforts to get rid of it. This is the main reason why farming

A lot of hairy roots below 20 cm (8 in) under the soil: a sign that there is no soil compaction

becomes so difficult. If you've done everything you can but still your crops are suffering from diseases and yield is small, it is likely that soil compaction is the underlying problem. Roots will not grow properly in compacted soil.

Address the root cause of soil compaction

Why do compacted soil layers form? What is the cause? As mentioned above, a plow pan is formed by the frequent use of heavy machinery (hence the name "plow" pan). Livestock manure with antibiotic residues, chemical pesticides, fertilizers and herbicides all aggravate the problem. The prevailing method of conventional farming is causing plow pan. Without discarding conventional farming, you cannot eliminate the plow pan. I have tried to find ways to reconcile soil management and conventional farming but could not. That the two are mutually exclusive has become very clear to me. You must solve soil compaction if you are to have sustained yield through the years.

Climb down from those heavy machines. They are convenient but they are the main culprit in destryoing soil. For fields, greenhouses, and orchards, you must refrain from the use of heavy vehicles. If you have to use machines, use light ones. Heavy vehicles may be permitted in some exceptional methods of farming; for instance, where tractors are equipped with GPS and extreme care is given so that their wheels always travel on the same tracks and never enter areas where crop roots are growing. Absolutely avoid livestock manure that is not certified to be devoid of all antibiotics. Accumulation of antibiotics caused by habitual input of livestock manure with unclear origin inhibits the activity of soil microorganisms. This is why organic farming does not allow that kind of livestock manure. Switch over from chemicals to natural material. A soil that is contaminated by chemicals and thus has a low microbial activity does not respond to input of fertilizer. So farmers will use even more chemical fertilizer. Break away from this cycle. Learn to make simple JADAM liquid fertilizers (JLF) that can replace chemicals. Indigenous microorganisms are probably the best means in solving soil compaction. Minimize the use of chemicals and apply JADAM indigenous microorganism solution (JMS) for a prolonged period. As microbial population and diversity increase, chemicals trapped in the compacted soil layer will start to dissolve; gradually the layer will disappear. This leads to a faster decomposition of organic matter, resulting in little need for chemical fertilizer. This is very impor-

If you have to use tractors, operate them so that their wheels do not tread over the space where crops grow.

tant. There are not many that present a solution to soil compaction. But based on experiences, I can speak with confidence that JMS combined with cover crop method is the best solution.

What is visible (plant) represents what is invisible (root)

We all want high yield. For a plant to produce an abundance of fruits, its nodes should be quite short with new shoots coming out continuously. That provides a large number of flower buds and fruits. This difference can produce more than a ten-fold difference in yield in the same type of crop. The root should extend wide and deep for the plant to produce new shoots for fruiting. In one word, high yield is the total area of the root that comes in contact with plant food (fertilizer). Many people think that simply applying abundant base fertilizer (fertilizer that you put in before planting) and additional fertilizer (fertilizer you apply after plants start growing) will produce more shoots. That is wrong. It's like having only prepared a 2-meter (6.6 ft) deep foundation and trying to raise a 10-storey building! Farming begins with simple principles. What is visible (building) represents what is invisible (foundation). Plants are smart; they look at where they are growing and grow only to the extent that is possible.

3. Make your soil like leaf mold

Find the secret to soil management in nature. Look at the soil formed from leaf mold in the adjacent mountains, fields and forests. It has been there for thousands of years. These places close to your field have the environment most closely resembling your field. JADAM believes leaf mold is the ideal soil. Organic farming is all about finding answers from nature. Below are the three tenets of soil management in the JADAM organic farming:

- Microorganism composition of my field should be identical to that of the leaf mold in the mountains
- Organic matter in my field should be abundant like the leaf mold in the mountains
- Minerals in my field should be diverse like the leaf mold in the mountains

Soil on left is full of contaminants trapped in compacted soil layer. JADAM organic farming changes that soil into the soil on right; soil from the mountains. Just do as nature does; that is the answer

Farming will be always difficult if soil compaction and chemical contamination are not dealt with. The only solution to soil contamination is microorganisms. Just like microorganisms purifying contaminated water, our home-cultured indigenous microorganisms will be put into the soil to dissolve contaminants and turn them into plant nutrients. When soil contamination is serious, one-time application of microorganisms is not enough. JADAM recommends applying microorganisms to fields regularly (3-4 times a month) throughout the year by mixing them into irrigation water. See the results for yourself.

Microorganism composition of my field should be identical to that of the leaf mold in the mountains

If you have thought it is more scientific to separate microorganisms into good guys and bad guys, then the JADAM method will be a complete eye-opener. It might appear scientific to divide good and bad microorganisms, but the truth is that we do not have the power or capability to make such a distinction. It has only been a few decades since modern science started studying soil microorganisms; less than one percent of the estimated one million existing species have been studied. It is impossible to label microorganisms good or bad. Bacteria are the most numerous of all soil microorganisms. But we can hardly look into the inside of a bacterium even with the most high-tech electronic microscope. Despite the advancement in molecular biology we still know very little about the inter-relation between specific species of microorganisms.

Bacillus anthracis, a well-known “bad guy” that causes canker, is not always bad. Having them in certain numbers actually keeps other pathogens away. Toxin produced by these bacteria have the effect of inhibiting cancer growth in the human body. Bacillus anthracis cannot be simply judged as “bad.” Like all other life forms on earth, it all depends on what situation they are in. Escherichia coli are not always bad either. E. coli disintegrates fibers in the large intestine; helps us absorb nutrients and water; and synthesizes vitamins beneficial for the body. Without them, we are not able to perform ordinary digestion and absorption. Look closely at nature and you will see that "good or bad" approach is nothing but an illusion. It sounds more scientific, sophisticated, and advanced to divide microorganisms into good and bad but this is nothing more than a marketing ploy. Business people want to monopolize microorganisms and use them for profit. These agents try to create fear among farmers on the potential catastrophic harm that the "bad" microorganisms can do. They try to persuade farmers that they are uneducated, untrained non-experts who should never try to handle microorganisms. So the "good" microorganisms have effectively entered corporate hands in the form of commodity. Despite the corporate propaganda and agenda, we are the descendants of those farmers who used microorganisms effectively for thousands of years. This assault, coming in the form of science, against the method tested by time is absurd. Corporations are touting commodity that is actually inferior yet expensive. Farmers are repeatedly told that they are non-professionals and it is best to buy the latest products and technology, and buy into the newest ideas. What the professionals claim as "good" microorganisms are in fact less than 1/10,000 of the total existing species of microorganisms. Does it make sense that an iota of all existing and mingling microorganisms is selected and is sold as a panacea for the improvement of your whole field? Is that scientific? How much do the experts understand of the role played by the remaining 9,999/10,000 other species?

Similar things are happening in theories about human health. To date, over 4,000 different bacteria were reported to be found in the human stomach. Say a scientist has identified three or four of them as beneficial. Would you believe the scientist if s/he claims that merely eating a lot of those three or four types of bacteria will significantly benefit your health; and that the rest can be safely ignored? This is a matter of common sense; but why is nobody raising questions about microorganisms in agriculture?

1 gram (0.04 oz) of soil from leaf mold of the mountains contains billions of microorganisms.

Our current level of using microorganisms for farming is completely immature. It is like claiming to build a Korean eco-park and then putting in a few wild animals from Japan and bringing in tropical fish from the Amazon. Microorganisms are producers of nutrients within the human digestive system and within the soil. **Their excretion equals nutrients**. If you select only a few microorganisms that means you are only providing a few types of nutrients for your plants. That inevitably means an imbalance of nutrients. Stop thinking of picking a few "good" microbes and using them. It is time to escape the trap of dualism.

Do not select microorganisms; they should be embraced as a whole. We should try to revitalize the whole micro-ecology as it existed in nature. Stop trying to choose but instead try to restore the long-lost balance and diversity that once was. JADAM sees microorganisms as "workers." We need them to work underground in our fields, so we need to find and bring those who have been living in conditions most similar to that of our fields. Nowhere is there a better

This is what happens after leaving cooked rice in leaf mold. The colors are beautiful and diverse. Modern science has little understanding of this world of soil microorganisms.

place to find them than the leaf mold in nearby mountains. Conversely, the tirelessly marketed products have factory-cultured microorganisms coming from Japan, the US and other distant, non-native origins.

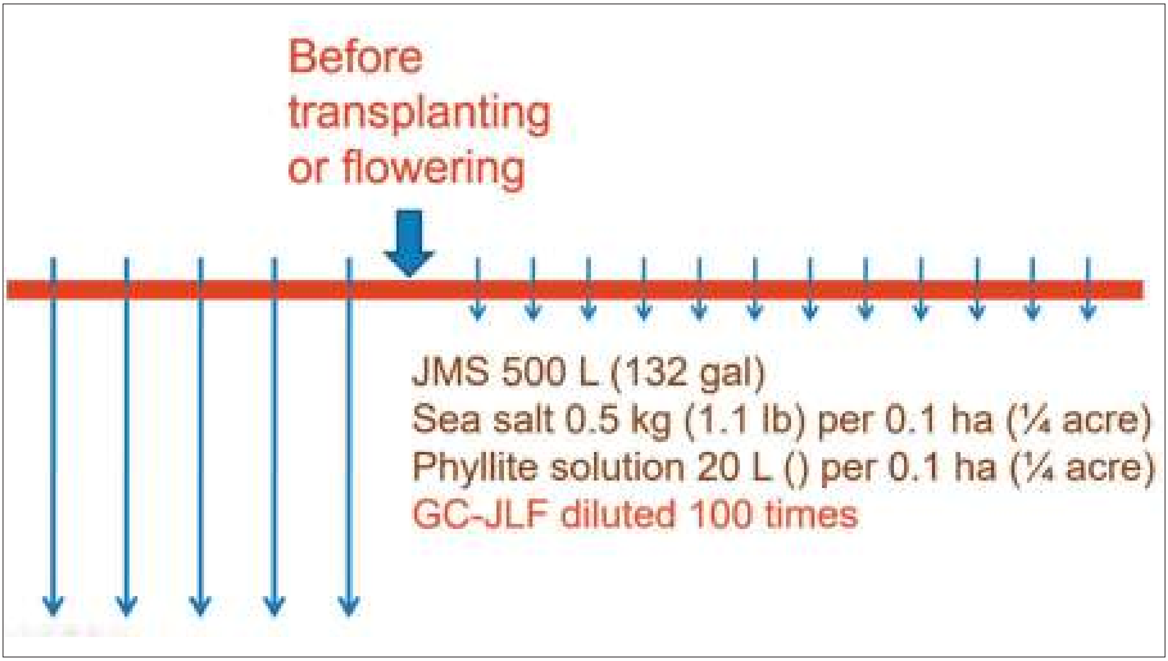
We call the microorganisms that live in our nearby forests the "indigenous microorganisms (IMO)." Bring them home, cultivate them and use them. In 1 gram (0.04 oz) of leaf mold there are approximately 2 billion to 10 billion microorganisms. There are over one million different species. The data published by a laboratory in Denmark revealed that 1 gram of leaf mold contains 30,000 protozoa, 50,000 algae, 400,000 fungi and billions of bacteria. The best microorganism input as JADAM sees it is those optimized for your field. It should have harmony and balance between the producers, predators, and decomposers. Diversity is the foremost value. This JADAM view perfectly coincides with the principles of modern microbiology.

Science is not ready to judge which organism is beneficial or harmful. Our best choice is to accept nature as it is. The key is in the leaf mold in the surrounding mountains. Leaf mold is the key to optimization of the soil environment, balance and diversity. This is where the four thousand years of Korean organic farming is rooted. With its mountainous terrain Korea has treasures buried everywhere.

Research in agriculture should have a clear purpose of serving the public interest. The moment it loses this sense of purpose, all the findings and associated methodology (and products) too easily fall into the hands of the corporations. Instead of serving the farmers, researches will be benefiting the corporations. Microorganism is a good example. It is an essential input in organic farming yet it is completely commercialized. Managing microbes is managing nutrients for plants.

Microorganisms cannot travel without the help of water. They are somewhat like fish. However strong a microorganism might be, over 95% of its body is water and it is like an aquatic animal. It cannot simply move around inside dry soil. Microbes must be applied with water. If you want your microorganisms to reach the ends of the roots, then water must reach there; microorganisms must "swim" with the water to reach that destination. What is especially important is that you apply microbe solution fully before plants take root. Early root settlement determines the success of harvest. Early root settlement is very, very important along with water (irrigation) and nutrient (fertilizer).

JADAM indigenous microorganism solution (JMS) should be intensively applied before active root growth. Meaning, for fruit trees, that period is after leaves fall until sprouts or flowers appear next year; for field crops, from after-harvest to before transplant. In this period, you can give as much water as you want so the microbes can swim deep and thoroughly into the soil. When there are crops growing, you can't give unlimited water so there's a limit to microbial penetration. "Soil foundation work" refers to applying JMS plus minerals plus



Apply these inputs intensively before transplant/flowering so that soil condition is fully improved and nutrients are sufficient. Continue using these after planting/flowering in smaller quantities.

The soil has been applied with JMS with a sprinkler. Microbial activity became so strong that the whole surface is covered with hyphae

If you apply JMS heavily before transplanting, root settlement will be extremely strong.

JADAM liquid fertilizer (JLF) before the transplanting of crop plants and the sprouting or flowering of fruit trees on a regular basis through irrigation. It looks simple enough but just put it to practice and you will be shocked at the results. This soil foundation method is the most important technology of JADAM; I repeat again that you have to implement this. Use motored sprayer, sprinkler or drip irrigation to apply a mixture of JMS, sea salt, phyllite solution, and wild grass plus crop residues JLF (GC-JLF). 500 L (132 gal) of JMS can be used for an area of ¼ acre to 8 acres. As for both sea salt and phyllite water, use 500 g (1.1 lb) for ¼ acre. GC-JLF should be diluted about 100 times. Standard is to use 1 ton (2205 lb) of water for 3558 sq. ft (0.08 ac). This liquid fertilizer made from various wild grass and crop residues (leaves, branches, fruits) is the most optimized fertilizer available. For areas smaller than 0.08 ac, do not add sea salt because they are added when making JMS. The greatest benefit of this JADAM soil foundation work is that root settlement will be very strong. Roots will be almost dancing inside the soil!

Organic matter in my field should be abundant like the leaf mold in the mountains

If the soil is barren, just putting in microorganisms will not necessarily secure the nutrients needed for plant growth. Certain elements need to be present. Inorganic nutrients such as nitrogen (N), potassium (K), calcium (Ca), phosphorus (P), magnesium (Mg), boron (B) and sulfur (S) are well known. But organic nutrients made of carbon (C), hydrogen (H) and oxygen (O) are also important. Organic nutrient is made from photosynthesis when light, air and water come together. If organic nutrients do not back up the soil, minerals will be dysfunctional. 96% of plant growth comes from organic nutrients and 4% from inorganic nutrients. In an ordinary plant, C, H and O take up about 96% of its dried mass. Major elements of the inorganic nutrients are N, K, Ca, P, Mg, B and S which take up 3.5%; trace elements are Fe, Mn, Mo, Cu, Zn and Co which comprise 0.5%.

Organic matter is broken down by small animals and microorganisms; it is disintegrated and turned to humus. Humus breaks down over time and releases nutrients into the soil thus making it fertile. Coupled with microbial activity, humus turns soil into an aggregate structure with good air permeability and water/fertilizer retaining properties. If humus content increases in the soil due to a large input of organic materials then the soil holds on tight to the various nutrients (K, Ca, Mg, Fe, Zn) so that even frequent rain cannot wash them away and the soil is resistant to erosion. Liquid fertilizers do not have the advantage of humus because they have already turned into pure nutrients. Humus is spelt similar to human. It seems that the nutrients that form a human come from this humus. When we die we all go back to humus. Farmers have great interest in increasing the sugar content (Brix) of their fruits. Organic material content in the soil has a deterministic effect on Brix. In an organic matter-rich environment, active microbial activity produces a lot of sugar that is accumulated in the soil; this helps produce top quality fruits.

JADAM sees microorganisms as "guests." Guests can leave whenever they like. If they don't like the soil, then they will leave. Treat your guests with good food, i.e., organic matter. Provide ample organic matter into your soil, then the microorganisms will become more active, happy and willing to extend their stay. The quality of food that I eat decides my health; likewise, the quality of organic matter put into the soil decides the health of the microorganisms and the crops. Enrich your soil with organic materials; however, make sure they are clean, pure and uncontaminated. Organic matter should have little or no antibiotics, chemical fertilizers, chemical pesticides because only then will it boost microorganism activity, which will, in turn, improve crop health and produce better quality fruits. If you are keen to get an overwhelmingly positive response from customers, make doubly sure that you use "pure" organic matter. You need a lot of unadulterated organic matter but the problem is that you also want to lower the cost. How is that done? Certified organic fertilizers cost about 20 dollars per sack – that's quite expensive! This is a problem. Now, as we have done repeatedly, let us ask nature what to do. Where did the leaf mold get its abundant supply of organic matter?

Nature's soil supplies 100% of its organic materials by itself. All these wild grass and leaves die and accumulate on soil in autumn; as they decompose, the soil turns rich. JADAM follows this pattern. JADAM suggests you sow seeds (those that do not die in winter) in autumn, let them grow and cut them down in spring. The fallen grass will become excellent base fertilizer. How is it that nowadays the prevalent method of organic farming does not do as nature does but instead, buys inputs from the market and provides it to the soil? These methods are touted as some key knowhow of organic farming. Farmers have to buy rice bran, perilla press cake, oil cake, sawdust, livestock manure and other ingredients from the market, add some more material, adjust the moisture level, add microbes and turn them often. Let us be honest and direct. Such method is making organic farming more and more difficult. Some say the compost has to reach 75℃ (167℉) in order to kill off the harmful microbes. They also say that beneficial microbes survive the temperature. Such claim is not backed by science. All organic matter has, for billions of years, decomposed at ambient temperature. Is the nature, as a result, full of only harmful bacteria? Temperature claim is just another trap set up to scam farmers.

In our traditional farming system, there was no composting in the form practiced widely in the organic circles today. Forget the complicated and difficult compost-making and **do as nature does**. Nature makes it a rule to apply fertilizer: in autumn, on the surface and in raw form. If you insist on adding rice bran, perilla cake and/or other organic matter, mix them together and scatter on the field in autumn. Apply JMS so that microbes can start feeding on them. Using tiller at this stage speeds up the process. After autumn, winter and spring pass, compost will be fully prepared. Fertilize your farm in autumn liknature; not in spring. Things will become so much easier. Another merit of autumn application is that it can prevent larvae damage in spring because there is no food for them in the organic matter that has decomposed completely through fall, winter and spring.

Someone might ask "instead of going through all the trouble of growing grass and turning it into organic fertilizer, would it not be easier to simply use rice bran, perilla pulp and press cakes which are good organic matter in themselves?" Somehow, everybody seems to believe that organic fertilizer equals oil press cakes. There are an infinite number of different organic materials; there are quality differences between them. What is the best organic material? Contrary to common practice and belief, rice bran, perilla pulp and press cakes are not the best of ingredients because they are the leftovers (peel) after the grain, nut and fruit have been extracted of their nutritional essences. They are just the skin of a fruit and are deficient of the comprehensive nutrients that the fruit has. That makes them far from the ideal substance to give to your soil/crops. Fertilizer made from plant **skin** does not possess the comprehensive nutrients required by plants – it simply increases soil nutrient imbalance. Contaminants are an important cause for soil degradation, however, **breaking of the balance in soil nutrients** is also a serious hazard. Putting in nutritionally unbalanced food (skin fertilizer) certainly disrupts nutrient balance. That is why it is very beneficial to use the "whole" plant as fertilizer like in JADAM's cover crop method. If you put in rice bran in the soil, the nutritional balance in the soil changes to a condition more favorable for growing rice. Would you grow tomatoes in that soil? Same for perilla pulp. If you love this input and overuse it, you will ruin your soil. Anything good that is excessive becomes bad. Good and bad are one. Farming is a precision-operation of finding and approaching the optimized nutritional balance for your crop. When you use skin fertilizers, use it in less than 1/10 of the total amount.

Base fertilizer is very important in farming; and JADAM suggests you do as

Let us get rid of compost method!

Prevalent method of compost-making is too complicated. You have to mix the ingredients,calculate green to brown ratio, build up a pile, adjust the temperature/aeration/moisture, turn them, finish composting by spring and scatter them on soil. JADAM method is very, very simple. In autumn, mix all ingredients together and scatter them on the fields, apply JADAM microorganism solution (JMS) and use tiller to break them down.

Compost pile has been made by mixing rice bran, perilla pulp and other organic matter; putting in microbes; adjusting moisture; and covering with rice straw. It is a tiring work.

Temperature and moisture differences occur throughout the pile; some parts harden or form clods. You have to turn often to prevent this.

Farmers must complete fermentation so that compost can be applied in spring. They have to work hard all winter long.

When white color appears and no more heat is generated, the compost is ready. Making this is not easy.

Turning this pile manually will break your back; and what do they tell you? The more you turn, the better.

Excavators are mobilized to do the turning. Organic farming becomes difficult; cost rises.

nature does. Nature always grows vegetation which turn into organic fertilizer. It is always 100% self-sufficient. The amount of organic matter you can acquire through cover crop cultivation is enormous. In addition to providing organic matter, cover crops also soften up the compacted soil layer, reduce salinity and boost microbial activity which in turn suppresses diseases and nematodes. Leguminous crops like hairy vetch and milk vetch even fix nitrogen from the air into the soil. You might be tempted to buy sacks of livestock manure for ease's sake, however, cover crop method is very important in JADAM organic farming. The Korean Rural Development Administration (RDA) has already done extensive research on cover crop. Below is information based on RDA's research:

Hairy vetch growing on an orchard. Being leguminous, they provide all the nitrogen needed by the fruit trees.

Milk vetches are planted in rice paddies. Being leguminous, they can provide the entire nitrogen needed for growing rice.

Hairy vetch is a leguminous crop which fixes nitrogen in air and provides 20 kg (44 lb) of nitrogen per 0.1 ha (¼ ac) with a total biomass of about 17 tons (37,500 lb). One of its wonderful qualities is that it inhibits weeds. Its sowing season is between early September and early October (in southern Korea). It needs to be sown by early October at the latest. Use 3-5 kg (7-11 lb) of seeds per 0.1 ha (¼ ac). Sow more if the climate is bad or if you sow them too late. In orchards, cut them down after they have formed seeds; then, you do not need to sow seeds again every year. They wither and die in summer. If a crop is planted before their withering, put them back into the soil by using a rotary two weeks prior to planting so that they have time to decompose. If crops are planted at a later period, then hairy vetch can be left to die and mulch the field. They grow well in sandy soil or loam with good drainage and are weak to excessive moisture. With a low carbon-nitrogen (C/N) ratio of around 10, it breaks down fast.

Milk vetch is a leguminous crop like the hairy vetch. It fixes nitrogen from the air and provides 15 kg (33 lb) of nitrogen per 0.1 ha (¼ ac). Its total biomass is about 17 tons (37,500 lb). In Asia it has been used as a green manure plant for thousands of years. It had been composted after having been mixed with soil. Sowing season is before September 20-25 in the southern area and before mid-September in the central area. For good germination, milk vetch should be sown when there is sufficient moisture in the soil. Milk vetch is vulnerable to cold and it can freeze to death if the temperature stays at below -5°C (23℉) for a long time. You can turn the vetch into the soil after May 25 after

Rye is planted in this orchard. "Experts" say that because rye has low nitrogen content, when it decomposes it will cause nitrogen suck-in by microorganisms and thereby damage the growth of fruit trees. However, in the fields, such concern is dismissed. The orchard produces more every year. The owner of this farm has done tree-rye symbiosis cultivation for over 20 years. (Mr. Jaegwan Yu, Hadong)

Weight of rye on 1 square meter (11 sq. ft.) was 18 kilograms (40 lb).

they seed so that you will not need to re-sow.

Rye is a gramineous crop. It is very tolerant to cold and can survive temperatures below -25°C (-13℉) in the central and northern areas. It provides 15 kg (33 lb) of nitrogen per 0.1 ha (¼ ac) with a total biomass of 20 tons (44,092 lb). It has strong nutrient absorption so is an excellent source of green manure. It is also helpful in eliminating salt from the soil. It has a vigorous root growth which greatly improves the physical characteristics of the soil and helps with soil compaction. Sowing season is between late September and early October for high lands and between mid-October to late October for other regions and Jeju Island. The crop will sprout in just four days even in soil temperatures of 4~5°C (39.2-41℉). Sow about 15 kg (33 lb) per 0.1 ha (¼ acre). Mixing hairy vetch and rye in a three to one ratio is an excellent method as that supplements the low nitrogen of the rye. Return them into soil immediately before the heading stage.

Sudan grass is a typical annual summer crop. It is good as green manure and removes salt from soil in protected cultivations. It is tolerant of high temperatures and draught, and easy to grow. Its early growth is slow but it grows very fast after rooting. Even in the short-term, it produces a lot of organic matter that can be returned to the soil. As the fast growth rate allows four to five times of cutting every year, it can be used as a feed crop. It helps reduce nematode damage and is good for curing problems from repeated monoculture. A good time to sow is in the summer when the temperature is high because it sprouts when the average temperature is over 15°C (59℉). The seeding rate is 4-5 kg (9-11 lb) per 0.1 ha (1/4 acre) in case of broadcast-seeding and 2-3 kg (4.4-6.6 lb) for line-seeding with thin soil covering. To use as green manure, cut and return to the soil before heading. To reduce salt from soil under protected cultivation, grow them for over 60 days to let them absorb the salt, then remove them. High groundwater level or alkalinity causes poor growth.

Rapes are one of the most common green manure crops with no part to be wasted. After oil is pressed out of it, the pulp is mixed with urine and excrements to produce organic fertilizer. Rape honey is a premium honey that can be harvested in April and May. As it is so with barley, rapes can be double-cropped with rice. Rapes can be harvested in early June and transplanting of rice seedlings can be done around June 20. Sowing season is early October and seeds can be broadcasted at a rate of 0.5 kg (1.1 lb) per 0.1 ha (¼ ac). In rice paddies, drainage is necessary to prevent winter-time moisture damage. Its optimum germination temperature is 20-25°C (68-77℉). The lowest it can tolerate is 0-2°C (32-35.6℉). Rapes are vulnerable to cold; they grow in the southern part of the country and Jeju Island. If they are sown after Oct 20, they will be prone to cold damage during winter so sowing them at the correct time is vital. Today most of our cooking oil is imported. But until the mid-60s, we produced 72.4% of our cooking oil. Rape seeds had 38-45% oil content and thus made for a valuable resource. A good time for combine harvesting is when seeds turn completely black. When you harvest with a sickle, it is better to harvest a little earlier – when the seeds begin to turn black. Wheat and barley are effective when they are grown with fruit trees that are not tall, such as grapes. Like rye,

Sudan grass grows very fast and can be used in greenhouses. Corns can replace Sudan grass.

Rapes are planted in rice paddies. They grow as tall as a person. One great feature is that you can collect seeds for next use. It also helps suppress weeds in the rice paddy.


Rye seeds have been broadcasted before harvesting persimmons. Seeds have sprouted. Best nutrient for persimmon is its own leaves; leaves fall in between rye plants so they are not blown away. No nutrient is lost; all is recycled back into the soil. This is a perfect fertilizer program.

using in a mixture with hairy vetch is a good idea, where the ratio of hairy vetch to wheat or barley is three to one.

There is a whole variety of plants that can be grown in winter and summer, in between the main crop's growth cycle. **Provide the base fertilizer with the crop residue and cover crop.** After doing this, provide any additional fertilizer as required. If growing cover crop is difficult, use manure that came from grass-eating animals. Manure from herbivorous animals contain optimum nutritional balance for crops. Nutritional balance is the key to high yield and quality.

Minerals in my field should be diverse like the leaf mold in the mountains

Surface-layer soil where most crop roots are located is called the "plow layer"; it is usually about one meter (3.3 ft) deep. When we pick fruits, where did their nutrients (96% organic, 4% inorganic) come from? Most of the organic nutrients would have been supplied by photosynthesis while a small portion of organic and inorganic nutrients came from the plow layer. As fruits are harvested, the nutrients in the plow layer are taken out. The leaching of organic nutrients can be replenished through photosynthesis; however, the leaching of minerals is almost irreversible. JADAM has coined the term "**the natural leaching of minerals**" to refer to this kind of inevitable loss of minerals through the practice of agriculture. In the 1940s in the US, there was a saying that "an apple a day keeps the doctor away" because an apple had all the minerals that a person needed in a day. However today you would need thirty-two apples to keep the doctor away because present-day apples are so much poorer in minerals!

Many data point to the fact that all the vegetables and fruits we eat today are highly deficient in minerals compared to the past. Why is that so? JADAM sees it as a result of the continued process of natural leaching of minerals. After agriculture shifted from self-sufficiency to commercialism, leaching of minerals has been accelerated. Some say that there are eighteen elements that are required for plant growth. Do not believe this because this is the conclusion arrived only by "today's" agricultural science. If science advances then it will find more essential plant nutrients. For humans – the object of science's greatest interest – the number of essential minerals is over seventy. Note that ten years ago the number was sixty. Science is always advancing. Its conclusions are subject to changes. As science makes continued progress, the world of agriculture will also widen. It is not a true science that suffices in the findings made to date and makes no efforts to progress. Science shelters only under canvas for it has to always move on. Unfortunately most scientific studies nowadays have more of a commercial focus rather than serving the public interest; "good" science is hard

Cucumber leaves are not a source of disease. Cucumber leaves contain nutrients for cucumbers. They should be returned back to the soil. Look how thin thread-like roots are approaching the leaf to absorb the nutrients to find. That is why I cannot stress enough the importance of being able to master the skills, knowledge and technology you need for your farming, always putting to maximum use your own common sense and intuition.

Apart from the "natural leaching of minerals" there is also the "**forced leaching of minerals.**" Whereas natural leaching is the deprivation of the nutrients from the soil mainly because the fruits take them, forced leaching refers to the process where nutrients are deprived due to the foolish human practice of removing crop residues. As crop roots stretch into the soil, roots select what the plant needs and absorb them. The difference in the nutrient content of each and every fruit is reflected by the different nutrients imbibed by the roots. Stems and leaves are made from nutrients absorbed by the roots. These nutrients are particularly selected from the "pool of nutrients" present in the soil. This pool is under a significant threat.

There is one thing repeatedly stressed to farmers in agricultural workshops: that they must completely eliminate crop residues to have fewer diseases and pests the next season. It's called field sanitation. So well-meaning, diligent farmers go about getting rid of the smallest scrap of residue. They expect that they would at least save some money from reduced use of pesticide next year. Let's stop and think: if what the experts said were true, then the amount of pesticide used every year should have kept decreasing, so that by now once or twice a season should suffice. But that is exactly the opposite of how things are going. Each year, farmers are more deeply entangled in the trap of pesticides. What more evidence to prove them wrong? By promoting the elimination of crop residues, current system of agriculture is eventually encouraging farmers to remove nutrients from the soil. Who is the winner? Needless to say, fertilizer and pesticide companies. Current agricultural practice leaves the soil deprived of nutrients and that calls for more market-bought fertilizers and pesticides. It is a vicious cycle. Diseases to plants and soil should be perceived as a "cold". Everybody is exposed to the cold virus but healthy people do not catch it. If plants and soil are healthy, they will not easily fall prey to the ever-present disease-bearing elements. Some argue that health runs in the family because of the DNA, but that is not true. Even DNA can change according to the environment.

Health is neither accidental nor destined; it is the result of effort. How you eat, drink, exercise, move your body, and operate your mind all matter. It is not because the crop was unlucky that it fell sick. Look at what kind of environment your crop is in. Natural and forced leachings of minerals is progressing in the soil. All sorts of chemical contaminants new to the environment are entering the soil. I daresay that farming that tells you to get rid of your crop residue is not a farming at all. That kind of farming is a direct harm to agriculture and nature. If you want to grow rice well, use rice straw as fertilizer instead of selling it and buying some other fertilizer from the market. People follow and practice a costly form of farming and yet complain that their farming is costly. Farming that treats crop residue as waste is waste. It is an exploitation of nature.

There are some advocates of zero-input agriculture. They argue that they can farm without adding anything – no nutrients, no water, nothing. I see farmers attracted to this kind of theory, but how can this kind of nonsense gain any popularity? Unless you are going to farm just a few years, this theory absolutely does not stand in the face of reality. Zero-input is possible only in nature. That is because all the leaves and the fruits fall to the ground. They are broken down and nutrients are recycled. Come to look at it, nature's process is not even zero-input; it is a complete recycling, everything **re-input**. Nutrients do not flow away; instead they stay in a closed loop.

Farming has a completely different process. Here humans take away all the fruits; sometimes fruits are harvested more than once a year. As a result, soil is exploited and the cycle of nutrients is clearly broken. How then can a farming stand with zero-input, without compensating for what humans have taken away? Human intervention for human-caused damage is all but necessary because farming is not same as nature: in nature all beings share; in farming, humans take all. Do not seek miracles in farming; comply only with science. What is taken out needs to be put back in. Organic nutrients come from the sun, air and water which are infinite resources. However that is not the same for inorganic nutrients. Minerals are finite resources and, like oil pumped out of the earth, what is taken out is taken out. They are not reproduced endlessly through the operation of the sun, earth and water.

Zero-input farming can be successful for a short time if the soil is excessive in nutrients because there is a lot to exploit. But this cannot go on for tens or hundreds of years. If zero-input is such a successful method then our ancestors have done needless things for the past four thousand years – using excrement, urine, livestock manure, green manure and residues to fertilize the soil. Some zero-input advocates from Japan use vinegar for pest control. That is literally not zero-input. Applying vinegar is same as providing foliar fertilizer. JADAM strictly adheres to a scientific thinking. As Adam Smith put it: “Science is the great antidote to the poison of enthusiasm and superstition.”

How much and what minerals have been taken out of my soil through the process of natural leaching? This is very difficult for even scientists to measure. But taking a super macro-view can give us an insight. Let us look at this problem of leaching from a “global” view. Then it is easier to find out where the minerals taken out of my soil have eventually gone: the sea. For hundreds of years, my soil has experienced leaching of nutrients; to cure it, we will **bring back the nutrients** from the sea. The mineral content of sea water is strikingly similar to that of the amniotic fluid of a mother. The mineral balance of plasma which is made from eliminating red and white blood cells from blood is very similar to that of plant fluid and sea water. That is why biologists claim that both fauna and flora came from the sea. Sea water is quite a mysterious thing. The human fetus goes through the entire process of evolution again. In the beginning it has a tail then it disappears. After ten months, it grows to the shape of a homo sapiens.

To date, 83 elements have been found to be present in sea water. Most of

83 identified elements in seawater

Element (form)		Mean concentration (ng/sea level 1 kg)	Element (form)		Mean concentration (ng/sea level 1 kg)
Cl	Chlorine(Cl^-)	19,360,000,000	W	Tungsten (WO42-)	10
Na	Sodium (Na^+)	10,780,000,000	He	Helium (He)	6.8
S	Sulfur (SO_4^{2-})	2,710,000,000	Ti	Titan ($Ti(OH)_4^0$) ※	6.2
Mg	Magnesium (Mg^{2+})	1,280,000,000	La	Lanthanum (La^{3+})	2.6
Ca	Calcium (Ca^{2+})	417,000,000	Ge	Germanium (H_4GeO_4)	5.1
K	Potassium (K^+)	399,000,000	Nb	Niobium ($Nb(OH)_6^-$)	5>
Br	Bromine (Br^-)	67,000,000	Nd	Neodymium ($NdCO_3^+$)	3.6
C	Carbon (HCO^{3-})	26,000,000	Hf	Hafnium ($Hf(OH)_4^0$)	3.4
N	Nitrogen ($H2NO^{3-}$) ※	8,270,000	Ag	Silver ($AgCl_2^+$)	3.2
Sr	Strontium (Sr^{2+})	7,800,000	Pb	Lead ($PbCO_2^0$)	2.7
B	Boron	4,500,000	Ta	Tantalum	2.5
Si	Silicon (H_2SiO_1)	3,100,000	Er	Erbium ($ErCO_3^+$)	1.3
O	Oxygen	2,800,000	Dy	Dysprosium ($DyCO_3^+$)	1.3
F	Fluorine (F^-)	1,300,000	Gd	Gadolinium ($GdCO_3^+$)	1.3
Ar	Argon (Ar)	480,000	Ce	Cerium ($CeCO_3^+$)	1.3
Li	Lithium (Li^+)	170,000	Co	Cobalt (Co^{2+})	1.2
Rb	Rubidium (Rb^+)	120,000	Yb	Ytterbium ($YbCO_3^+$)	1.2
P	Phosphorus ($H_2PO_4^-$)	62,000	Ga	Gallium ($Cu(OH)_2^0$) ※	1.0
I	Iodine (IO_3^-)	58,000	Pr	Praseodymium ($PrCO_3^+$)	0.8
Ba	Barium (Ba^{2+})	16,000	Te	Tellurium (TeO_3^+)	0.7
Mo	Molybdenum (MoO_4^{2-})	11,000	Sc	Scandium (Sc(OH)30) ※	0.7
U	Uranium ($UO_2(CO_3)_3^{4-}$)	3,200	Sm	Samarium ($SmCO_3^+$)	0.6
V	Vanadium ($H2VO_4^{2-}$)	2,000	Ho	Holmium ($HoCO_3^+$)	0.6
As	Arsenic ($HAsO_4^{2-}$)	1,700	Sn	Tin ($SnO(OH)_3^-$)	0.5
Ni	Nickel (Ni^{2+})	470	Hq	Mercury ($HgCl_4^{2-}$)	0.4
Zn	Zinc (Zn^{2+})	390	Lu	Ruthenium ($LuCO_3^+$)	0.4
Cs	Cesium (Cs^+)	310	Tm	Thulium ($TmCO_3^+$)	0.3
Cr	Chrome (CrO_4^{2-})	260	Tb	Terbium ($TbCO_3^+$)	0.24
Sb	Antimony ($Sb(OH)^{6-}$)	240	Pt	Platinum (Pt)	0.20
Kr	Krypton (Kr)	230	Be	Beryllium (BeOH-) ※	0.20
Se	Selenium (SeO_4^{2-})	160	Eu	Europium ($EuCO_2^+$)	0.18
Ne	Neon (Ne)	140	Rh	Rhodium (Rh)	0.08
Cu	Copper ($Cu(OH)_2^0$) ※	130	Pd	Palladium (Pd)	0.06
Cd	Cadmium ($CdCl_2^0$) ※	70	Th	Thorium (Th)	0.05
Xe	Xenon (Xe) ※	66	Bi	Bismuth (BiO^+)	0.03
Fe	Iron ($Fe(OH)_3^0$)	34	Au	Gold ($AuCl_2^-$)	0.03
Al	Aluminum ($Al(OH)_3^0$)	27	In	Indium ($In(OH)_3^0$)	0.02
Tl	Thallium	25	Ru	Ruthenium (Ru)	0.005
Re	Rhenium (ReO_4^{2-})	19	Os	Osmium (Os)	0.002
Zr	Zirconium ($Zr(OH)_4^0$)	18	Ir	Iridium (Ir)	0.00013
Mn	Manganese (Mn^{2+})	16	Ra	Radium (Ra)	0.00013
Y	Yttrium (YCO3+)	13			

* Oxygen and hydrogen, components of water, are excluded from the table.
* 1 g = 1,000 mg, 1 mg = 1,000 ug, 1 ug = 1,000 ng

Source: Ocean March 2000, Resources in the 21st Century/ Potential Biological Productivity and Resources—Writer: Professor of Department of Oceanography at Graduate School of East Coast University the elements that make up the earth are in the sea water; not only Mg, Ca, K and P which are essential for crop growth but also other various minerals such as I, Mn, Mo, Co, Se and Ge. About 100 million marine microorganisms live in 1 mL of sea water. This makes it an excellent ingredient to mix with the JADAM indigenous microorganism solution (JMS) which is bred from microorganisms collected from leaf mold. If you mix the two types of water together, then you essentially have all the diversity Earth has to offer: from the land and from the sea. That could be why if you do a foliar application of JMS and sea water, you have no more powdery mildew. Let us make good use of sea water to fight the leaching of nutrients from our soil. Note that since sea water is around 3% salt and the body fluid of plants is around 1%, you must mix the sea water with thirty to one hundred times more plain water. This is to prevent salt damage to plants and accumulation of Na and Cl in soil. JADAM recommends using 20 liters (5.28 gal) (or 600 grams (1.3 lb) of sea salt) for 0.1 ha (¼ ac).

Mix sea water with JMS and continue applying it 3-4 times a month. Using sea water not only supplements minerals leached out of the soil but also improves sweetness, coloring, storing period and product value. If you look at the sea water composition, it has plenty of S, Mg, Ca, K, B, P, I which are all essential for crop growth. It even has Se and Ge which are known to be extremely beneficial. That is why JADAM strongly suggests the use of sea water as mineral supplement for plants. Even the Korean National Institute of Agricultural Sciences has confirmed the benefits of sea water and/or sea salt. It is the sales agents of agricultural inputs that adamantly oppose the use of sea water/salt. Benefits of sea water has been proven through history. Fields, rice paddies and orchards by the sea were showered with sea water elements for hundreds and thousands of years. They produce better quality food than inland farms. What clearer an evidence?

However, take care not to apply sea water mixed with less than thirty times water because then the salinity will be too strong which can damage some crops. Do not sprinkle salt directly onto soil or spray undiluted sea water! Remember that good and bad are one. If a good were excessive, it will turn bad. If you cannot obtain sea water, then sea salt can be used. 20 liters (5.28 gal) of sea water is equal to around 500 grams (1.1 lb) of salt. Calculate your dilution ratio based on this conversion. The salinity of sea water differs according to regions; normally it is between 3.1-3.8%. It is generally accepted as sea water if the salt concentration is above 1.7%.

There is another ingredient that JADAM uses to supply mineral to the soil. Use fine-powdered phyllite as mineral supplement. This rock contains almost all inorganic nutrients required by plants. Use it together with sea water and you will be surprised. Phyllites are sold in powder form and are inexpensive. Add 60 kg (132 lb) of phyllite powder to 500 L (132 gal) of water. Stir and let it settle. Scoop out the upper water for use. Refill the water when you need. Use like so for one year. JADAM calls this water "phyllite solution." In soil with serious mineral leaches, directly sprinkle phyllite powder to the soil (approx. 1 kg (2.2 lb) per 3.3 square meters (36 sq. ft.).


JADAM encourages the use of phyllites to replenish the soil of minerals


Put in 60 kg (132 lb) of phyllite and add water. Stir and let sit for a few hours. Use the upper portion of the water. Refill with water and repeat use. Use throughout the year

Fauna and flora that once lived all die and their bodies are piled up. When pressure is applied they become sedimentary rock. Higher pressure and temperature turn them into metamorphic rocks then granites. Rocks made from the accumulation of organic matter contain materials closest to the mineral requirements of plants. If phyllite is not available, use other rock powders.

Humus soil is also beneficial. It helps to distinguish leaf mold soil, humus soil and humic acid. Leaf mold soil is the soil we easily see under a pile of leaves in the mountains. When leaf mold is exposed to microbial activity for tens of thousands of years, it turns into humus soil. Because microorganism activity is almost finished, humus soil will not generate any heat in soil. If humus soil is further disintegrated, it turns into various humic acids. These are much more expensive than humus soil. The price of humus soil is not much different from livestock manure so JADAM recommends the use of humus soil. Humus soil is the optimum pure organic fertilizer with abundant minerals and organic nutrients. In Korea, it is mined from ancient bogs. To use for fruits and vegetables, it is more effective if some nitrogen is added.

To improve your soil quality and fight mineral leaching, use JMS, sea water and phyllite solution every time you water. Your crops will show visible improvements in their growth and root settlement. Needless to say that the taste, aroma and market value of the fruits will soar! Take caution because this is such a powerful method that it can suddenly break down the insolubilized nutrients in the soil and boost plant growth and produce water sprouts. It can also delay fruits from ripening. So JADAM recommends this method to be used starting from **before** the transplanting or growth period. I cannot stress this enough. It is **the most important technology of JADAM: "Apply JADAM indigenous microorganism solution (JMS), sea water, and phyllite solution every time you water."** Use sea water/salt and phyllite solution every time you use JADAM microorganism solution. Soil foundation work is the most important of all farming tasks: use JMS, sea water, phyllite solution and wild grass JADAM liquid fertilizer (JLF) to optimize the soil condition before transplanting or flowering. This is the key to strong root settlement and thus high quality and high yield.

❐ Other effects of the leaf mold-method of soil management

Increased diversity of microorganisms prevents a particular type of pathogen from gaining dominance. Nowadays, soil-borne diseases and nematode damage are ever on the rise. Even the most toxic chemical pesticides cannot control powdery mildew. All along, our method has relied on disinfection. We thought killing the target pathogen would save us but it is not working that well. What is worse, the pathogens are building resistance towards chemical pesticides. It is time we drastically shift our thinking. Disease is caused when a certain virus, bacteria or pest takes control over the soil. So JADAM's solution is simple. **Maximize the population and diversity of soil microorganisms.** As I mentioned, add JMS whenever your crop is watered. This is a complete shift. Mankind has concentrated on killing and eliminating pathogens when there was an easier and effective method of using microbes to check microbes (pathogen). **Let us shift from disinfection to diversity.** Most of the pathogens are heterotrophic; meaning they cannot produce nutrition for themselves but have to rely on foreign sources of nutrients. This means that the "area" they occupy is directly interpreted into the amount of food they acquire. What do we want to achieve by repeatedly showering crops and soil with JMS? We want the army of diverse microorganisms to occupy the area and crowd out the pathogens. When the micro-ecology recovers its natural diversity, no particular pathogen will be able to multiply in extraordinary numbers and take control.

The same holds true for soil nematodes. When microorganism diversity and activity are recovered in the soil, the nematodes become much less active. There are interesting pictures of a certain fungi using hyphal loop to trap and consume nematodes. Bactericides might have some success in controlling powdery mildew; however, the disease can also be controlled by foliar application of mi-


Leave the crop residues on the soil. Add some organic matter and fully wet with JMS. Cover them from the sun and soon the soil will be full of hyphae. Microorganisms, sea water and phyllite solution play an important role in improving the physical and chemical qualities of the soil.

croorganism solution. Indigenous microorganisms will occupy the area that the powdery mildew pathogens would want to take up, effectively preventing the outbreak of powdery mildew. This costs almost nothing, and contrary to chemical agents, application of such material actually promotes plant health. If you are trapped in your belief that only pesticides can save you, then you will forever rely on them. Think outside the box; nature has all the answers. Follow nature and things will be surprisingly simple, easy, scientific and effective (SESE). Ultra-low-cost farming is so easy!

Minerals become abundant with JADAM farming, solving any issues of mineral deficiency. Farming should become easier and simpler with age and experience. But farming nowadays becomes ever more difficult as years go by; the main reason is mineral deficiency. Most farmers have a few mineral products they favor and use those frequently, but the problem seems nowhere close to being solved. Modern science cannot say for sure which mineral is deficient and in what quantity. It cannot even clearly distinguish between insolubilized and solubilized nutrients. That is why all soil evaluation results are extremely inaccurate. JADAM's way of thinking is that, compared to human diet, you do not try to find out which particular mineral you lack; rather, you try to recover the diversity and balance of minerals by eating a wholesome diet. This is a simple yet outside-the-box approach. Diversify your soil microorganisms. This means that your soil is filled up with different microorganisms with different diets. Different diet means different processes of nutrient digestion and excretion. In other words, **diversity of microorganisms means diversity of nutrients available for plants.** In sum, the diversity within the soil ecosystem supports the diversity of available nutrients.

In addition, sea water with its 83 different minerals is put into the soil combined with phyllites. Your soil will never be richer in minerals. The minerals in your soil recover both in terms of diversity and quantity. Crops will recover from mineral-deficiency. Conventional farming is like eating junk food and then taking vitamin pills for health. Just eat wholefood from the first place. Thoroughly understand the world of balance and diversity of microorganisms, balance and diversity of nutrients. This is the essence of JADAM. This is what makes farming so easy, so effective and so ultra-low-cost.

Soil nutrient-tolerance increases; complicated skills are not needed anymore. All nutrients have their optimum levels. Deficiency is bad but excess is no better. Frequent acid rain and soil acidification cause problems. For example, ionization of aluminum (Al) leads to root rot. There is no known solution to this problem. However, constant input of JADAM microorganism solution (JMS), seawater and phyllite solution into the soil significantly reduces root rot. This is due to the excess aluminum being absorbed by microorganisms that like aluminum and therefore the aluminum being removed from the soil. Because aluminum is kept in the microorganisms' bodies, the soil aluminum level is kept at an optimum level. This is increased nutrient-tolerance.

These things are not yet fully understood. JADAM thinks that the microbial balance and diversity is directly linked to soil nutritional balance and diversity, and because nutrient balance is optimized, the soil is less sensitive to excess or deficiency of certain nutrients. There is a tendency where the more experienced a farmer is, the more s/he thinks soil management is difficult. JADAM thinks differently. Choose leaf mold. Don't choose microbes. Use all. Good and bad are one. Do as nature does. JADAM's method is easy because here, opening one door automatically opens ten other doors.

Quite often you hear about people discussing the pH of the soil. This is more so among the educated farmers. Invariably, they try to control the soil pH by putting in lime, silicic acid, oyster shell powder, etc. JADAM thinks differently. Just stick to JADAM microorganism solution and cover crops. Apply microorganism solution every time you water. Add crop residues and organic matter to soil. Naturally, the soil pH will return to normal. Inputting minerals might change the acidity in a short time but raises the possibility of disrupting the soil nutrients balance in the long run. Remember that you cannot take out what you put in the soil. Not one single mistake is acceptable in soil fertilization. Take it as seriously as you would take seriously what you put into your mouth. Soil is still little understood; be humble about your limited knowledge and be aware of things that you cannot reverse.

Many blueberry farmers raise the problem of acidity related to the use of microorganism and liquid fertilizers. They think they have to make these inputs acidic because this crop is acid-loving. But this is not necessary. Come to think of it, the largest quantity of water blueberries receive is not liquid fertilizer but rainwater. The pH of rainwater is around 6.0 which is much closer to neutral than what farmers would like to give blueberries (pH 4.5). Blueberries receive rainwater in abundance but have no problem at all.

Seed and seedling treatment using leaf mold

Leaf mold is a reservoir of millions of different kinds of indigenous microorganisms. It also holds millions of different excreta from these microorganisms. It is a super nutrient-rich material that can easily replace commercial root promoters. Try leaf mold in your seed and seedling treatment. This substance will boost the biodiversity in the seed and seedling environment which in turn effectively suppresses the outbreak of diseases. Bring leaf mold from mountains nearby. Prepare a large bucket, put in about 3 kg of leaf mold and add water up to a level where the root part of the seedling will be submerged. Allow the seedlings to rest in that solution for 1-2 minutes so that they are fully soaked; then transplant. If you have a lot of seedlings to treat, dig out a wide area of soil, cover with plastic, fill in water and put in leaf mold. For seeds, put them in a porous bag and leave submerged for around 30 minutes before planting.

JADAM's view is that canker and athlete's foot are essentially the same. Chemical pesticide cannot control canker; medicine rarely fixes athlete's foot. However, when you tackle them with microbial diversity, the disease-causing organisms are neutralized. This is why this simple seed and seedling treatment promotes root settlement and disease prevention at the same time.

Part IV.

Principles of Making Organic Farming Inputs

"When the facts change, I change my mind. What do you do, sir?"

John Maynard Keynes

Photo: Youngsang Cho

JADAM cannot stress this enough:

Microbial balance and diversity is the key to soil health.

Nutritional balance and diversity is the key to crop growth.

Once you grasp this, you will be finally freed from this dreadful "complicated" farming.

JADAM's ultra-low-cost agriculture is easy.

1. Understanding organic farming inputs

Once farming began on the Korean Peninsula millennia ago, everybody used organic farm inputs. Our ancestors knew that as crops grew, they sucked out nutrients from the soil so something needed to be added back in to supplement it. These wise people developed know-how that made best use of anything that was nearby; moreover, it was low-cost and efficacious. This system of agriculture that evolved for thousands of years became the backbone of our traditional farming. Then came the chemical fertilizers and pesticides. We were completely dazzled by them. Yet, after 40 or 50 years, we realized the problems of exploitive chemical agriculture and tried to go back to organic. Shockingly, nobody seems to remember that we had been organic all along. Organic farming is nothing new to us; it is still vivid in some of our memories. Let us look at organic farming not as something new and special but as something of a continuation of what has been practiced all along. We need only to add a few things on the backbone prepared by our ancestors. If you are a farmer over 50, you will find that JADAM system is not really new.

What our ancestors used for farming were things easily available and cheap, and of course they were all “organic.” However, nowadays organic farming inputs have become something expensive and hard to get; something difficult to make; something that requires extensive use of machinery. I am not rejecting science; as science advances, agriculture will change. The world of organic farming inputs can also go through a change. But the point I am making is that all these developments are heading to a direction where they raise the cost and give more financial burden to the farmers. As practicing organic farming and organic food become more expensive, more people are turning away from it. Organic farming is no longer sustainable; it is sustained only through the purchasing power of the very few rich people.

Conventional agricultural practices contaminated the soil to such an extent that the soil can no longer tolerate any more chemical pesticides and fertilizers. Organic farming was introduced as an alternative, but the system of organic farming was too expensive and too complicated to replace chemical farming. Now is the time for a fundamental change in organic farming. Organic farming has to become easier, more effective, and less costly than conventional farming. If this cannot be done, there will be no future for organic farming. After decades of struggle, JADAM established a system that achieves these goals. Why did organic farming become so expensive? Certainly, organic farming as practiced by our ancestors did not need money at all. First, farm inputs are being bought instead of made. Second, the process of making of farm inputs itself has been changed into something costly. It is JADAM's aim to change the farming practice of buying inputs to making inputs; change the process of input-making ultra-low-cost. In JADAM system, even pesticides, which no farmers could dare dream of making on their own, can be made at home at a very low cost. As you will see, such change is not even that difficult because we already have most of the answers in the wisdom of our traditional agriculture. JADAM only made small improvements to make it easier. I personally believe that modern organic farming inputs are inferior to our ancestors' in terms of nutrition, economy and science. Knowledge prevalent today are anti-nature, anti-technology and anti-farmer. They only serve the interests of the businessmen. Today's organic farming is a tragic manifestation of what happens when commercialism takes over farming.

JADAM is trying to reverse this. We should re-examine these high-cost, ineffective organic farming inputs and the methods of their making. The traditional method has much to offer. We have wonderful ideas about how organic farming inputs ought to be. But bear in mind that prevailing notions have been forced on us in the last couple of decades. Changing our ideas is the first, the most important and difficult step to take. If we cannot discard these highly erroneous concepts, we will not be able to produce ultra-low-cost farming inputs. Technology that does not serve farmers and farming should be discarded. Technology that has no economic value should be discarded. Technology that does not help farmers earn money should be discarded. When publicly criticized about changes to his economic theories, John Maynard Keynes, a genius, left a famous saying, "When the facts change, I change my mind. What do you do, sir?" When you find a wrong, you should correct it immediately. What JADAM is about to explain will be radically different from what you have learnt and accepted as a norm. Methods will be completely different. But do bear in mind that actually these methods were the norm only 40-50 years ago.

2. Anaerobic fermentation

All this time while I was developing the system of JADAM method, I always did an "island-test." This is a simple test of imagining if a particular method would work in an uninhabited island. It is to check whether that method is self-supporting and independent instead of relying on commercial products. I discard anything that does not pass this test unless it is absolutely vital.

Why do we make fertilizers? What are they for? They are like food prepared by a mother to feed her child. Look at the inputs from a "nutritional" perspective. Food given to a child must be nutritious. Inputs given to plants should be nutritious too. This is very important. But too often this perspective is lost. People get lost because there are so many other perspectives such as: beneficial-ness (dividing good and bad microbes), air (aerobic and anaerobic), temperature (hot or cold), smell (stinking or sweet), C/N ratio (carbon to nitrogen), pH, EC (electrical conductivity), etc. Things do look awfully complicated but the most important perspective is "nutrients." Strangely, one does not come across theories that explain an input from this nutritional perspective. Knowledge is added to further confuse the essence. The result is that the farmers lose control over their farming and it goes into the hands of experts. Behind these experts are the agro manufacturers, distributors and retailers. I do not think this was all a coincidence.

Rarely is there an expert that talks about nutritional perspective of an input. Input is same as food; primary role of food is to provide nutrition. An input might be fancy, but if it lacks nutritional qualities, it is meaningless. Complex problems become simple when you look at them with the right perspective. Look at farm inputs with a nutritional perspective. How rich is the input of nutrient and in what balance? The best technology is that which makes inputs with minimum nutritional losses. The same holds true in cooking. In cooking contests in Europe, besides taste and skill, over 60 percent of the points are allotted to how little nutrition has been destroyed. If the cooking method destroys vitamins and amino acids, nutrients vital to life, it is useless to humans. The same goes for agriculture: if the crops are fed with food deprived of vitamins and amino acids the plants will fall to diseases.

Sunlight and air destroy vitamins and amino acids. Heat is the next culprit. This is the basics of nutritional science. All cooking processes involve blocking off light and air, and using minimal heat. There is no cooking method in the world that actually inputs air. But why are companies putting in air when they make farming inputs? Air pumps are used extensively. For JADAM, anaerobic fermentation (cutting off oxygen) is the norm. Anaerobic fermentation refers to the breaking down of materials by microbes in an anaerobic condition. Somehow this has become labeled as something "bad," so when I talk about using anaerobic fermentation people look at me with skeptical eyes. Somewhere along the way people came to the erroneous conclusion that only the "aerobic" processes are "good."

Anaerobic fermentation is nothing strange or new; it certainly is not "bad." Our whole digestive system is breaking down food in an anaerobic environ-

Grass grows with the apple trees from spring to autumn. Soil becomes more and more fertile; fruits become sweeter; yield increases. Gihwal Bak's organic apple farm, Yesan.

ment. It is the system chosen by virtually all creatures on Earth – from soil microbes to large animals – to digest the food they ingested. Korean traditional food Kimchi is made through anaerobic process. Alcohol and yogurt are all created anaerobically. As just explained, aerobic fermentation actually destroys vitamins and amino acids. This is why it is never used in cooking. It is thus very strange that somehow this process came to be regarded as the core of manufacturing all organic farming inputs. Anaerobic fermentation has been completely defamed; people think it is something disgusting, bad and terribly wrong. This could be no further from the truth. For thousands of years, we did farming through anaerobic fermentation. This method minimized the loss of nutrients and was very simple; all you needed was a jar or a container.

It is frustrating that people think of Sir Albert Howard's "An Agricultural Testament" of the 1980s and similar books as the gospel of organic agriculture. They believe J. I. Rodale **started** organic farming inspired by Howard's book. However, our history of organic farming began long before that. It is true that "An Agricultural Testament" played a pivotal role in making into theory and disseminating the Indian method of compost-making. Unfortunately, the work made a serious mistake: it over-complicated the process of making farming inputs. It talks about working to increase aeration, turning to meet the optimum moisture level, improving carbon to nitrogen ratio, adjusting pH, etc. These, in JADAM's opinion, are too complicated, difficult and unnecessary. It seems that Sir Howard had his focus not on the nutritional aspect but on eliminating odor. He also overlooked the importance of making technology easy so that the public can more readily accept it.

In Asia, it was common to pile up agricultural by-products, crop residues, wild grass, human manure, food waste and similar material, and then scatter them in the fields whenever needed. They became compost on the soil and enriched parts of the field. The tragedy began when we disregarded our own tradition and only looked at organic farming from the West as the "developed" method. Farmers who are already brainwashed will find it very hard to accept JADAM's anaerobic method. Aerobic fermentation makes necessary the use of machinery – at least an electric air pump. Anaerobic processes do not need machines. Then you might equip the air pump with a timer, a sensor to control the temperature, a mixer to unify the fermentation condition throughout the ingredient and even lights to stimulate photosynthetic microorganisms. It seems you cannot farm without machines. Again, if you observe from a **nutritional perspective**, these are doing more harm than good since light, air and heat are the three biggest destroyers of nutrients.

Real organic farming inputs are simple and meant to be simple. The process became complicated because "experts" brought in the requirements of air, temperature, uniformity, agitation, time and smell. They made conditions which neither existed nor mattered before. As more conditions and requirements were declared as "scientifically proven," **farming became more complicated and farmers became less confident**. Farmers, after being brainwashed by the so-called experts and having been deprived of confidence, end up buying expensive machineries. Those that do not have the money to buy machines will buy end-products from input agents.

The anaerobic process is the way to go. Bring the methods closer to anaerobic. Look and judge organic farming inputs with a **nutritional perspective**. Minimizing nutritional loss is the goal: light and air should be tightly blocked out. This holds true not only for liquid fertilizers but also for solid ones as well. A factory that treats a large amount of livestock manure containing a lot of nitrogen might have to use aerobic fermentation to get rid of the smell. However, if you are producing fertilizer from livestock manure on a small scale, you do not need to turn often. That you have to turn is a misperception. Look at solid fertilizers from the nutritional perspective also. This may at first seem very confusing. You will not understand that you can make compost without turning. You turn compost to provide oxygen and prevent overheating. The more you turn, the more nutrients you will lose. Keep the compost pile small – pile up to a 1 m (3.3 ft) width and 1 m (3.3 ft) height so as to prevent nutrient loss from overheating. Let the compost stand and when the heating period passes the work is done.

There is an easier way of using a gunnysack. Put a pallet on the ground. Prepare gunnysacks and fill them with wild grass, leaves and sawdust as the main ingredients; add food waste, livestock manure, fish waste, etc. Pile up the gunnysacks in about six layers on the pallet. Apply a generous amount of JMS to the sacks as you pile them up. Next, wrap them tightly with a plastic sheet. Use the contents after three months. It is easy to make and easy to use. Moisture content and uniform moisture are keys to fermentation. After you apply generous amount of JMS, excess water will drain from the bottom resulting in an optimum moisture level. Because it is covered with a plastic sheet the moisture level will be uniform throughout and the ingredients will not lump together. JADAM calls this the "gunnysack fermentation" method.

There are theories about carbon to nitrogen (C/N) ratio claiming that nitrogen-rich materials have to be added if the ratio is too high and vice versa, and that that is important for faster fermentation. There are also theories about acidity: how you have to add lime to control the pH. Well, guess what, even if you disregard these theories, the process will work just fine. Without human helping hand, nature does a fine job. These theories of C/N ratio and acidity fail to explain Mother Nature's cycling of materials, a work of perfection. Just like we select and eat food following our intuition, we should do the same in making compost.

What about the leaf mold in the mountains? Are they undergoing aerobic or anaerobic fermentation? The surface is exposed to air but the inside is undergoing an anaerobic transformation. From the surface down into the deep soil, anaerobic activity is taking place. Let us not look at anaerobic fermentation with too much prejudice and suspicion. Photosynthetic bacteria, lactobacillus and yeast are names for some of the best-known beneficial microorganisms; and they are all anaerobic. How can you tout these anaerobic microbes as beneficial on the one hand and on the other hand condemn anaerobic fermentation? We make farming inputs so that they provide nutrients for the crops. The nutritional aspect is the most important criterion in making the inputs. Remember that keeping them an-aerobic minimizes nutrition loss. I read many foreign books but they simply presuppose the use of air pumps when making liquid fertilizer. "Compost tea" is popular which most of the time is made using an air pump. We should assess this from a nutritional perspective. Not all that is foreign glitters. Our traditional organic farming has been lost while we were busy pursuing highly-flawed, foreign knowledge.

Those who teach complicated theories might be the people most ignorant. Those who know no other way than to speak of truth in a difficult way might not know the truth at all. The truth about the truth is that it is like water; it flows along the way. Without complicated theories these truths can flow into our hearts. Truthful methods of farming are all the same: easy and plain. If you cannot understand, the problem could lie in that knowledge, not you.

3. Water and leaf mold

There is a wide-spread misperception that in order to practice organic farming there are basic necessities such as black sugar, molasses, vinegar, wood vinegar (pyroligneous liquor) and alcohol (ethanol). Black sugar and molasses are not produced in Korea; they are 100% imported. These products use a lot of oil and electricity in their making so their prices are prone to fluctuation in the international oil market. Vinegar and wood vinegar can be made at home but most of the time they are bought from the market. Most of the alcohol is also imported and its price is likewise linked to international oil prices. You can see that all the inputs you thought of as farming essentials are connected to oil price and this has generally risen. Organic farmers have to pay big money to buy these so-called necessities.

JADAM strongly urges to do away with all these inputs. They were not used in our millennia of farming history. In particular, black sugar and molasses must go. Not only are they expensive but they are actually doing harm. People think black sugar from the market is close to raw sugar extracted from sugar canes but it is not. Take out minerals and other nutrients from raw sugar and you get white sugar. Treat it with caramel coloring and you get black sugar. Artificial caramel coloring is a chemical obtained through heat and pressure treatment of sugar, sulfites, and ammonia. The Center for Science in the Public Interest (CSPI) strongly warns against the use of this product because it is a carcinogen. If you are addicted to using black sugar and molasses you will never truly go organic. "Suicide by Sugar" (Nancy Appleton, G.N. Jacobs, Square One Publishers) lists 140 diseases which can be caused by ingesting sugar. There are numerous other books warning about the dangers of sugar.

Some of the harmful effects of sugar include: inhibiting the immune system; causing adolescent delinquency; weakening immunity; causing chromium and copper deficiency; inhibiting the absorption of calcium and magnesium; increasing levels of neurotransmitters such as dopamine, serotonin and noradrenaline; causing a rapid increase in adrenalin which induces tension and aggression in children; contributing to osteoporosis; facilitating aging by decreasing vitamin E in the body; reducing growth hormone levels in the body; promoting the onset of Parkinson's disease; and worsening fatty liver. "Suicide by Sugar" presents detailed research data that supports the claim. What would happen to your child if you mix, roll, roast, fry and steam all the food with sugar? This is what organic farming is currently doing; almost all inputs are soaked in sugar and molasses.

Human bodies, soil and crops are one. There is very little research on the relationship between sugar and agriculture, but sugar turns the inputs acidic;

using them turns the soil and the plant's body-fluid acidic. Most insects, pests and bacteria pathogens are classified as acid-lovers. Acidification is directly linked to disease outbreak. After you use sugar, diseases will become rampant – more so than conventional farming. Fruits and leaves will be covered with black scum. Only use home-made vinegar and wood vinegar and do not buy them from the market. These are useful if you dilute them 100 to 500 times with water and then use the solution as a nutrient supplement. Do not buy alcohol unless absolutely necessary.

Since when did we become so reliant on sugar, molasses, vinegar, wood vinegar and alcohol? Certainly our ancestors did well without them. This is probably because we tried to copy the Japanese method, thinking that theirs was more advanced. Japan's famous agriculture magazine "Modern Agriculture" frequently promotes the use of sugar and vinegar. I do not think that Japanese farming is superior to Korea's. All regions have their own farming methods. Different regions need to develop farming tailored to their respective needs. Of course we should learn from others but if this entails learning a system that excludes farmers from the technology and turns them into mere consumers, JADAM strongly opposes that system. Korea does not produce any sugar at all, yet how can that ingredient become an essential in organic farming? That is against the very spirit of organic farming. If you have sugar remaining on your farm, dilute with 500 parts water and apply the solution to the soil but not to the leaves. Finish off the sugar and do not buy again. If your fish waste is not decomposing well in sugar, take out half of it, fill the half with water and add a handful of leaf mold. Decomposition will accelerate and the material will be ready for use after three months.

JADAM urges farmers to stop using sugar, molasses and market-bought microorganisms but instead start using water and leaf mold. Prepare a container, add the ingredient, fill up with water and add a handful of leaf mold. That is it! No more worries about C/N ratio, pH level, artificial heating, aerobic vs. anaer-

This organic strawberry farm is very high yielding, using rice straw and sudan grass as base fertilizer, and strawberry residue JLF (liquid fertilizer) as additional fertilizer. The fruits have excellent taste and aroma. Bokhi Ju, Buyeo.

obic, good or bad microbes, aroma vs. odor, etc. The solution will cost nothing. There will be minimum nutrient loss. It is easy and simple. Best of all, it works. The indigenous microorganisms in the leaf mold will actively break down the ingredient and turn it into an excellent liquid fertilizer. But there is one problem: the smell. We have been told constantly by the experts, the scientists and their books that if things are going good there will be a good smell. Smell has become the criterion for judging what is going well or wrong. What happens after farmers follow the JADAM method? They try it out and soon detect an obnoxious odor. They are worried. "Something has gone horribly wrong!"

Relax. It is only natural that leaf mold + water method smells. If it is animal-matter containing high nitrogen, the smell will be awful; wild grass and plants are less-offensive. If you wish, you can add phyllite powder or charcoal powder to prevent the fumes from permeating. But then I have to ask: why is bad smell a problem? Since when did we accept a sweet smell as the criterion for a good input? Our ancestors used human manure liquid fertilizer, food waste liquid fertilizer, and green manure liquid fertilizer. They all stink. Our ancestors farmed with these scents for the past few thousand years. Smell was not an issue. Those farmers even had the ability to judge the nitrogen content by the smell and adjust the dosage accordingly. Who started pointing fingers at the smell? Who first defined smell as **bad**? Who started teaching that bad smell means putrefaction and putrefaction is **bad**? This nonsensical idea and fostering of it is an important reason behind the fall of our traditional organic farming. If smell was not labeled problematic we would still be making and using liquid fertilizer as our ancestors had been doing. We would be 100% self-sufficient in liquid fertilizer. Leaf mold would still be used as an important source of microorganisms. Since smell became evil, the farmers who toiled with smell were labeled unhygienic, uncivilized and dirty people. These farmers fell from favor and so did the system of our traditional organic agriculture. The "experts" taught us that fermentation is good and putrefaction is bad. This thought has gained such a strong support that all farmers seem to believe in it. But I cannot assert enough: this is all a scam. There is no science that backs the claim that fermentation is good and putrefaction is bad.

Is putrefaction bad? What would happen without it? Dead animal and plant bodies would not go back to the soil. That putrefaction produces harmful toxins is an egregious insult against the work of nature. Without putrefaction there is no purification; putrefaction is purification. It is because things rot that they are cleaned. Do not judge the grandeur of nature with limited human capacity. Judging a farming input based on smell is not scientific and is a complete misreading of nature. Why did this concept come to be? Who spread it and who benefited from the propaganda? Who became the losers? The answers are quite obvious. Farmers lost their ability to self-produce the inputs they needed for farming, and lost money because they now have to buy factory-made inputs. Microorganisms have become an important **commodity**; farmers have become important **buyers.** The experts say good microorganisms have a sweet aroma. Peddlers carry these products around to show everyone how sweet they smell. These charlatans sometimes even add mint flavor. It is the sugar content of the product that produces this sweet smell. Sugar is added because it suppresses microbial activity. This is just a cheap marketing, a sham. Sweet smell has nothing to do with the quality of the input. Do you think if the product contained quality animal protein it would still smell sweet?

There is no good or bad in fermentation and putrefaction. Stop trying to judge. The two processes are so named for convenience's sake, based purely on subjective standards. There are no agreed definitions for fermentation and putrefaction where the two can be clearly divided. People just call what is useful fermentation and what is not putrefaction. Kimchi has a strong smell which Koreans love but some foreigners detest. If "smelly" Korean foods such as fermented skate (Hongeo hoe) or fermented fish guts (jeotgal) burst out of their packing in an airport, I bet, a lot of people would be unhappy. What is fermentation to Koreans is putrefaction to others. Another example would be Surströmming, the infamous fermented Baltic Sea herring popular in Swedish cuisine. According to a Japanese study, a newly opened can of Surströmming has one of the most putrid food smells in the world – even stronger than Korean fermented skate (Hongeo Hue) or Japanese Kusaya. The putrid smell is so strong that people often eat it outdoors.

There is no good and bad in decomposition. The smell is actually not coming from the microorganisms but from the food they feed on. If the microorganisms feed mainly on carbohydrates (glucose, sugar) then the associated alcoholic fermentation will produce a sweet aroma. If the food is mainly protein or fat then the following disintegration into amino acids and fatty acids will produce amines which create an awful smell. Some people add molasses to suppress the disagreeable smell coming from the breaking down of animal proteins. But molasses will eventually break down and then the material will produce an even worse smell. So they add more molasses to suppress that; vicious cycle is repeated. Eventually too much molasses will thicken the liquid and microorganisms – the bodies of which are made up of 95% water – will lose their activity due to osmotic pressure squeezing water out of their bodies; that is how sugar acts as a preservative. Liquid fertilizer will become strongly acidic and the decomposition process will significantly slow down. Sugar and molasses do not help your farming; all you are doing is wasting money.

Now, maggots. Some people are horrified by the sight of maggots. Why is it that worm excreta are good but maggot excreta are bad? In reality, maggots are one of the most important players in turning dead bodies into soil. Without maggots the material cycle on earth will stop. They quickly disintegrate dead animals and plants so that small insects and microorganisms can feed on the remains.

I am not blindly against input manufacturers and its agents. If they can live in harmony with farmers then it is good. The problem arises when only the input companies trick and exploit the farmers. I have met many farmers in

China and Japan where farmers had become outsiders of farming. When financial motivation takes over agriculture, both farming and farmers fall. The important question is this: who is in control of farming? This is the question you should ask, we should ask. Ultra-low-cost agriculture that brings money to farmers, easy do-it-yourself agriculture that brings farming back to farmers. Let us make a change together.

4. Ambient temperature

In workshops, you will often hear about what temperature is optimum for liquid fertilizer and what is optimum for microorganisms. This sounds quite simple so you go home and try to get the right temperature but the process turns out not easy at all. First, you try a sheath heater to warm up the liquid. But then you are told that sheath heaters cannot heat evenly so you need an agitator. You are also told that you need a heat insulating container to keep the temperature stable. You are also told that it is good to provide air and light. In the end, you buy machines that help you meet these conditions. These machines were a few hundred dollars in the past but now range from a thousand to a few hundred thousand dollars. All the rubber containers that you had at home have become useless because they cannot "keep the temperature even." Farmers are driven to a situation where they have to keep buying new products. They have to buy devices to maintain the temperature, provide air, provide light, accelerate the decomposition, etc.

Machine manufacturers, their agents and experts all unequivocally claim that you have to meet certain conditions including temperature, aeration, light, pH and fermentation speed. All the knowledge surrounding farmers indirectly force them to buy machines. Agents are bold enough to win government subsidy. They make it convenient for farmers; farmers need only pay 30% then the government will provide the rest. Rich farmers buy machines, less well-off farmers buy end-products. Government ends up spending millions of dollars to revive agriculture, but money has never flown into the pockets of the farmers.

But is keeping an even temperature really important in making farming inputs? How did we do it in the past when we had no electricity and no heaters? How did we produce liquid fertilizers and cultivate microorganisms back then? What about nature? What did she do before humans? How did nature cultivate microorganisms and produce plant nutrients without heating? Now, you may start to think that something is not right. All these years, our ancestors and Mother Nature herself farmed without any artificial heating. Will a disaster occur if you start ignoring the “temperature condition”? What if you just give up all artificial heating and leave everything to nature? Is there some other secret to temperature? Or will your liquid fertilizer and microorganism culture turn out just fine?

Let’s shift our view. We have been thinking that artificial heating helps speed up the process, improves quality and make things convenient for us. But is artificial heating actually helpful in providing **nutrients** to plants and improving their **health**? Place yourselves in the position of the crops for a moment. If you are the crop and you would like some microorganisms to enter your sphere, what kind of microorganism would you prefer? Those grown at ever-changing outside temperature or at factory-fixed temperature? Say you need nutrients; would you prefer nutrients contained in inputs made at room temperature or at an artificially-warmed temperature?

Microorganisms are super-sensitive to temperature. Some people say 32°C (89.6℉) is the optimum temperature for culturing microorganisms. Is that really so? Do you think if 32°C (89.6℉) is maintained, then that liquid fertilizer would contain a whole variety of different microorganisms? No; only those that like 32°C (89.6℉) would thrive. Books on soil microorganisms say psychrophiles like the temperature of around 10°C (50℉) and psychrotrophiles prefer 22°C (71.6°F). Only the mesophiles like it around 32°C (89.6°F). Thermophiles thrive at 65°C (149°F) and hyperthermophiles love 95°C (203°F). Come to think of it, something clearly looks awry. The period when the plants are at 32°C (89.6°F) is only for a short while during the summer; and that too in the day. Regardless of the outside environment, whether it was spring, summer, autumn or winter, you cultured the microorganisms at 32°C (89.6°F). Would this product really benefit the plants? Or has it effectively excluded many microorganisms that prefer temperature ranges outside 32°C (89.6°F)?

Now you should become skeptical about the microbiology theory that you have always believed in. Then at what temperature should you culture microorganisms? What is the best temperature to grow microorganisms so that you can produce an input that is helpful for your crop? You search through all sorts of books on microbiology, ask the experts but there is no clear answer. Your best course of action once again is to ask nature. Do as nature does. Culture your microorganisms in conditions that are the same as the conditions your crops are in. You do not need temperature sensors for this. Keeping the temperature constant when culturing microbes is actually an unscientific and incorrect method. Keeping them at ambient temperature is the easiest and the most effective method. Again, it is common sense. You want to cultivate microbes that can benefit your crops; then you should **cultivate them in the same environment as the crops!**

We are blinded by technology so we choose to walk in zigzags. We try to walk straight but there are so many pseudo-sciences out there to confuse us. Nobody is speaking for the farmers. True organic farming is about returning to nature and seeking answers from nature. Let us build a new system of farming based on nature's system. There are truths we can readily utilize. There are truths about microorganisms, truths about liquid fertilizers, and truths about agriculture. It is often our current, so-called knowledge and none other that hinders us from reaching our goal. Our vision prevents us from seeing. When you make liquid fertilizers or culture microorganisms, always remember to look at the process from a **nutritional perspective.**

We learn that psychrotrophs are bad, thermophiles are good, anaerobic is bad, aerobic is good, etc. The conclusion? So you must buy machines to control the conditions. That is a complete rubbish; and an expensive one too. Crops that love low-temperature can get help from low-temperature loving microorganisms. If the crops like hot climate, provide them with microorganisms cultured in hot conditions. This principle makes things so easy: just grow your microorganisms where your crops grow. Prepare your liquid fertilizers so that they stand in the same place as the crops.

Make your microorganism solution and liquid fertilizers at ambient temperature. Don't bother heating. For field crops make them outdoors; for protected crops make them in the greenhouse. Free yourself from the restrictions of temperature. Your old rubber drums, bins and all sorts of containers will turn into valuable tools for making your inputs. It is interesting to note that when you culture microorganisms at low temperature then the bubbles that appear on the liquid surface will be much tinier. This is nothing to worry about as this happens because the psychrotrophiles are much smaller than thermophiles. Just like size difference exists in the animal kingdom – like an elephant and an ant – so too does it in the world of microorganisms.

Now we have an answer to temperature problem for liquid fertilizers too. **Make them in the same environment as the crops.** We make liquid fertilizer to provide nutrients to our crops and these nutrients are produced by microorganisms. If you make liquid fertilizers in the same environment as the crops, then the microorganisms that become most active in that environment will multiply. Then you have crop-tailored fertilizer. Remember that it is the microorganisms that produce nutrients for the crops. They are the chef. If you change the chef, the taste, quality and nutrients of your dish will change. Eat a strange new food and you may even get sick. Consequently, do not hastily attempt to change the chef for your crops. Our chefs are extremely sensitive to temperature. Changes in temperature will cause changes in microorganisms. Changes in microorganisms will cause changes in nutrients. Making of both microorganism solution and liquid fertilizer should be done in ambient temperature that is same as the crops'. Common sense has no less power than advanced science.

Liquid fertilizer machine is a useless piece of metal; all it does is cause financial burden and headaches. Furthermore, I find no reason to have two separate machines for microorganism culture and for liquid fertilizer. People use machine because they think it can make liquid fertilizer in a short period of time. After all, it seems to produce fertilizer in as few as two days when fifteen are otherwise the norm. There is a trick here that you have to be cautious about – did the machine really break down the ingredients that fast? Did you really make a complete liquid fertilizer? Unfortunately, the answer is no. What does it mean to say that the liquid fertilizer is complete? It means that the ingredients that were put in (e.g. wild grass, fruits, leaves, etc.) have turned into liquid and have disappeared – except for some substances like lignin which are not easily broken down by microorganisms. At least 70 percent of what was put in should no longer be visible. However, look at the end-product of these liquid fertilizer machines. You open one after the specified period and you have this wonderful chocolate-colored liquid with sweet aroma. You say to yourself "Mmmm. What a great smell! This must be an awesome fertilizer!" Well, is it?

The best way to judge whether the liquid fertilizer is a success or not is to look at what has happened to the main ingredient. Has it decreased in volume? Only when it has decreased in size does it mean that it has been broken down. Observe closely. The ingredient would have bloated in water and only become larger. Most of the ingredients put into these machines are not broken down completely. That chocolate-colored sweet liquid is just molasses-mixed water with a hint of the main ingredient. The result is just a big joke, and an expensive one at that! You bought 400-500 dollars' worth of ingredients. The molasses, wood vinegar, microorganism solution all cost you at least 700 dollars. This method of farming does not make farmers rich; it only makes them poorer.

But for some reason the government continues to provide subsidies to farms for the purchase of these machines. Machine manufacturers have gained influence and now they make sure that the purchase of their machines becomes an essential part of the government policy. Meanwhile, farmer-friendly, low-cost, easy and effective methods of farming are completely ignored. Sadly, all over the nation, farms have bought and installed these counter-productive microorganism machines and liquid fertilizer machines. Yet, many take great pride in such awesome achievements in organic farming, where the electricity bill alone will cost a few thousand dollars a month and cannot be sustained without government subsidies.

The three principles of JADAM's input-making are:

- Anaerobic (instead of aerobic)
- Water and leaf mold (instead of sugar and molasses)
- Ambient temperature (instead of using heaters)

These three tenets are powerful enough to destroy prevailing core-beliefs about organic farming and also threaten the foundation of input sellers and machine producers. But the three are nothing new; they are what were practiced by our ancestors. JADAM has only transformed these methods into a form easier to understand and practice. The traditional method is the way to ultra-low-cost and ultra-easy agriculture. Put the three principles into practice and you will no longer need huge machines that produce organic farming inputs, huge warehouses to store the machines, land to build the warehouses, vast quantities of electricity, gasoline and money. Many people have this very wrong perception that organic farming is high-cost and that organic produce are inevitably expensive; that is why when we think of organic farming we think we need some huge budget. I stress again that organic farming in its most "organic" form cannot be but low-cost.

It is the mistaken notion that organic farming is expensive that justifies government spending on agriculture. This is completely wrong. That organic farming is expensive is an idea improvised by inputs and machine-related business. Track the flow of government money and you will see who benefit. True organic farming can be nothing but ultra-low-cost.

Black spot disease of plums have been completely cured with JS and JWA pesticide. The fruits are very healthy; increasing market value. Hojeong Bang's organic plum farm in Hadong.

Part V.

Making Organic Farming Inputs

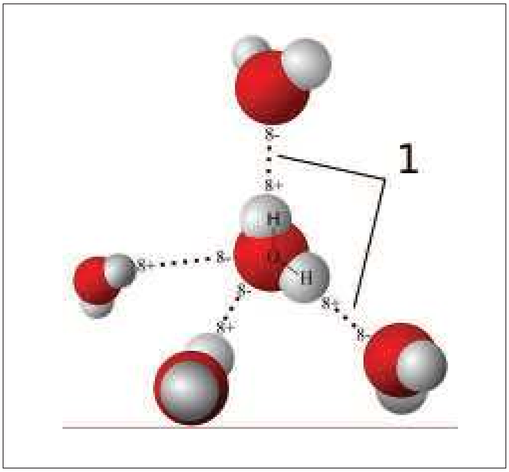
"When commercial capital occupies a position of unquestioned ascendancy,
it everywhere constitutes a system of plunder.
Karl Marx

Photo: Youngsang Cho

What is fertilizer about?

Look at it from nutritional perspective; everything will become clear.

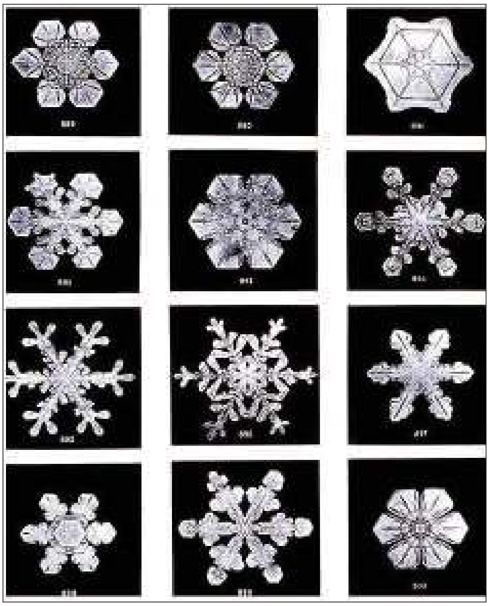
1. Natural mineral water



One molecule of water has two hydrogen atoms covalently bonded to single oxygen atom. The oxygen atom carries a slight negative charge, whereas the hydrogen atoms are slightly positive. (source: Wikipedia)

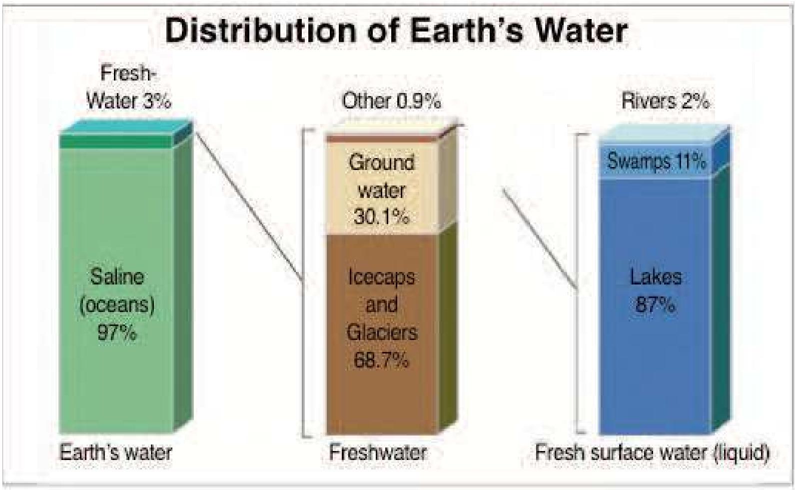
Water is made up of two hydrogen atoms and one oxygen atom joined together (length: 0.10 nm). It is the door to life. Water is used as the primary indicator for the existence of life. Water freezes at 0℃ (32℉) under one atmospheric pressure with a volume increases of about 10 percent; it boils at 100℃ (212℉). One liter of water weighs one kilogram. Water makes up about 70% of the human body (90% for internal organs and brain). Fish are at 80%. Microorganisms are at 95% which is similar to the crops (e.g. cucumber, tomato, watermelon, strawberry, etc.) that we grow. Water molecules have strong polarity which makes them a good solvent that can dissolve many materials. Life-sustaining nutrients are delivered with water as their medium. 90% of our brain is water, so water decides 90% of the health of the brain. 95% of a tomato is water, so water decides 95% of the quality of the tomato.

JADAM asserts that if you use the wrong water, your farming will fail. Water is the most important input of all. Just think about it: 95% of the health of the microorganisms is determined by water. The quality of water determines the health of life forms – and farming produce. As earth, air, water all became polluted, it became harder to get good water. People buy and consume expensive water for their health; please make similar efforts for your crops. Regard water as the critical element in the success of your farming. How does the quality of water directly determine the health and quality of the crops? There are few research studies on this topic; however, we cannot simply disregard the relationship. We know by experience that after staying in a hot spring and drinking spring water for a few days, our skin becomes much smoother. These waters are renowned for their life-bringing qualities. Our cells have become healthier with the change in water. Remember: our bodies and plants are one.



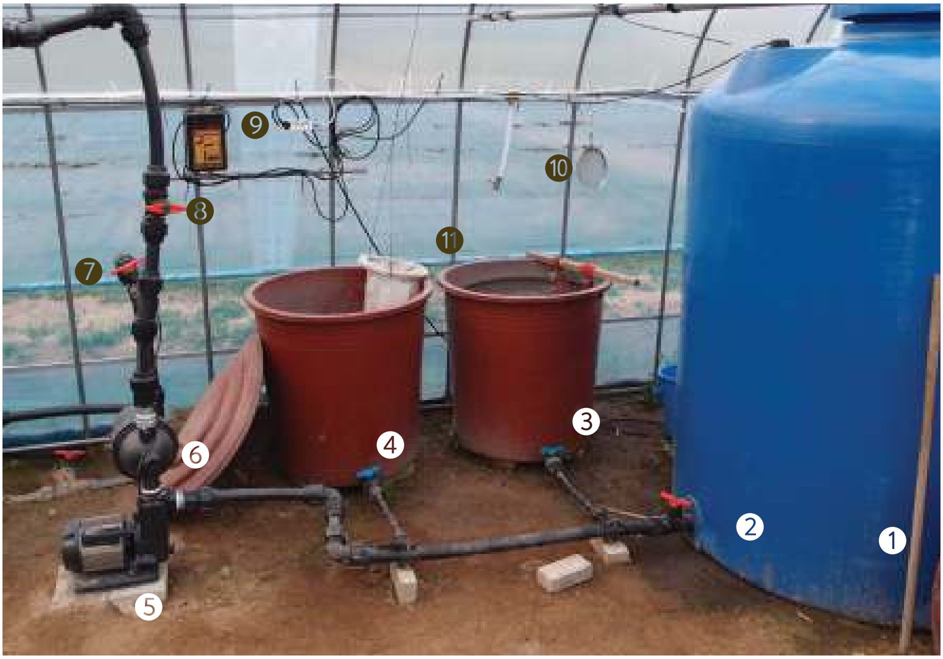
Different shapes of snowflakes. (Photo: Wilson Bentley 1902, Wikipedia)

Most farms will have huge water container numbered ①. Let's use this as natural mineral water container. Fill about a 1/3 of a gunnysack with leaf mold and hang it in the container so that the contents will sink in the water. Bring some rocks from the vicinity and cover 20-30 cm (8-12 in) at the bottom. Simple as that. Change the leaf mold bag 1-2 times a year. Cotton gunnysacks are not suitable because the cotton will be broken down by the microbial activity. Just like microbes break down contaminants in water in nature, this method is using indigenous microbes from the leaf mold to purify water. After 2-3 days, microbes would have acted on polymers (contaminants) and the water will have turned into an excellent water. Use this water to cultivate microorganisms, irrigation or applying pesticides. When irrigating liquid fertilizer and JMS mixed with water, it is difficult to know the exact amount of water being used. In that case, prepare 1 ton (264 gal) of water for 0.1 ha (0.08 ac) and dilute based on that amount (1 t or 264 gal). For example, if you are irrigating 3.3 ha (1/4 ac) with a ×100 dilution solution, the water will be 3 t (793 gal), add 30 L (7.9 gal) of liquid fertilizer and/or JMS (30 L or 7.9 gal being



Distribution of water on earth. Freshwater accounts for only 3% of the total. Aboveground water again is only a tenth of that. (Picture: Wikipedia)

the combined volume). For ×300 dilution, liquid fertilizer and/or JMS will be 10 L (2.6 gal); for ×500 dilution, it will be 6 L (1.6 gal). Open the valve ② slightly, open valves ③ and ④ (③ and ④ holding liquid fertilizer or JMS), run motor ⑤, then the inputs will automatically flow into the water as irrigation proceeds. Control valve ② to adjust the volume of water. After liquid from ③ and ④ have all run out, let the system only run on clean water from ① for 5 minutes to clean the hoses.



Make watering system like this picture. It is convenient and inexpensive. ① is water container; prepare one that fits your field size. ② is valve for controlling water volume. If you tighten valve ②, more liquid fertilizer will flow out of valve ③ and ④. ③ is container for microorganism cultivation. ④ is container for liquid fertilizer. ⑤ is a motored pump; consider field size and water volume to determine pumpmotor capacity. ⑥ is a filter used to keep the hose from being blocked. ⑦ is valve for soil irrigation. ⑧ is valve for sprinkler on the ceiling. ⑨ controls water level. ⑩ is water supply for ③ and ④. ⑪ is a simple filter made from felt; it is a bag shape long enough to reach the container bottom; opening is made with a strong frame. Filter needs regular cleaning.

Important: Valves ③ and ④ have to be always shut and only opened while the pump is running (or else you will be flooded by the pressure from ①!)

Old method for making indigenous microorganisms developed by Hankyu Cho

Old friends of JADAM will have a special memory of the Jiri Mountains. JADAM had tried and experimented with many methods based on the one developed by Mr. Hankyu Cho, who laid the foundation of JADAM organic farming system. Once, we even cooked 10 huge pots of rice to promote the use of our indigenous microorganisms. JADAM's current method is a significant development from this. It has been simplified to the extreme while still improving effectiveness..

2. JADAM indigenous microorganism solution (JMS)

Under the leaf mold in the mountains live millions of different indigenous microbes that have adapted to the local environment. Use them as starter. Use potatoes or grains as medium (feed). Apply continuously throughout growth but intensively before transplanting for annuals and before flowering/sprouting for perennials. It reduces soil salinity, helps root settlement, prevents nematodes and wilting. Developed by Youngsang Cho.

❶ Pour 500 L (132 gal) of water in a container. Dissolve 0.5 kg (1.1 lb) of sea salt into the water. Put 1 kg (2.2 lb) of boiled potatoes, 0.5 kg (1.1 lb) of leaf mold and some rocks in a fine net bag. Hang the bag over the container so that the bag is underwater. Knead well so that the contents melt into the water.
❷ To culture crop-customized microbes, blend 1 kg (2.2 lb) of crop residues (fruits, leaves, branches), put it in a fine bag and hang it over the container.
❸ Close the lid and leave under the sun for culturing. Place it in the same environmental condition as the crops. Leave it at ambient temperature. It takes 1-3 days till completion. It is faster, and there are more foam in summer. If water temperature drops below 18℃ (64.4℉), use an electric heater to keep at 20℃ (68℉) and wrap the container with insulation. (If you use cold underground water, take out the water and leave for a day for it to warm before use.)
❹ When foam is at its most vigorous and the edges of the disc is clear, it is time for use. If you are just one day late, the edges will crumble and the microbes will die so is useless as JMS (in this case, use as JLF). Dilute 10 times with water and use up completely. 500 L (132 gal) of JMS can be applied to 0.1 to 3.3 ha (0.25-8.2 ac).
❺ When applying JMS through a hose or on the leaves, filter with a fine net. Run clean water through hose after running JMS. For foliar application, dilute over 20 times and mix with JADAM wetting agent (3 L for 500 L, or 0.8 gal for 132 gal).

Microbes are extremely small forms of life only seen under a microscope. They include protozoa, algae, fungus, bacterium and virus. Approximately, 2 to 10 billion microbes live in 1 gram of leaf mold. Fungus and bacterium are decomposers that recycle nutrients. Protozoa are predators that control the microorganism population. Just as the food chain exists in our visible world, so too does it in this tiny universe. A variety of decomposers and predators form a complicated relationship. As they feed, excrete, breed, die and decompose, soil environment changes; it recovers vitality and fertility, and becomes optimum growing ground for plants. Most of the nutrients required by crops are produced by microbial activities. Microbial conditions and farming are directly linked.

Some algae and bacteria can make food by themselves through photosynthesis or chemical reactions. Autotrophic microbes synthesize their food themselves. Heterotrophic microbes are those that rely on feeding for food. Aerobic microbes like oxygen while anaerobic ones dislike exposure to air. Microbes that have adapted to both environments are called conditional aerobic (or anaerobic) microbes. In nature, aerobic and anaerobic processes are not strictly separated. Many microorganisms change from one system to another according to their situation. Acidophilic, neutrophilic and alkaliphilic microbes respectively favor acidic, neutral, and alkaline conditions. The majority of disease-causing pathogens are classified as acidophilic, so most of the time disease breaks out when the body fluid of the crop or the soil is acidified. Most microbes survive between -10 to 110℃(14 to 230℉). Depending on what temperature they like, they are classified into psychrophile, psychrotrophile, mesophile, thermophile and hyperthermophile. The lower the temperature the microbe likes, the smaller its body size tends to be. There also exist microbes living in extremely low or high temperatures. If you catch a fly and put it in a freezer, it will appear dead. However, if you take it out to room temperature, it will come alive again. Microbes are even more like so; they become dormant or active according to the changing conditions. They adapted to their environments over billions of years amid the challenges of nature: high or low temperatures, too much or too little moisture, acidic or alkali soil, aerobic or anaerobic environments and so forth. Some microbes have been reported to wake up from thousands of years of dormancy to be fully active again.

Some complain that crop yield decreases after switching to organic farming from conventional farming. This is because soil microbial activity has not yet been fully normalized to the original natural level. Chemical pesticide, fertilizer and herbicide have decreased the biodiversity, population and vigor of the microbial ecology. Even if you add organic matter to this kind of soil, they are not broken down rapidly due to the weakness of the microorganism activity. This in turn causes nutrient deficiency for crops, thus the low yields in the early stages of transition to organic farming. If you make efforts to restore the soil microbial abundance in advance, cutting off chemical fertilizer and replacing them with organic matter does not significantly reduce yield; in many cases, yield actually increases.

Modern science knows less than one percent of the total number of microorganisms in existence. We know this because only one percent of mi-

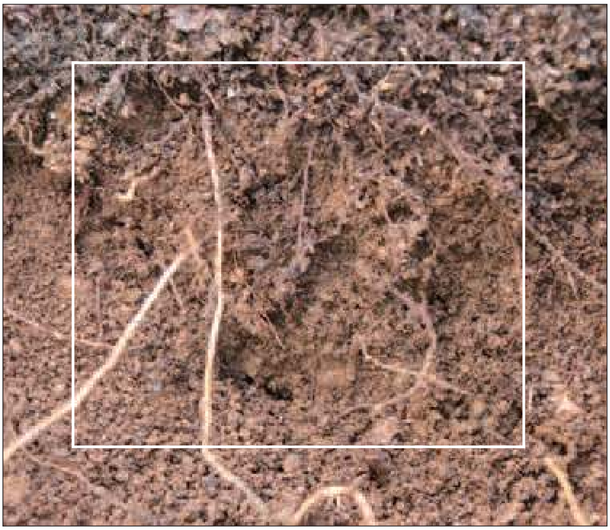
“Flower” of microorganisms blooming on cooked rice. Modern science knows almost nothing of this world. JADAM does not select a few “good” microorganisms and use them. JADAM embraces the whole microbial diversity by using leaf mold; this way, you can use microorganisms that have adapted to the local environment.

croorganisms can be cultivated with the methods developed by science. If we cannot cultivate them, we cannot study them. Another amazing fact is that microorganisms are constantly evolving – probably at a rate faster than the development of science. This means that we might never know more than that one percent that we think we know now. Modern farming recommends the input of "good" microorganisms and teaches us to suppress the "bad" ones. Selective usage of microbes is regarded as scientific farming. However, it is nonsense to divide "good" and "bad" microorganisms. We simply do not know well enough to tell which is good and which is bad. Remember, we know less than one percent. There have been quite a lot of researches done on some well-known pathogens, but we only have some very basic information about most other microbes. Moreover, we have no knowledge on how the species relate to other species to form this complicated micro-ecosystem.

JADAM believes this dualistic thought of dividing good and bad is actually unscientific, furthermore, it is invariably linked to a commercial motivation. What is a microorganism? JADAM simply sees it as a "worker." We want to boost the workforce in our field where the crops are. Then the best way to do that is to bring in workers from an environment closest to that of our field. Where are they? They are in the leaf molds in nearby forests, hills and mountains. It makes no sense to look for microorganisms imported from other places or countries. How can you bring in a foreigner and expect him/her to suddenly speak the local tongue, mix with local population and become a good worker?

Use the leaf mold as the starter for microorganism culture. JADAM does not separate the "good" ones from the leaf mold and use them selectively. Narrowing down microorganisms means narrowing down the pool of nutrients available for plants. Selective use of microbes will result in an imbalance in nutrients. Stop narrowing and start expanding, embracing. Restoring diversity and population of soil microorganism will give you remarkable results. JADAM believes that this is the best approach we can take as of yet, taking into consideration the very real limits of modern science. The cost is much less than commercial microbes but is just as effective. It can also be used throughout the year.

How to collect leaf mold: Collect from mountains near your farm. The places with a thick layer of soil formed from leaf mold are best. Use the leaf mold soil that is right under the top leaf layer. Leaf mold soil developed from conifers is acidic so take care that if you collect soil from that area you mix it with leaf mold soil from two or three other places. Remove the undecomposed leaves at the very top, take the soft soil mixed with decomposing leaf debris. Put it in a black plastic bag or gunnysack. Store in shade and use as needed. Keep loosely closed; tight sealing is not necessary. You can go out to collect it every changing season, or bring in a large amount for one year's use. It is better if it is kept moist but becoming dry is not a serious problem. You will use about 500 grams (1.1 lb) each time. Take that into calculation when deciding how much to bring home.



Remove covering leaves and collect leaf mold soil from the underparts. It is full of indigenous microorganisms that have lived in an environment similar to my field. Collect the soil from the rectangle in the photo

If you cannot collect leaf mold: You can make them. Find an uncontaminated piece of land. Cut wild grass and cover the soil with it. Keep it moist by frequently watering. Microorganisms in the soil and air will start propagating on the grass and soil surface. Soil will become soft and you can use it as leaf mold. The time


Pile up different types of grass on soil and water frequently. Microorganisms propagate on soil surface and the soil turns soft. Use it as leaf mold; it is an excellent starter.

it takes differs greatly according to moisture, temperature and organic matter, but a rough guideline would be approximately 3 weeks in an optimum environment. Using wet grass is better than straw because straw has low moisture. This is a very easy method that can be done anywhere on earth.

Culturing microorganisms: After you have the starter (leaf mold), you culture it. Microorganisms normally take thirty minutes to divide into two. Accordingly, one microorganism will multiply to 1,048,576 (2^{20}) in ten hours. That is one million times in ten hours! This explains how disease can spread so fast in your crops.

So-called "experts" of microorganisms can explain for hours on the complicated procedure of cultivating microorganisms. They make it so difficult and hard that farmers would eventually quit trying to learn and do for themselves. Experts can add and keep adding a multitude of difficult conditions that need to be met to grow the "right" microorganism. At the end, farmers give up and purchase microorganism products. It has been their dirty strategy and an enduring one at that, to deprive farmers of knowhow, to deprive farmers of self-sufficiency, to deprive farmers of confidence. I shout out in rage that anybody can make microorganism at home. It is same as brewing wine. Traditionally every household knew and brew wine.

The principles are the same in brewing wine and culturing microbes. Input manufacturers and their agent-experts stress that it is very difficult, but this is something everybody knew in the past. Let me now introduce you this easy and powerful method of do-it-yourself microorganism cultivation.

To grow microorganisms you need food for them which we will call a "growth medium" or "culture medium." Preparing a medium can be very complicated and expensive if you desire to make it complicated and expensive. That means that even though you brought indigenous microorganisms from local mountains, if you use them with a medium you purchased commercially, the result will be neither wholly self-sufficient nor cost-saving.

How to make JMS 500 liters (132 gal)

Starter: Leaf mold 0.5 kg (1.1 lb)
Medium: Boiled potato 1 kg (2.2 lb) + sea salt 0.5 kg (1.1 lb)

You will need: Plastic container with lid, 2 socks or cotton bags, 2 rocks, stick, string (For heated cultivation you need heater and insulation)

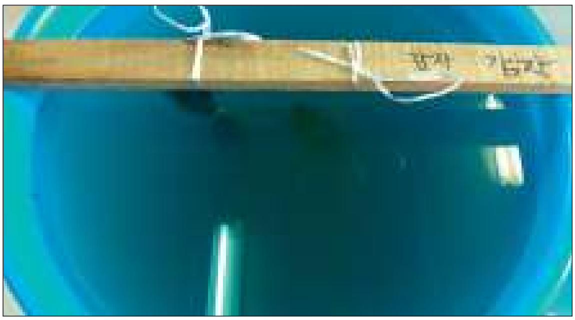
- To further diversify microorganisms, blend 1 kg of crop leaves and fruits, wild grass from the surroundings; add them in the solution as medium.
- If you increase or decrease the volume (500 L, 132 gal), adjust the starter and medium accordingly.
- The amount of starter and medium need not be strict. You can increase potatoes.
- 500 L (132 gal) of JMS can be diluted with water and be used for an area from 0.1 to 3.3 ha (0.25-8.2 ac).
- You must filter the liquid through a fine net before applying on soil or plants.
- In cold periods where water cools below 18 °C (64.4°F), use heaters.
- It takes 24 hours when the daytime temperature is 28°C (82.4°F); 72 hours at 25°C (77°F); 96 hours at 19°C (66.2°F).

Culturing at ambient temperature (Daytime temperature 25℃ (77℉), 72 hrs)

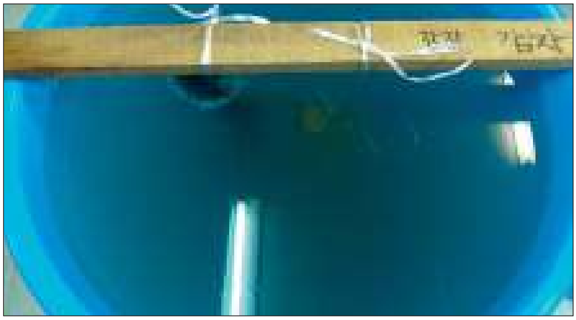
1. Prepare 1 kg (2.2 lb) of boiled potato for 500 L (132 gal) of water.

2.Put potatoes and rocks in cotton bag and knead until potatoes fully melt into the water. You can use blender.

3.Put leaf mold and rocks in cotton bag and knead so that the leaf mold melts into the water.

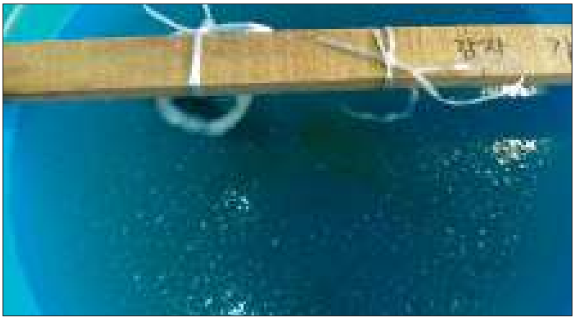


4.As microbes feed on potatoes and sea salt, bubbles start to rise. (Picture taken after 21 hours)



5. Size of bubbles increases. (32 hrs)

6.Foam will start forming a circle in the center. (46 hrs)



7. Foam becomes more vigorous as microbes keep propagating. (48 hrs)

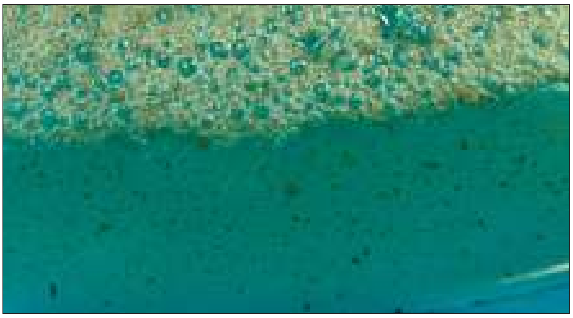
8.Area covered by foam increases, size of bubbles are also bigger. (50 hrs)

9.Foam is becoming more vigorous. (55 hrs)

10.Foam displays a clear circle. (67 hrs)

11.Foam is at its peak, forming a pizza-like layer. Cultivation is completed. (72 hrs)

12.Close-up view of the foam.



13. The space between container wall and the foam layer indicates that the microbial propagation is still ongoing.

14. Disc of foam starts to crumble; indicating that the microbes are starting to die. (84 hrs)

15. All nutrients of medium have been consumed; microbes die faster. (134 hrs)

16. All foam has disappeared, leaving behind a film. Microbes have perished. This is not suitable as JMS, but good for liquid fertilizer. (144 hrs)

Culturing at ambient temperature (Daytime temperature 19℃ (66.2℉), 96 hrs)

1.The lower the temperature, the smaller the bubbles will be. This is because low-temperature-loving microbes are smaller in size.

2. When these small bubbles form a round foam and the edges of the foam are clear, the cultivation is completed.

Just think of how we made wine in the past. Rice, barley, wheat, potato and sweet potato could all be used as ingredients. JADAM has tested these and whole range of other material as medium. JADAM's conclusion is that potato is the best medium. You can get it anywhere in the world. Cook potatoes, add sea salt and feed the microorganisms. Sweet potatoes are also good. Next, I recommend brown rice with mixed grains. It helps to add local wild grass or parts of crop after chopping them into fine particles. This method of using cooked potatoes or sweet potatoes or mixed grains keeps the end solution at around pH 6.5 unlike sugar or molasses that turn the solution into strong acid. pH 6.5 is best for the soil. This JADAM microorganism solution (JMS) will solve almost all soil problems.

The purpose of culturing microorganisms is to benefit the crops. It is best to culture them at the temperature condition same as the crops. A plant will experience all sorts of ups and downs in temperature during its growth. That is the environment we want to grow our microorganisms. However, microorganism manufacturers, their agents and "experts" say you have to keep it at 32℃ (89.6℉). Maintaining that uniform temperature actually does produce more foam and decomposes faster; but the microorganisms you get are not as suitable.

After bubbles hit their peak, they will gradually calm down as the microorganisms start to die. The size of an individual bubble and the vigor of foam production will differ according to temperature. This is so because microbes that propagate in lower temperatures are generally smaller in size. Your JMS might display small and weak foam, but it does not mean that you failed. As microbes start to die, the circular shape of foam will start to crumble and bubbles will die down. The best time for use is when the circular foam is at its peak. This state lasts approx. 12 hours so it won't be too difficult to recognize, particularly after a few tries. Completely use it up at the optimum period and then start culturing again. Do not leave any quantity unused as it can start smelling bad and attract mosquito larvae. If you missed the optimum period of use, dilute 10 times with water and use as liquid fertilizer.

At the peak-bubble period, the number of microorganisms reaches 1 billion per 1 ml. So if you made it with a 500 L (132 gal) container, you would effectively have produced yourself 1,000 bottles of microorganism products equivalent to the market-sold ones. That is a lot. 500 L (132 gal) of solution can be applied to an area of 0.1 to 3.3 ha (0.25 to 8.2 acres). If you apply JMS undiluted during plant growth, it can radically increase the microorganism population of soil and damage the roots. Dilute with over 10 times of water for use. Apply JMS before transplanting of seedlings and before flowering of fruit trees. On top of this JMS, add sea water/salt, phyllite solution and wild grass liquid fertilizer; use this continuously 3-4 times a month. Phyllite solution can be made separately and added when applying JMS, but you can also put the rock powder in a bag (1 kg for 500 L, 2.2 lb for 132 gal) and hang it on the JMS-culturing container. Replace phyllite after using 2-3 times.

Soil foundation work using JMS before transplanting and before flowering/sprouting is the most important technology in the JADAM organic farming system. Apply abundantly so that microorganisms and nutrients reach deep into the soil. This is crucial in inducing strong root settlement after transplanting and flowering/sprouting. This leads directly to high yield. For greenhouses where rainwater does not fall, repeat applying JMS with irrigation water, wetting the soil fully every time. For open fields, apply

JMS before rain, then microbes will reach into deep parts of the soil with rainwater. During the entire growth period, apply JMS to soil every time you water; supplement with foliar application. Your soil will change completely. JADAM soil foundation will solve the problems of nematodes, wilt and virus diseases which are all notoriously hard to cure. Making soil microorganisms active will suppress particular pathogens from taking over. Active soil microorganisms also raise the soil temperature; you will have less chill and freezing damages; you can have an early harvest. Increased diversity in microbes means increased diversity in nutrients for plants. The process is bolstered by sea water/sea salt with its 83 identified minerals. Contaminants in the soil are broken down by the microbes; roots settle well and plants become healthy. High yield and high quality is then no coincidence.

If you use air pump for culturing microbes, it produces too much foam and you cannot judge which period is the best for use. Do away with these machines; just cover the lid and let nature do her wonders. The microbes known to help farming – photosynthesis bacteria, lactic acid and yeast – are all anaerobic. Why would you want to pump oxygen into the solution with an air pump? It is important to use the JMS at peak-bubble period because when there is little foam the number of microbes are more than 10,000 times smaller. Microorganism is all about battle of numbers. To defeat soil pathogens, you need numbers to fight them. Always use JMS at its peak-bubble period.

How to culture microorganisms in winter: If the temperature of the water drops below 18℃ (64.4℉), you need to use heating and insulation. Pick a spot less affected by wind – inside a greenhouse is excellent – and be sure to wrap the container tightly with insulation on all sides (bottom, side and top). If the temperature is kept at 25℃ (77℉), foam will be vigorous; but if you want to culture microbes that are active in low temperature, grow them at 20℃ (68℉). At 20℃ (68℉), microbes that survive sub-zero temperatures (below 32℉) will propagate as well. JMS will completely change the shape of your farming.

Culturing microorganisms in low temperatures where water temperature drops below 18℃ (64.4℉)

(72 hours to completion using heating)

Pictures /demonstration by Hyunho Cha

Wrap with insulation so that heat does not escape from the side or bottom.

Cover the lid with insulation too.

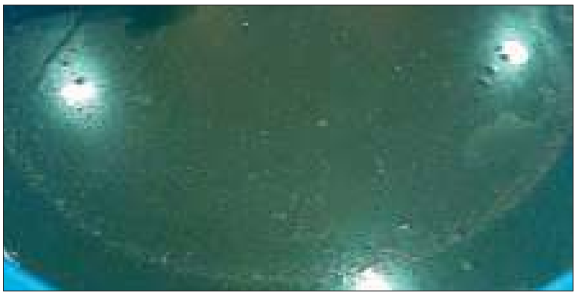
Use 3kw heater for 500 L (132 gal), 1.5kw for 100-300 L (26-79 gal).

Set the temperature; as the machine might not be precise, always test in prior.

Use an ELCB (Earth leakage circuit breaker) for safety; long-time running can cause overheating

Culturing microbes at around 20°C (68°F).

Bubbles are forming on the entire surface.



A clear disc has formed; it is time for use. (72 hrs passed)

Foliar application of JMS: JMS can be applied on soil or leaves. If you spray JMS regularly on the leaves and branches, microbial diversity will be maintained on the plants and this prevents a particular pathogen dominating. Caution is needed so that the solution does not leave marks on the plant. Spray marks left particularly on the fruits are a serious problem. When applying on the leaves, take extra caution to filter the JMS thoroughly. Use something finer than a fine net, such as fabric. Also, before application, you must mix the solution with JADAM wetting agent. JADAM wetting agent (JWA) coats the target evenly and helps in leaving no marks. For 500 L (132 gal), use 20 L (5.3 gal) of JMS and over 3 L (0.8 gal) of JADAM agent. You can add JADAM herb solution (JHS) or JADAM liquid fertilizer (JLF). Take care to filter when using JADAM liquid fertilizer made from JADAM herb solution, water and leaf mold. This is a pesticide, nutrient and fertilizer. For 500 L (132 gal), if you use more than 20 L (5.3 gal) of JMS, JADAM wetting agent will become less effective. JADAM wetting agent is easily broken down by microorganisms. For foliar application, always use water that passed JADAM wetting agent test (explained later). The method of using indigenous microorganisms from the local leaf mold was developed by Hankyu Cho. It was a big hit in and abroad. JADAM's method is a result of years of effort to make this method easier and more effective.

JMS is also useful for livestock: JMS can be fed to animals or sprayed on floors of animal shelters. It significantly reduces odor. It also increases feed conversion ratio. Dilute it ×20 with water and feed the animals. Pictures are organic animal growing method that began from Yamagishi movement of Japan and developed by Hankyu Cho. I myself have grown animals in this method and the results were astounding. Greatest advantage of this method is that you do not need to clean out the manure that accumulates on the floor. Microorganisms feed on the manure and they are turned into feed; it does not pile up. You only need to take them out about once a year. There is very little smell and flies. Animal manure on the floor will dry out nicely due to the sunlight and air circulation; sawdust, straw and microbes help decompose it; and animals will eat it again after it is fermented. The whole process is just so astonishing. This system has solved most of the problems raised in modern livestock farming. Go to en.jadam.kr to learn more of organic pig and poultry farming.

Organic livestock farming (no feces-removing)

Livestock shelter is facing south so that the sun will gradually warm all parts of the structure. Air comes in from sides and goes out through the opening on top; triggering air circulation. Roof is made from galvanized steel sheet which further promotes air circulation

Lay straw and rice husk on the floor. They are combined with animal feces; microbes act on them and become feed again. It is almost free of smell.

Organic pig farming where feces turns into feed after being mixed with sawdust and microbes. Add sawdust about once a year.

Watch the sunlight traveling through the floor. Sunlight and air circulation make a very comfortable living environment.

3. Grain medium for microorganism

Other than potatoes, grains are another excellent ingredient in culturing microbes. To grow many different microbes, you need medium that contains many different nutrients. If you cook rice using brown rice and other mixed grains, it will be wonderfully rich in nutrients. It is the best medium for grow-

To store the medium, blend the mixed grains, add 5 L (1.3 gal) of water and boil. Do not use pressure pots.

Pour into heat-resistant bottles while boiling; tightly seal; store in cool place.

ing microbes. Prepare so that brown rice is 7 parts and other grains 3 parts. You can buy mixed grains from the market. There are many cheap ones. The nutrients in the grains must be easily absorbable by the microbes if propagation is to speed up. Leave the grains in water before cooking for 1-2 hours; when cooking add a lot of water. If the dry grains weighed 0.5 kg (1.1 lb), add equivalent amount of water so that end-product weighs about 1 kg (2.2 lb). Use this as medium to make 500 L (132 gal) of JMS. Potatoes are easy to dissolve into water by kneading it inside a cotton bag, however, grains are more difficult. Easy method would be to add some water to the cooked grains and grind with an electric blender. And then, put it in cotton bag and knead it out into water. Don't worry about C/N ratio. It works well.

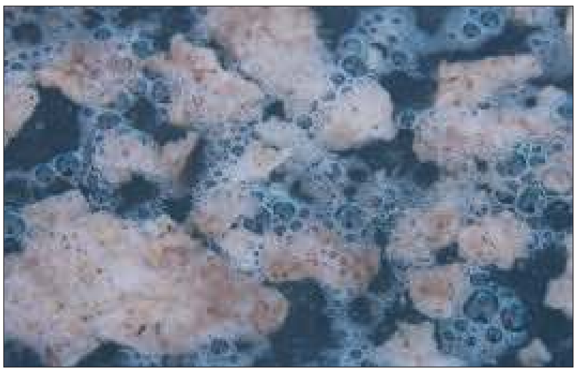
4. Customized microorganism medium

While using potatoes as the basic medium, you can add fruits, leaves and branches of a crop to make medium customized for that crop. This is in principle same as selective medium method used in labs. Bell pepper farms can use bell peppers to culture indigenous microorganisms that are best for bell peppers. For grapes, add grapes to medium. For tomatoes, use tomatoes. For 500 L (132 gal), blend 1 kg (2.2 lb) of the ingredient into fine particles; put in cotton bag; knead in water. When you add these ingredients to potatoes (or grains), the results are not visibly different. However, if you use these ingredients by themselves, the results are visibly different. That is because, for instance, when bell peppers are used as feed, microbes that like bell peppers will propagate. These microbes are the ones that help bell pepper farming. If you want to grow great strawberries, you need microbes that like strawberries in the soil. Use crop residues and waste fruits; you will have an even better JMS. You can still make JMS, using only the crop residues and not using potatoes, however, the problem is that it takes too long.







5. JADAM liquid fertilizer (JLF)

There are quite a few ideas that make no sense but have become common sense. They are claims like: it should not smell when you make liquid fertilizers; there should be no maggots; black mold should not form; you will be in trouble if you use smelly liquid fertilizer, etc. Our ancestors who did organic farming for millennia certainly did not think this way. They knew that the bad smell of liquid fertilizers equalled the sweet smell of fruits. All those famous local produce were made from the quite unsweet smelling human manure, green manure and organic waste. Let us not give up what our ancestors had been doing in harmony with the nature; what is easy and works; what saves money and energy. All those input manufacturers and their agents tenaciously continue an anti-campaign against traditional inputs. They are destroying the very foundation of our organic farming. This criterion of smell – that bad smell is bad and good smell is good – has gained such an enormous power that everybody believes so. Look how much farmers have already fallen prey to the businesspeople; 1 liter (33.8 fl oz) of imported liquid fertilizer costs an astounding 200 dollars. 1 L (33.8 fl oz) of liquid fertilizer permitted in organic production costs up to 100 dollars. Now, liquid fertilizers are costing more money for farmers than chemical pesticides. I would not be too exaggerating to say that farm input shops make profits through tie-in sales of liquid fertilizers to chemical pesticides.

I stress that liquid fertilizer is nutrient supplement. Any nutrient supplement should be judged by its nutritional value. Process of making them should be focused on destroying the nutrients in the least. Fertilizer with the richest nutrients are the best ones. I suggest that we view this input in the "nutritional perspective." Which kind of fertilizer is best for tomatoes? It is fertilizer made from tomatoes. That is the perfect answer. Nutritional perspective will make everything simple. Once you become faithful to this nutritional perspective, you will find that only I have the ingredients for my crops, only I can make it, and it only costs very little. It is an important method in JADAM to make liquid fertilizer from fruits, leaves and branches of the crop (crop residues). Add some wild grass you find around your field; they are the same "plant" as your crops and make excellent fertilizer. What's even better, they are free! Well known organic fertilizers such as rice bran, perilla pulp and oil cake are all nutritionally unbalanced.

All experts say that N, P, K, Ca, Mg, B, etc. are essential for crop growth. The solution they present is that you approach each nutrient separately; adjust each and every one of them to prepare the optimum balance of nutrients. Such approach is very complicated and nearly impossible for farmers to practice. It deprives the farmers of confidence in fertilizer. That is how fertilizer manufacturers and their agents take over. Fertilizer becomes something that only the trained professionals know; farmers accept it as a rule to buy fertilizer from the dealers. If you follow the logic presented by these experts, providing nutrients for plants cannot be more difficult. I wish to present a very, very simple method. Just use liquid fertilizer out of crop residues and wild grass. These materials have all the perfect balance of N, P, K, Ca, Mg, B, etc. that the crops need. It is such an easy and inexpensive method that anybody can practice; but we have wandered so far. Do not try to analyze the fertilizer in NPK instead, think of it this way: "things similar to my crops are good food for my crops." Use what is similar to the crops as base and additional fertilizers. Use crop residues and wild grass; this is an easy way to prepare the optimum balance of nutrients for your crops. Break the nutritional balance and you will have disease. So this problem of nutritional balance is the most important in farming. And the solution lies everywhere around you. Use cover crops for base fertilizer and use crop residues and wild grass liquid fertilizer as additional fertilizer. This makes farming so much easier.

C/N ratio is another theory that makes things complicated. This theory goes on to say that if the ingredient lacks N, then you need to supplement N for microbial growth. This is partially true, however, you can ignore this and still make fertilizer. It just takes longer. This C/N theory cannot explain how everything in nature is recycled. Another complicated theory is pH which says that too strong an acid is bad for the crops so you need to adjust it in advance. You need to measure the amount of lime to adjust the pH; this is another cumbersome work. In JADAM, pH is not a big problem because JADAM does not use sugar or molasses. The analysis of JADAM inputs shows that they are mostly around pH 7. Using water and leaf mold solves this issue. Another evil theory is that no-fully-fermented liquid fertilizer will do harm to crops. It is confusing because farmers are not sure at which stage it is "fully fermented." JADAM has a straight-forward answer: you can use JADAM liquid fertilizer at any stage. You need only to dilute it above ×30. JLF is similar to soy sauce; the longer it ages the better. More aged liquid fertilizers will be more easily absorbed. Standard is ×100 dilution. Calculate the volume of liquid fertilizer based on 1 t (264 gal) of water being used for 0.03 ha (0.08 ac). Try ×100 dilution first and see how it is; if too strong add less liquid fertilizer, if too weak add more. Our ancestor farmers used very strong liquid fertilizers (such as human manure) straight on the soil. It was diluted about 5-10 times.

Do not use black sugar or molasses. **Fill the container with the ingredient; fill up with water; add a handful of leaf mold; and close the lid – finished**. You don't even need to stir (unless the ingredient sinks to the bottom). Open the lid and check the liquid; if decomposition has progressed and it is quite dark, it is ready to use. It only takes 7 days in summer. However, JADAM recommends that you prepare the liquid fertilizer in the spring for use next year – the older the liquid fertilizer, the better. Prepare a plastic bowl with many holes, wrap it with fine net, place a rock in it (to make it sink), and put it in the JLF. Filtered liquid will gather in the bowl so it is easy to use. As you use it, the bowl will sink and finally touch the solids. Take out the bowl and put it in another

Liquid fertilizer made from potato leaves. Only 7 days passed but it is already good to use.

Put the JADAM liquid fertilizer containers in the same environment as the crops. That is how you propagate microbes adapted to that local environment. Put on lid securely so that evaporation is minimized. Larger containers can be used for larger farms.
Prepare many containers for liquid fertilizer; use them in sequence. Use filter as shown on the right page. After you have used all the liquid, do not take out the solids, just fill up with water and add leaf mold and continue use, repeat this. Inside of containers do not need cleaning. Above is 500 L (132 gal) container and below is 5 t (1,320 gal). (Picture: www.mooltong.com).

liquid fertilizer container. Do not remove the solids; fill up the used container with crop residues and wild grass on top of the used solids. Fill up with water again, add leaf mold and close the lid. You do not need to ever take out the solids from a liquid fertilizer container. Inside of the container does not need cleaning. Liquid fertilizers are made under the sun, shut with a lid. For long-term storage, tie the lid tightly with a rope or put on heavy rocks to minimize evaporation. This is how simple it is. JADAM has opened the world of liquid fertilizer for you. Nutritional balance in the soil becomes optimized for the crops as you use this liquid fertilizer. You can use very large containers like 5 t (1,320 gal) or 10 t (2,640 gal) if your farm is big. Fill up the container with crop residues and wild grass, fill up with water, add 2-3 kg (4-5 lb) of leaf mold, close lid, use after about 3 months. Here is a picture of how to use it in large quantities. Place a box covered in fine net in the liquid fertilizer container. Put a rock in it to sink it. If you run a motored pump, you can get large quantities of liquid fertilizer. Occasionally add more crop residues and wild grass, water and leaf mold. This simple method produces fertilizer for huge fields. You can make crop residues, fruits and wild grass together in one liquid fertilizer or separately. If you have a nitrogen-rich ingredient (e.g. food waste, fish), it is better to make it separately. If the ingredients float on top (as in grass, fruits, food waste), you do not need to stir. If it sinks down (as in powders), then stir occasionally. When making liquid fertilizer out of dry powdery ingredients, add 10 times water of the weight.

Place a fine net on a long pipe with holes. Stick the pipe into the liquid fertilizer then the liquid will be filtered and gather in the pipe.

You can add sea salt to liquid fertilizer up to 0.1% salinity (0.5 kg in 500 L, or 1.1 lb in 132 gal) except for human feces, urine and food waste. If the liquid fertilizer smells too awful, add phyllite powder to 0.2% (1 kg for 500 L, or 2.2 lb for 132 gal). For foliar applicationof liquid fertilizer, it is important to use it **well-filtered and mixed with JADAM wetting agent** so as to coat well and not to leave marks on the plant.

Liquid fertilizer filter. The liquid passes through 100 mesh steel filter. This prevents hoses from being blocked. Open the round cap and clean regularly.

Making liquid fertilizer filter 1 (for 500 L or 132 gal)

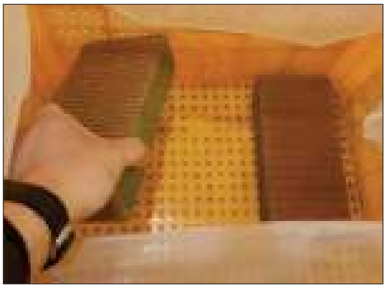
Pictures /demonstration by Hyunho Cha

1. Prepare a plastic box.

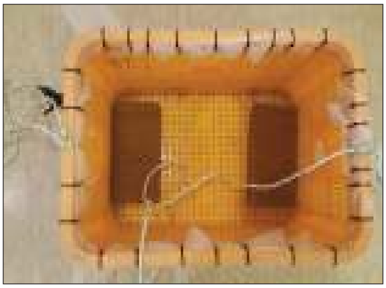
2. Put the box in a fine net bag.

3. Fix the net tight on the box with a thick rubber.

4. Cut the top to make an opening



5. Put bricks to sink the box.



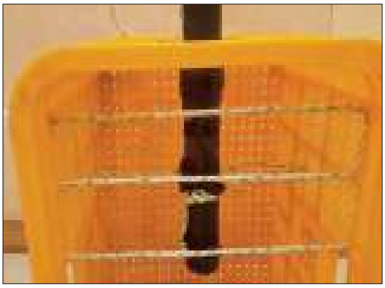
6. Rope on the side is to control the sinking (so that the box does not entirely submerge).

Making liquid fertilizer filter 2 (for 2-10 T or 528-2,641 gal)

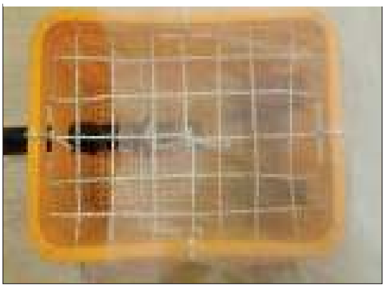
1. Drill a hole on the side of a plastic box.

2. Place a pipe so that the opening is in the middle of the box. The pipe will be connected to an electric motor

3. Fix the pipe tight.



4.Tie nylon string above the open side of the box so that it will not collapse.



5. Put the box in fine net bag.

6. Tightly tie the opening of the bag. Put it in 5 t (1,320 gal) container and connect the motor.

Wild grass JADAM liquid fertilizer

Wild grass contains 1.5 to 2.5% nitrogen (N) for its dried weight. Grass collected in spring has a higher nitrogen content. Fill the container with wild grass, fill up with water, add a handful of leaf mold and close lid. Crops are plants. Use plants as feed. You can add crop residues.

Dilution	20~300 times
When to apply	Throughout growth
How to apply	Soil,foliar application
What to eapect	Balanced growth
How long to make	More then 10 days




Analysis of wild grass JLF (100 L or 26 gal: wild grass, water, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
6.9	0.67	0.21	0.12	0.01
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
9.25	0.070	0.071	0.015	0.005
Na_2O %	Fe $mg \cdot kg^{-1}$	Mn $mg \cdot kg^{-1}$	Zn $mg \cdot kg^{-1}$	Cu $mg \cdot kg^{-1}$
0.002	15.885	1.376	0.253	0.012
Cd $mg \cdot kg^{-1}$	Cr $mg \cdot kg^{-1}$	Ni $mg \cdot kg^{-1}$	Pb $mg \cdot kg^{-1}$	As $mg \cdot kg^{-1}$
-	-	-	0.101	-

Purslane JADAM liquid fertilizer

Dilution	20~300 times
When to apply	Throughout growth
How to apply	Soil,foliar application
What to eapect	Balanced growth
How long to make	More then 10 days

Purslane is one of the fastest disintegrating wild grasses. Fill the container with purslane, fill up water, put in a handful of leaf mold, close lid. Decomposition is almost complete in 10 days. It is an effective fruit color enhancer. Purlslane has a high nitrogen content compared to other wild grasses. Purslane is a very common plant growing anywhere, yet they make excellent fertilizer. Decomposition is fast because it is relatively high in nitrogen and the tissue is soft.

Analysis of purslane JLF (100 L or 26 gal: purslane, water, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
8.4	13.89	0.64	0.37	0.20
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
1.91	0.004	0.133	0.012	0.021
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.038	1.037	0.316	0.701	0.049
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	0.041	-	-	0.011

6. Customized JADAM liquid fertilizers

An egg is single-celled. If it is kept warm for a certain period of time, cell division occurs and a perfect form of life is born. An egg has all the nutrients needed to create a life. No wonder it is called the "perfect food." Let's understand plant in a similar way. A fruit contains all the nutrients needed by a seed to sprout and grow into a perfect form of life. Just like an egg is the child of a chicken, a fruit is also the child of a crop. So fruit is equivalent to the egg. Do not turn them into waste.

Collect your fruits, including diseased ones, and turn them into liquid fertilizers using water and leaf mold. Before collecting the fruits, fill half of the container with water. Don't forget to add a handful of leaf mold. Put the fruit in the water until the container is full. If you want a fertilizer that has the best nutrients for the tomato, make fertilizer from tomatoes. To grow strawberries, use liquid fertilizer made from strawberries. For melons, use melon liquid fertilizer. Remember to look at liquid fertilizers from the "nutritional perspective." That particular fruit has the best nutritional composition for that fruit. Your left-over, unsold fruits will turn into precious fertilizers for next year's farming.

Strawberry JADAM Liquid Fertilizer

Dilution	20~300 times
When to apply	Throughout growth
How to apply	Soil,foliar application
What to eapect	Balanced growth
How long to make	More then 1 month

Gather strawberries that were unsold, left-over, diseased, ugly, malformed, etc. Don't worry about diseases; just turn them into liquid fertilizer. Once microbial diversity is acquired, disease-causing organisms cannot gain dominance. Fill half the container with water, add a handful of leaf mold and then put in strawberry residues whenever produced. You will be able to make next year's liquid fertilizer as you go ahead with this year's farming. Strawberry has what strawberry needs.

Analysis of strawberry JLF (100 L or 26 gal: strawberry, water, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
7.9	11.69	0.58	0.34	0.17
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
1.95	0.007	0.088	0.006	0.008
Na_2O %	Fe $mg \cdot kg^{-1}$	Mn $mg \cdot kg^{-1}$	Zn $mg \cdot kg^{-1}$	Cu $mg \cdot kg^{-1}$
0.061	5.291	1.637	0.546	-
Cd $mg \cdot kg^{-1}$	Cr $mg \cdot kg^{-1}$	Ni $mg \cdot kg^{-1}$	Pb $mg \cdot kg^{-1}$	As $mg \cdot kg^{-1}$
-	0.024667	-	0.203	0.0141333

Cherry tomato JADAM liquid fertilizer

Dilution	20~300 times
When to apply	Throughout growth
How to apply	Soil,foliar application
What to eapect	Balanced growth
How long to make	More then 10 days

Gather cherry tomatoes that were unsold, left-over, diseased, ugly, malformed, etc. Fill half the container with water, put in a handful of leaf mold. Put in the cherry tomato residues as you gather them. Keep lid closed. You will notice that the peel is slow in disintegrating. You can add tomato leaves or branches. A handful of leaf mold is sufficient regardless of the container size. Remember that fruits are like eggs – the perfect food.

Analysis of cherry tomato JLF (100 L or 26 gal: cherry tomatoes, water, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
8.2	21.20	1.22	0.71	0.27
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.65	0.006	0.153	0.006	0.004
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.045	2.468	0.308	0.583	0.019
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	0.0706667	-	0.113	0.0147333

Spinach JADAM liquid fertilizer

Dilution	20~200 times
When to apply	Throughout growth
How to apply	Soil,foliar application
What to eapect	Balanced growth
How long to make	More then 10 days

By-products or residues from a crop collected during harvest are turned into excellent liquid fertilizers for that crop. Seen from a nutritional perspective, JLF can only be perfect when made from its own body. Fill the container with spinach residues, fill up water, add a handful of leaf mold. For spinach, use spinach JLF; for leek, use leek JLF; for potato, use potato (or parts of its body such as leaves) JLF.

Analysis of spinach JLF (100 L or 26 gal: spinach, water, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
8.8	17.56	0.84	0.49	0.29
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
1.71	-	0.126	0.006	0.015
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.046	3.923	0.327	0.655	0.025
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As$mg{\cdot}kg^{-1}$
0.0026667	0.2873333	0.0033333	0.623	-

7. Food waste JADAM liquid fertilizer

We were told that because the food waste is too salty, it cannot be used as fertilizers or else the salinity will damage the crops. This intimidation strategy was adopted by fertilizer companies and their agents for decades. Farmers, who had salt accumulation in their soil, quickly bought this idea. Now, almost nobody uses food waste as fertilizer. If all the farmers of the country made fertilizer out of food waste like our ancestors did, fertilizer market of this huge size would never have formed. No wonder they do their best to stop farmers from using food waste as fertilizer. But let us look at the claim of salinity more closely; you will realize that this was a fraud. Salty food we normally consume such as kimchi or sauerkraut is around 1.5% salt. Most other foods are less salty. When making food waste into JLF, you add water so the salinity drops below 1%. This is below compost standard stipulated by law. When you add leaf mold and start fermenting, salinity drops further. You can see in the following analysis that the Na_2O level is merely 0.204% (Na_2O level is used to determine salinity). Then again, this is diluted 100 to 1,000 times with water before use; then the liquid that is actually applied to the plants has a salinity lower than 0.002%.

Let me tell you a big comedy. Look at the back of the compost bags sold by fertilizer companies. It will read that salt is 2%. That is over 10 times salty compared to food waste JLF. They sell this salty compost while blocking the use of food waste claiming that it is too salty. This is how corporations operate; they have taken away compost, microbes, liquid fertilizers, everything from the farmers and turned them into products to sell back at the farmers. All those workshops and educations seldom help farmers; most of them are a disguised exploitation. It is this injustice that JADAM wishes to correct. Farmers and farming are being systemically destroyed. Look at the analysis next page; food waste JLF is full of nutrients. Nitrogen is about 20 times higher than wild grass JLF. If you gather all food waste from a household, you can make 2,000 L (528 gal) of JLF in a year. It is full of N, P and K. Use wild grass, fruits and crop residue JLF as the main additional fertilizer; when plant growth weakens, add food waste JLF. Standard dilution is ×100. Calculate the volume of food waste JLF based on 1 T (264 gal) of water going into 0.03 ha (0.8 ac).

Food waste JADAM liquid fertilizer

Dilution	30~500 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 6 months

Gather food waste and wastewater (water that washed food, etc.) in a container. Add water as necessary. You need a lot of water for faster decomposition. Food and water being one to one is good. Add leaf mold occasionally. It will smell awful; that is because of high nitrogen. Add 1 kg (2.2 lb) of phyllite or fruit peels to reduce smell.

Analysis of food scraps JLF (100 liters or 26 gal: food waste, water, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
7.1	45.15	13.84	8.03	2.93
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.74	0.054	0.138	0.015	0.009
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.204	11.165	0.521	1.545	0.221
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
0.004	0.1693333	-	0.627	0.0060667

8. Human excreta (feces and urine) JADAM liquid fertilizer

Most of the famous Korean local brands of produce were made through the use of human manure liquid fertilizer. There was a saying that nothing is as sweet as that which is grown with human manure. In Korea in the past, human manure was so treasured that there even existed trade that bought and sold the rights to collect human manure. However, the introduction of flush toilets as a means to attain hygiene and convenience completely exterminated human manure from our farming. Human excrement and urine are permitted materials under the Organic Farming laws. Let us re-discover this precious resource.

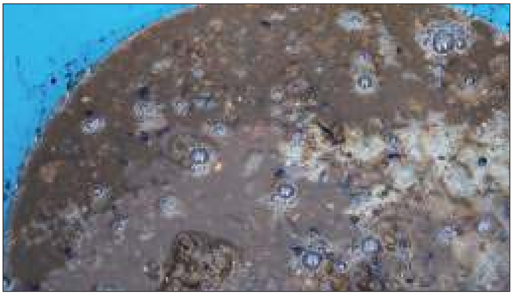
The Soil Association (SA), the organization that first introduced organic certification system in 1967 and is currently certifying over 80% of UK organic food, has emphasized the value of human manure. Its 2010 report “Peak Phosphorus and the Threat to Our Food Security” announced that human manure will play a vital role in food security for the future. It affirms that phosphate rock – the ingredient for phosphorus fertilizer – will reach its peak production in 2033; price will soar after that. It stresses the importance of bringing human manure back to farming. There was a case in 2007-2008 where phosphate rock price soared 800%. Human manure is rich in N, P and K; it is the last option we have in the coming age of chemical fertilizer depletion. Vegetarians produce around 400 g (0.9 lb) a day, meat-eaters about 150 g (0.3 lb). A productive (?) person will produce 0.2 T (441 lb) of feces a year. An adult produces about 1-2 kg (2.2-4.4 lb) of urine a day; making it 0.5 T (1,102 lb) a year. Surprisingly, one day’s urine from an adult contains 30 g (1 oz) of urea. Besides urea, the liquid is also rich in various amino acids and inorganic salts. Should you really keep throwing these away? Our ancestors saw feces and urine as “money.” We need to re-discover human manure. It is foolish to flush this fertilizer away; they become nothing but environmental pollutants when in fact they can save the environment. Let’s build excrement-collecting toilets again on the farm. If you throw in wood chips and rice stalks before use, the splashing won’t be so bad! A family of four will produce 1 T (264 gal) of human manure liquid fertilizer, over 2 T (528 gal) of urine fertilizer, and 2 T (528 gal) of food by-product liquid fertilizer. What moree do you need? Look at the analysis tables and you will see that they are all excellent sources of nutrients.

Many argue that organic farming should be combined with organic livestock farming. The reason is that they want to promote the use of livestock manure as fertilizer. I do not understand why you would need animals when your family can produce better quality fertilizer! **Our body is the ultimate fertilizer producing machine.**

Urine JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 6 months

Urine JLF is over 30 times richer in nitrogen compared to wild grass JLF. It is a good replacement for chemical fertilizers. Collect urine all the time, throw in leaf mold occasionally, keep lid closed to limit evaporation. Organic farming regulations says it has to be used after full fermentation and dilution. Use wild grass and fruit JLF as the main additional fertilizer. When growth seems weak, use urine JLF diluted ×100 to supplement N. Use when crop growth is weak.



Analysis of urine JLF (100 liters or 26 gal: urine, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
9.1	61.15	10.07	5.84	2.48
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.35	0.016	0.183	0.009	0.002
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn$mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.203	3.108	0.444	0.865	0.165
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	0.084667	-	0.566	0.0113667

Human feces JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 6 months

Although the nutritional contents of human excrement liquid fertilizer will differ according to what kind of diet the person is on, certainly the matter is a very rich source of N, P and K. Simply throw in leaf mold in feces container. In organic farming regulation, you have to ferment in high heat (over 50℃ or 122℉) for over 7 days, or over 6 months in low temperature (ambient). It cannot be directly sprayed onto parts for human consumption.

Analysis of human feces JLF (100 L or 26 gal: human feces, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
9.5	12.51	9.19	5.33	3.92
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
1.36	0.085	0.212	0.002	0.000
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.411	2.121	0.002	0.745	0.090
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
0.002	0.041	-	0.093	0.022

9. Natural nitrogen JADAM liquid fertilizer

Protein is broken down into amino acids by microorganisms. These amino acids are a source of nitrogen for plants. You can choose any ingredient in nature that is rich in nitrogen and ferment it with water and leaf mold – JADAM style; then you will have a nitrogen fertilizer. Do not worry about smell or maggots; they do not signify anything wrong. Fish JLF has approximately 1/5 the nitrogen contained in urea fertilizer; however, it is of much higher quality than urea. Urea consists only of nitrogen but fish liquid fertilizer has a wide variety of other nutrients. Growth of the body of a plant is like building a house; you cannot build house just with cement (N). You need a variety of other material to build a house. Same with plants; you need a diversity of nutrients. Liquid fertilizer is high-quality when it contains a variety of other nutrients. Use wild grass and fruit JLF as the main additional fertilizer; use fish JLF to promote growth.

Mackerel JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 3 months

Fill half the container with mackerel. Fill up with water and throw in a handful of leaf mold. No need to stir. If there is too much mackerel, decomposition will be significantly slower; make sure you have enough water. To reduce smell, add phyllite. You can make JLF out of any animal byproducts. This has 3 times the nitrogen of human manure JLF and 50 times that of wild grass and fruit JLF. When using in early stage of growth, dilute over ×1,000.

Analysis of mackerel JLF (100 liters or 26 gal: mackerel, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
6.8	135.15	128.20	74.36	10.98
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
3.24	0.332	0.729	0.023	0.012
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.189	10.608	0.181	1.636	0.084
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
0.0028	0.813	0.172	-	0.020

Fish Meal JADAM Liquid Fertilizer

Put in fish meal (dried powder) in the container and add water 10 times its weight. Add a handful of leaf mold. Because the solid keeps sinking, you have to stir it every 7-10 days for at least 3 months. After 3 months, stir once a month. The longer it ages, the higher the nitrogen content becomes. You can heat the solution to speed up the process.

Dilution	50~500 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 3 months

Analysis of fish meal JLF

(100 liters or 26 gal: fish meal 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
6.1	8.16	4.36	2.53	4.69
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
3.67	0.002	0.174	0.046	0.039
Na_2O %	Fe $mgkg^{-1}$	Mn $mgkg^{-1}$	Zn $mgkg^{-1}$	Cu $mgkg^{-1}$
0.148	25.136	0.212	1.419	0.142
Cd $mgkg^{-1}$	Cr $mgkg^{-1}$	Ni $mgkg^{-1}$	Pb $mgkg^{-1}$	As $mgkg^{-1}$
-	-	-	0.461	-

Fresh Anchovy JADAM Liquid Fertilizer

Dilution	100~1000 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 1 months

Fresh anchovies decompose very fast. They have a superior nutritional balance because the entire body of the fish is used. Fill half the container with anchovies, fill up with water and add a handful of leaf mold. You do not need to stir. If there is too much fish, the water becomes too thick and the microorganisms' activity will slow down, prolonging the fermentation period.

Analysis of fresh anchovy JLF (100 liters or 26 gal: anchovy 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
9.2	69.60	25.15	14.59	5.08
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.87	0.107	0.194	0.004	0.001
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.208	7.547	3.009	0.909	0.071
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	0.1473333	-	0.174	0.0694

Perilla pulp JADAM liquid fertilizer

Dilution	30~500 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 3 months

Put in perilla pulp in the container and fill it up with water 10 times its weight. Add a handful of leaf mold. Stir every 7-10 days. It takes several years for the husks to break down completely. Rice bran, chicken manure, pig manure, all sorts of press cakes can be made into JLF this way. Water and leaf mold is all you need. Rice bran JLF is great for rice.

Analysis of perilla pulp JLF (100 liters or 26 gal: fish meal 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
7.7	30.15	13.75	7.97	3.00
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.66	0.008	0.314	0.028	0.017
Na_2O %	Fe $mg \cdot kg^{-1}$	Mn $mg \cdot kg^{-1}$	Zn $mg \cdot kg^{-1}$	Cu $mg \cdot kg^{-1}$
0.044	5.339	0.591	1.037	0.273
Cd $mg \cdot kg^{-1}$	Cr $mg \cdot kg^{-1}$	Ni $mg \cdot kg^{-1}$	Pb $mg \cdot kg^{-1}$	As $mg \cdot kg^{-1}$
0.01333	0.204667	0.122	0.333	-

Fish by-product JADAM liquid fertilizer

Dilution	100~1,000 times
When to apply	Early to mid-growth
How to apply	Soil,foliar application
What to eapect	Promotes growth
How long to make	More than 3 months

Fill half the container with fish by-product. Fill up with water. Add a handful of leaf mold. You do not need to stir. If you fill more than half the container with fish, the decomposition will be slow. If oil layer forms on top, add more water and leaf mold. After an extended period of fermentation, even the bones will melt away and enrich the liquid with calcium and phosphorus. Dilute 1,000 times in early growth stage.

Analysis of fish by-product JLF(100 liters or 26 gal:fish by-product 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
7.7	99.40	40.86	23.70	7.44
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
3.19	0.127	0.094	0.035	0.008
Na_2O %	Fe $mg \cdot kg^{-1}$	Mn $mg \cdot kg^{-1}$	Zn $mg \cdot kg^{-1}$	Cu $mg \cdot kg^{-1}$
0.218	34.335	0.895	1.513	0.186
Cd $mg \cdot kg^{-1}$	Cr $mg \cdot kg^{-1}$	Ni $mg \cdot kg^{-1}$	Pb $mg \cdot kg^{-1}$	As $mg \cdot kg^{-1}$
0	0.054667	-	0.553	-

10. Natural calcium phosphate JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Mid to late growth
How to apply	Soil,foliar application
What to eapect	Controls growth
How long to make	More than 3 months

Animal bones consist of around 20% phosphate (P) and 20% calcium (Ca). Fill a container with 1 part bone powder and 10 parts water (by weight). Add a handful of leaf mold. Stir regularly. These elements have an important role in controlling bodily growth but stimulating reproductive growth. Apply this through irrigation or spray on soil in the later stage of fruit growth to strengthen flower buds. It can be used for winter pest control or applied to the branch or stem

Analysis of calcium phosphate JLF (100 L or 26 gal: bone meal 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
7.4	2.58	0.88	0.51	0.16
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
3.25	0.065	0.023	0.016	0.012
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.024	3.942	0.061	0.190	0.021
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb$mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	-	-	0162	-

11. Natural calcium JADAM liquid fertilizer

Oyster shell JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Mid to late growth
How to apply	Soil,foliar application
What to eapect	Controls growth
How long to make	More than 3 months

Oyster shell powder and egg shell powder make for excellent sources of calcium. Fill a container with 1 part oyster shell powder and egg shell powder and 10 parts water (by weight). Add some wild grass and a handful of leaf mold. Stir occasionally. The longer it ages, the richer calcium content becomes. Take out and use the upper water and fill up again. Use calcium liquid fertilizer to control later-stage growth, increase storability, and improve taste.

Analysis of calcium JLF (100 L or 26 gal: oyster shell 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
8.1	0.42	0.04	0.02	0.01
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.09	0.002	0.007	0.021	0.003
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.019	4.757	0.154	0.219	-
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	-	-	0.673	-

Quick oyster shell JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Mid to late growth
How to apply	Foliar, soil application
What to eapect	Controls growth
How long to make	More than 1 months

It takes over 3 months for the water and leaf mold to produce calcium JLF. However, if vinegar or wood vinegar is used, you can make this in one day. Prepare vinegar or wood vinegar. Add oyster shell powder (1/10th the weight of the vinegar) slowly in small quantities. Bubbles will spill out if too much is put in at once. When used with JADAM wetting agent, it reduces foam and wetting power. Use through drip irrigation.




Analysis of quick oyster shell JLF(100 liters or 26 gal: oyster shell 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
5.74	14.71			
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
	3.91	4.38	7.30	6.97
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.218	32.16	4.105	0.227	0.120
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
		-		-

12. Natural potassium JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Mid to late growth
How to apply	Soil,foliar application
What to eapect	Larger fruit size
How long to make	More than 3 months

Sulfate of potash magnesia, also known as Sul-Po-Mag or K-mag (K, Mg and S) is not dissolved in water easily. Add 1 part K-mag to 10 parts water. Stir every 2 to 3 days. If you do not stir often the solution can harden. You can also use potassium sulfate (K and S) which dissolves more easily. Another method is using wood ash. Gather ash in a gunnysack. Place in water for 15 days

Analysis of Sul-Po-Mag JLF (100 L or 26 gal: sulpomag 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
8.1	0.42	0.04	0.02	0.01
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.09	0.002	0.007	0.021	0.003
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.019	4.757	0.154	0.219	-
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	-	-	0.673	-

13. Natural chitosan JADAM liquid fertilizer

Dilution	50~500 times
When to apply	Mid to late growth
How to apply	Soil,foliar application
What to eapect	Controls growth
How long to make	More than 3 months

Allow microorganisms to break down crab and shrimp shells and you will have chitosan liquid fertilizer. Fill up a container with 1 part shell powder and 10 parts water (by weight). Add some wild grass, and a handful of leaf mold. This solution has a whole variety of minerals including calcium so is helpful in controlling growth and increasing taste and aroma. Microorganism activity can be stronger than other inputs. Not only chitosan microbes act in decomposition, microbes from leaf mold all work together.




Analysis of chitosan JLF (100 L or 26 gal: crab shells 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
7.2	7.24	2.08	1.62	0.39
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
4.17	0.003	0.070	0.354	0.078
Na_2O %	Fe $mg \cdot kg^{-1}$	Mn $mg \cdot kg^{-1}$	Zn $mg \cdot kg^{-1}$	Cu $mg \cdot kg^{-1}$
0.076	9.302	0.571	0.195	0.701
Cd $mg \cdot kg^{-1}$	Cr $mg \cdot kg^{-1}$	Ni $mg \cdot kg^{-1}$	Pb $mg \cdot kg^{-1}$	As$mg \cdot kg^{-1}$
-	-	-	0.307	-

14. Natural mineral JADAM liquid fertilizer

Humus soil liquid fertilizer

Dilution	30~500 times
When to apply	Throughout growth-
How to apply	Soil,foliar application
What to eapect	Improves quality
How long to make	More than 3 months

Humus soil was formed at the bottoms of swamps or reservoirs millions of years ago. It contains a lot of nutrients good for plant growth. It can be used by simply putting it in water but it can also go through long-time fermentation like other JLFs. Place humus soil in container with 10 times its water, add some leaf mold and wild grass. Using this method, many different rock powders can turn into liquid fertilizers. Sea water or sea salt is also excellent mineral fertilizer.

Analysis of humus JLF (100 L or 26 gal: humus soil 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
8.1	0.42	0.04	0.02	0.01
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
2.09	0.002	0.007	0.021	0.003
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.019	4.757	0.154	0.219	-
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	-	-	0.673	-

Phyllite JADAM liquid fertilizer

Dilution	30~500 times
When to apply	Throughout growth-
How to apply	Soil,foliar application
What to eapect	Improves quality
How long to make	More than 3 months

Phyllite is a kind of metamorphic rock that is formed from the deposit of the remains of plants and animals that lived millions of years ago. It contains a variety of minerals needed for plant growth. It is particularly effective in improving taste and aroma. Sedimentary rocks are generally black in color and break easily; when sedimentary rocks are further solidified they become metamorphic rocks and granite. Place phyllite dust, some wild grass, sea salt and a handful of leaf mold. Add water 10 times the weight of phyllite powder.

Analysis of phyllite JLF (100 L or 26 gal: phyllite 10kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
7.2	7.24	2.08	1.62	0.39
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
4.17	0.003	0.070	0.354	0.078
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.076	9.302	0.571	0.195	0.701
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As$mg{\cdot}kg^{-1}$
-	-	-	0.307	-

15. Natural color enhancer

Dilution	30~500 times
When to apply	Throughout growth-
How to apply	Soil,foliar application
What to eapect	Enhances color
How long to make	More than 3 months

If the microorganisms break down material that contains a large quantity of iodine (I), then you can make natural color enhancers. Most types of seaweeds are good; kelp is particularly effective. Kelp produces peculiar white bubbles and stickiness during the making but they will disappear later. If it is dried kelp, add water 10 times its weight; when fresh, fill half the container with kelp, then add water to fill it up. Add a handful of leaf mold. Purslane is also good for enhancing fruit color.

Analysis of natural color enhancer (100 L or 26 gal: dry kelp 10 kg or 22 lb, leaf mold)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
6.9	0.67	0.21	0.12	0.01
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
9.25	0.070	0.071	0.015	0.005
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.002	15.885	1.376	0.253	0.012
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	-	-	0.101	-

Note: The production period presented is for May. Analysis of liquid fertilizer may differ in different conditions.The JLFs that have been analyzed and presented in the analysis tables all have phyllite and sea salt in them but you can make JLFs without them.

❒ How to read the analysis table:

pH: hydrogen ion concentration. The pH scale ranges from 0 to 14. A pH less than 7 is acidic. A pH greater than 7 is alkaline. Each unit change in pH represents 10 times as many ions in the solution. Therefore, dilution with water 10 times leads to one unit change in pH.

EC: It is measured based on the fact that electricity is conducted well if there are ionized ions dissolved in water. It is an indicator to estimate the amount of total dissolved salts or concentration of nutrients.

OM: An indicator of the amount of dissolved organic matter in liquid.

T-C: Total carbon in liquid

T-N: Sum of inorganic and organic nitrogen

C/N: Carbon to nitrogen ration. The more the nitrogen, the lower the ratio becomes.

$mg \cdot kg^{-1}$: How many milligrams are in a kilogram. Also written as ppm.

- : not found

16. Fertilizer for nutritional balance

What is fertilizer about? Fertilizer is all about how to skillfully apply base (applied before planting) and additional fertilizers (applied during growth) so that they provide the optimum nutritional balance for crops. Current widespread methods of applying fertilizer, or fertilizer programs, all take an "individualized" approach where they consider each and individual nutrient elements and add or subtract them in fertilizer application. This individualized method gained such dominance that nobody raises any question. Most farmers believe this method to be scientific and study it for years after years. Farmers, in hope that they can become a master one day, pursue a concrete answer, a practical method, but they find themselves still confused after having spent decades. It is because they are still confused that they give up designing their own fertilizer program but eventually entrust it upon the "experts." Fertilizer program for each crop is so complicated and difficult.

Even if you read all the fertilizer books taught in universities, it is still near impossible to find the answer to the perfect fertilizer program. But pause and think of it then it is no coincidence that knowledge and technique have evolved into this complicated and difficult form. Behind it, lurk the expert group and fertilizer companies that seek to forever be the exclusive owner and beneficiary of this knowledge. When I travel to countries with highly modernized and advanced agricultural industry, I cannot erase the feeling that the taking-over of agro-technology by the corporation has been completed. All around the world, it has become nothing unusual for a farmer to receive full services from businesses ranging from soil analysis, fertilizer program to pest control. But of course, nothing is free. Large lump of money earned by farmers will flow into the service providers' pockets. No wonder why careercast.com announced that by 2012-2022, the second job to disappear would be farmers.

Modern medicine elaborated complicated theories on human health so that people feel they cannot take care of their own health. Such theories explain human health in extremely sophisticated mechanism. The result? People buy medical services to maintain their health. Through a person's life, one will spend 0.1 million dollars on average just to keep healthy. Farming is becoming something similar. This business group continues to make technology more difficult, frequently partnering with scholars and media to dissuade farmers. It is violence disguised in kindness. German philosopher and revolutionary Karl Marx (1818-1883) pointed out that "When commercial capital occupies a position of unquestioned ascendancy, it everywhere constitutes a system of plunder." Unfortunately, in agriculture, we now evidence this system of plunder constituted in every corner possible. JADAM takes this very seriously. Farming is becoming more high-cost and less profitable. Farmers are becoming more technology-dependent and less self-sufficient. It is JADAM's mission to bring farming back to the farmers. JADAM cannot but look back at traditional Korean agriculture. Farmers of those days valued what was cheap and easily available; farming costed almost nothing. They did not buy sophisticated inputs but still did very well; this small land of Korean peninsula successfully fed its people for five thousand years which was possible only because the method of farming they practiced made soil richer by the season. They did not have complicated fertilizer programs, back-breaking turning of compost, sophisticated pest control technologies, no difficult books or trainings; but still they did well. They were self-sufficient down to the seeds. It was a farming completely free from commercial capital.

Fertilizer experts will tell you that in the early stage of plant growth (nutritional growth cycle), the plant needs a lot of nitrogen, so you need to come up with high-N fertilizer program. When the plant flowers and fruits, it needs a lot of phosphorus (reproductive growth cycle) so you need a high-P fertilizer program. When fruits grow larger, you need high-K and when fruits mature, you need high-Ca. They go on to elaborate about at which period you need to apply Mg, B, Mn, Mo, etc. Then they bring in plant hormones such as cytokinin, gibberellin and auxin. Learn all this, and farmer's brain will overload.

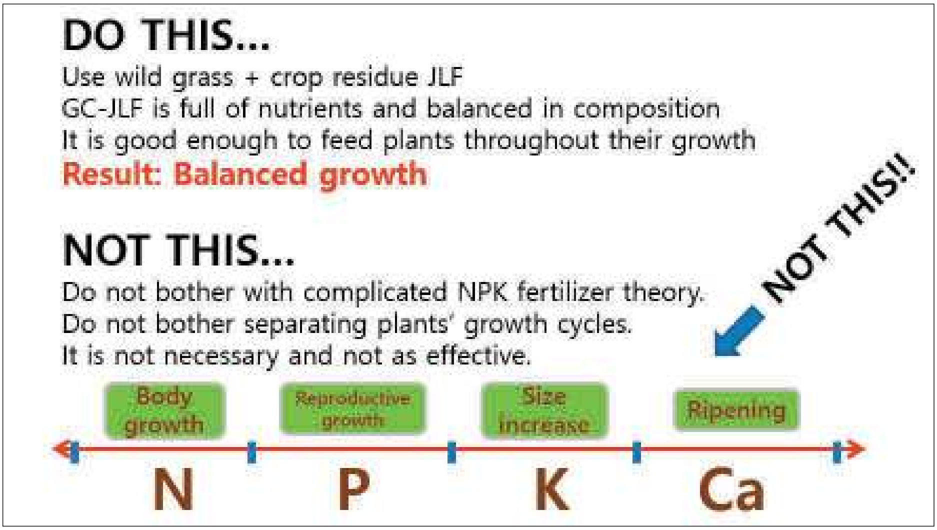
Dividing growth cycles and applying fertilizer for each cycle looks scien-

Optimum level of elements in plant tissue

Element	Chemical symbol	Dry-basis concentration (% or ppm)	Relative atomic number to molybdenum
Obtained from water or carbon dioxide			
Hydrogen	H	6	60,000,000
Carbon	C	45	40,000,000
Oxygen	O	45	30,000,000
Obtained from soil			
Macronutrient			
Nitrogen	N	1.5	1,000,000
Potassium	K	1.0	250,000
Calcium	Ca	0.5	125,000
Magnesium	Mg	0.2	80,000
Phosphorus	P	0.2	60,000
Sulfur	S	0.1	30,000
Silicon	Si	0.1	30,000
Micronutrient			
Chlorine	Cl	100	3,000
Iron	Fe	100	2,000
Boron	B	20	2,000
Manganese	Mn	50	1,000
Natrium	Na	10	400
Zinc	Zn	20	300
Copper	Cu	6	100
Nickel	Ni	0.1	2
Molybdenum	Mo	0.1	1

It is nearly impossible to adjust the quantity of individual element to achieve the optimum nutritional balance for plants. Don't bother trying to do the impossible. Use crop residues and wild grass as base and additional fertilizer. It is so much easier, inexpensive and it naturally provides the nutritional balance the crops need.

Source: Epstein 1972, 1990.
Note: Organic elements (H, C, O) and macronutrients are shown in percentage. Micronutrients are in one millionth.



The objective of fertilizer program is to provide nutritional balance required by the crops. Let's get rid of this complicated practice of dividing plant's growth cycle and designing separate fertilizer program for each cycle (above); instead I suggest the use of wild grass and crop residue JADAM liquid fertilizer as the main additional fertilizer. This GC-JLF has all the nutritional balance that the plant needs. What easier way to achieve fertility?

tific, but such method does not exist in nature. Nature does not grow a single plant on the entire earth in this method. Then why this method? Why does it exist? It is intimately related to the sales of chemical fertilizer, NPK mixed fertilizer, customized fertilizer and customized liquid fertilizer. Let us be honest; this method is not an honest method. It is not truthful to farmers. It has only faithfully served as a marketing tool to sell more chemical fertilizer and pesticide. Farmers complain that pepper farming is very hard. But let's look back 40 to 50 years. Most farms harvested pepper until frost came in late fall. They didn't have any "foliar-application-of-Ca-at-late-growth-stage-technology." They had neither such knowledge nor product; nor did they need them. But still, they harvested much more than modern day farmers.

I am not saying that anything that is not in nature is wrong. I am not saying that anything modern or Western is wrong. I am talking of the results. After all that complicated and difficult theories on fertilizer program, did it bring high yield and high quality for the farmers? No. It actually hindered farmers from achieving it. It only made farming more expensive. It ripped off farmers. It makes farmers more dependent on corporations; takes away farmers' mastership of technology. JADAM strongly urges to break away from this method of distinguishing plant growth stages and applying fertilizer accordingly. The answer to perfect fertilizer program lies in nature. Observe nature, the trees, how they grow. The answer is there. Do as nature does.

Many farmers now use a lot of rice bran as fertilizer thinking it is a good organic input. Such fertilizer might be good for growing rice but abusing it for other crops can actually be harmful. If you apply generous amount of rice bran for your tomatoes, the soil will change its nutritional balance into that which is good for growing rice. Another commonly used organic matter is perilla pulp. It has higher nitrogen than rice bran; so farmers take it for granted that it is a better fertilizer. But if you use perilla pulp as base fertilizer repeatedly, you will ruin your strawberries because the soil is more adjusted to a nutritional balance that is good for growing perilla. Oil cakes are also widely used. Most commercial oil cakes consist of 50 percent castor pomace. Again, this means that if you overuse oil cakes, your soil will be suitable for castor farming. Simply putting in organic matter instead of chemical fertilizer in the soil does not make you an organic farmer. You have to be extra careful; be aware that input of organic matter can seriously disrupt soil nutritional balance. I traveled many places of the world, tasting organic produce. Surprisingly many of them had inferior taste and quality compared to conventional produce. This is because the growers failed to provide the optimum nutritional balance for their crops. If the grower successfully applied organic matter that suffices the nutritional balance needs of the crop, the taste and quality will be extraordinary. Good and bad are one. Organic matter is deemed "good" but overuse it, then it becomes "bad." Attachment to certain organic matter is what makes your farming a failure. It is common sense. When nutritional balance in my body is broken, I will fall sick. When you fail to meet the quantity and composition of nutrients that a plant needs, your crops will soon be diseased.

In essence, what is it that the farmers want to know? The correct

The Rule: Fill up with the same thing!

Base fertilizer: Put these on the soil
Wild grass cover crop + crop residue (+ herbivorous livestock manure)

1st additional fertilizer: Irrigate into soil
JMS – 10~100 dilution
Wild grass JLF, crop residue JLF, seawater, phyllite solution – 30~300 dilution

2nd additional fertilizer: Irrigate into soil
Food scrap JLF, urine JLF, human feces JLF – 50~500 dilution

3rd additional fertilizer: Irrigate into soil
Fish JLF, bone meal JLF, calcium JLF, etc. – 50~500 dilution

All the confusion and complication of fertilizer program becomes easy when you establish a right view: give plants what is same (or similar) as the plants. For base fertilizer, use cover crop and crop residue. You can add manure from animals that ate a lot of grass. Focus on growing a lot of cover crop so that it alone can suffice as base fertilizer. When you water the plants, put in additional fertilizer: JMS 500 L or 132 gal + sea water 20 L or 5.3 gal (or sea salt 500 g or 1.1 lb) + phyllite solution 20 L or 5.3 gal + GC-JLF diluted ×100. Do this 3-4 times a month. Observe growth and adjust the dilution of GC-JLF. To accelerate growth, add food waste JLF or urine/feces JLF or fish JLF.

method of base/additional fertilizer and pest control. Quite simple; and I will explain it simply. How should you design your fertilizer program? Harvesting is taking of fruits or leaves from the crop. If human did not harvest, then the crop could grow on that soil for generations without having to put anything in from the outside. The nutrient loop is closed just like nature; organic matter formed from leaves that fall in autumn and grass that die down would have sufficed the fertilizer needs of the crop. But the problem is that purpose of farming itself is to collect fruits or leaves of the plant; it is to harvest. Every time the farmer harvests, organic and inorganic nutrients contained in the harvested plant parts escape; they are leached from the soil. Because human takes out the nutrients, arises the need to replace them. That is why we need base and additional fertilizers. Climate change and changed or increased pattern in rainfall accelerates the leaching of nutrients from the soil. It makes additional fertilizer all the more important. You see, farming is critically different to nature; its nutrient loop is open. There cannot be zero-input agriculture.

Fertilizer is to bring back the nutrients taken out of the soil from harvest. What you have emptied, you need to fill back in. When filling it back, you have to fill it up with something similar to the thing that has been taken out. That is how you provide the optimum nutritional balance for the crops. This is logical; it makes sense. But farmers blunder right here. They bring in all kinds of organic matter that is totally different from the nutrients that have been taken out. Rice bran, perilla pulp, oil cakes and livestock manure are their favorites. This popular method of organic fertilizing completely destroys the soil nutritional balance. Destruction of soil nutritional balance is also soil degradation. The aim of any fertilizer program is to provide the optimum nutritional balance for the crops. To do so, you have to give back to the soil what has been taken out. Rather than an individualized approach where you have to add or subtract individual nutrients (buy and apply the individual fertilizer), JADAM suggests that you use something that already has what the plants need. **Keep filling the soil with things that have the same or similar nutritional content as the crops.** Base fertilizer will be crop residue and cover crop. Additional fertilizer will be JLF made from crop residue and cover crop. Keep using these and you will eventually reach the ultimate nutritional balance. It is easy, anybody could do it, and it costs almost nothing. It rewards you with high quality and high yield. Today farmers are not master of their farming. Good bye to high-cost farming. Agricultural technology is freed from corporations. This is beginning of agricultural revolution. Farming can be very difficult or very easy depending on how you approach fertilizer program. The answer is in the nature! The way to easy, simple, effective and ultra-low-cost is in the nature.

Why do religions become complicated? Religious-business group are the people who develop extremely complicated forms of religion that can successfully block ordinary people from communicating directly with god.

Medical-business group work hard to dissuade people from taking care of their own health, convincing that they need to rely on the experts – and buy from them. Agro-business group make simple things hard, easy things complicated until farmers have completely lost confidence in farming – and buy inputs from them. People are lost and lonely. So much of the real world can be seen from the operation of agro-business groups. If only we, together, can change agriculture, we go one step closer to changing the world.

The key is to provide a nutritional balance that is best for the crops. How do you do that? **Base fertilizer** is supplied by crop residues and cover crop. You can add manure from animals that ate a lot of grass. Chicken and pig manure can also be used. Focus on cover crop so that you can supply 100 percent of base fertilizer just with your cover crop and crop residues. If you can't grow cover crops, bring in saw dust or tree barks or leaves; they all make excellent fertilizer. Additional fertilizer is JLF made from crop residues (fruits, leaves, branches, roots, etc.) and JLF made from wild grass. Crop residues JLF is best because it has the same nutrients that the crop needs. Wild grass JLF is second best because it has nutrient composition that is similar to the crops – wild grass and crops are the same plants! You can make JLF with both wild grass and crop residues; this is called wild grass and crop residues JADAM liquid fertilizer, or GC-JLF in short. Use GC-JLF as the main additional fertilizer. Dilute it around 100 times and use it throughout the season. Always add JMS when applying additional fertilizer. When you feel GC-JLF is a bit weak, then use nitrogen-rich inputs like food waste JLF, urine JLF, human feces JLF, fish JLF, etc. Nitrogen composition for each JLF is as follows: wild grass (0.01%), purslane (0.2%), tomato (0.27%), spinach (0.29%), food waste (2.93%), human feces (2.48%), urine (3.92%), raw anchovy (5.08%) and fish (7.44%). To control growth, use calcium JLF diluted ×100.

Anytime during growth, you may apply sea water, humus soil JLF, phyllite JLF and chitosan JLF. They help improving the quality. If you think the plants need some phosphorus, apply calcium phosphate JLF. If you want to give some potassium, apply potassium JLF. Dilute around 100 times, but farmers can decide on the best dilution. Calculate the amount of inputs (and therefore dilution) based on 1 ton (264 gal) of water going in 0.03 ha (0.08 ac) of land. I'd like to note that according to the root settlement and the soil quality, the required JLF can differ over 10 times. If root settlement is strong, the total root area is very large which means they can easily absorb nutrients. In this case, you need to only use little JLF and increase the dilution to ×500. You need almost no money for JADAM organic farming. You can see that JLF and JMS cost almost nothing. Ultra-low-cost is not a dream. The little money you need is because you have to buy some ingredients for making natural pesticide and wetting agent (surfactant). In 1 year, the cost will be merely $100 per acre (0.4 ha).

Rice bran, perilla pulp, oil cake, oyster shell, bone meal… what do they have in common? They are "parts" of a whole body. This "partial body fertilizer" should not be the main ingredient in your base fertilizer. Partial fertilizers should be limited to 1/10 of the total fertilizer. On the other hand, there are the chemical fertilizers. They are made of material (urea, ammonium sulfate, NPK mix, etc.) even simpler than partial fertilizers. JADAM calls them "simple fertilizers." Simple fertilizers are most notable for their fast effect. But they disrupt the soil nutritional balance; they cannot be used for a sustainable farming. They eventually bring in more pests and diseases, creating more demand for pesticides. Try JADAM method; you will find that you can still farm with excellent results even if you don't use any chemical fertilizer at all. Make it a rule to give nutrients to the roots. Use foliar application only as a secondary means. Absorption of nutrients through leaves can weaken the power of the roots to take in nutrients. When you practice foliar application, take care not to leave any marks on the leaves or fruits. Always mix with JADAM wetting agent for complete coating and absorption (JWA 3 L or 0.8 gal for water 500 L or 132 gal).

When applying on open fields, if possible, apply in strong concentration right before the rain so that the inputs may follow the rainwater to seep into the soil. For greenhouses, apply the input with generous amount of water; it is important to deeply and fully wet the soil. It is particular important to apply before transplanting for annuals and before flowering/sprouting for fruit trees. Farming in essence is about balance. Roots should extend wide and deep so that the upper and lower parts of the plant are balanced.

Soil nutrients should be supplied with material that are same or similar to the crops so that the nutrient composition is balanced. Think simply. Make soil fertile where the roots reach. Use JADAM fertilizer program intensively before transplanting and flowering/sprouting; you will be on your way to high yield. Root settlement will be robust as never before after transplanting. If you succeed in establishing strong roots, moisture and fertilizer management become so much easier because large root area means the plant has secured a stable supply of water and nutrients. If you use this method, wherever the root goes, microbes will be teeming, minerals will be sufficient, nutrients will be ready in balance. Plants will grow in excellent health. It is not rare for the yield to increase four-fold after applying JADAM method. This is the path to high yield, high quality, strong health, soil nutritional balance, nutritional diversity, microbial population and diversity. All this costs almost nothing.

Organic blueberry farm in Yesan. Gangbong Yi makes all farm inputs himself ranging from microbes, fertilizers to pesticides.

17. Examples of JADAM fertilizer programs

Below are some methods of combining Jadam inputs. They are explained for soil application. If you want foliar application, reduce the amount of inputs (JMS + JLF) to below 30 L (7.9 gal) for a total solution (input + water) of 500 L (132 gal) and add over 1.5 L (0.4 gal) of JWA so that the spraying will not leave any marks. For foliar application, if you use more than 20 L (5.3 gal) of JMS, JWA will be broken down and will have little wetting power. 20 L (5.3 gal) of seawater can be replaced with 0.5 kg (1.1 lb) of sea salt. Seawater and sea salt both decrease wetting power of JWA; so apply them to soil. Use seawater or sea salt 3 or 4 times a month. **Below is only a guideline; you can adjust according to your plants' needs.**

❒ Soil foundation builder

For 0.33 ha (0.8 ac). Use before transplanting and before flowering. Apply mixed with water or undiluted solution before rain for open fields. Seasalt should be used with plenty of water (at least 1,000 times). For greenhouses, apply with plenty of water so that they go in deep into the soil. 500 L (132 gal) of JMS can be used in an area of 0.1 to 3.3 ha (0.25-8.2 ac). Promotes root growth. Strengthens resistance against cold and frost. Repeat 3 to 4 times before transplanting and flowering. For trees, you can apply on the tree trunks.

- JMS 500 L (132 gal)
- Sea salt 1.5 kg (3.3 lb)
- Phyllite solution 60 L (16 gal)
- GC-JLF 60 L (16 gal)

❒ Seed and seedling treatment

Add water to make 500 L (132 gal). Leave seeds or seedlings before planting in leaf mold solution or JMS dilution for 2-3 minutes. It greatly improves root settlement. Diversity of microbes prevents diseases.

- JMS 100 L or 26 gal (can be replaced with 10 kg or 22 lb of leaf mold)

❒ Basic additional fertilizer

This is for 0.33 ha (0.8 ac). Apply to soil. Continue use throughout growth. This input provides balanced nutrients and minerals for crops. Add as much water as you need. Use sea water 3-4 times a month.

- JMS 500 L (132 gal)
- Seawater 60 L (16 gal); can be replaced with sea salt 1.5 kg (3.3. lb)
- Phyllite solution 60 L (16 gal)
- GC-JLF 30 L (8 gal)

❒ Body growth promoter

For 0.33 ha (0.8 ac). Apply to soil. Use during growth. Keep using basic additional fertilizer but when you feel you need to boost growth, use body growth promoter.

- JMS 500 L (132 gal)
- Seawater 60 L (16 gal); can be replaced with sea salt 1.5 kg (3.3. lb)
- Phyllite solution 60 L (16 gal)
- GC-JLF 30 L (8 gal)
- Food scrap JLF 60 L (16 gal); can be replaced with urine, feces, fish JLF

❒ Reproductive growth promoter

For 0.33 ha (0.8 ac). Apply to soil. Use during growth. Keep using basic additional fertilizer but when you feel flowering and fruiting is weak, use reproductive growth promoter.

- JMS 500 L (132 gal)
- Seawater 60 L (16 gal); can be replaced with sea salt 1.5 kg (3.3. lb)
- Phyllite solution 60 L (16 gal)
- GC-JLF 30 L (8 gal)
- Calcium phosphate JLF 60 L (16 gal)

❒ Fruit growth promoter

For 0.33 ha (0.8 ac). Apply to soil. Use during growth. Keep using basic additional fertilizer but when you feel you need to boost fruit growth, use fruit growth promoter. To control growth, take out potassium JLF and increase calcium JLF.

- JMS 500 L (132 gal)
- Seawater 60 L (16 gal); can be replaced with sea salt 1.5 kg (3.3. lb)
- Phyllite solution 60 L (16 gal)
- Calcium JLF 30 L (8 gal)
- Potassium JLF 40 L (11 gal)

18. Summary of function of each element

Nitrogen (N)

Nitrogen is the inorganic element that is needed the most by crops. Nitrogen occurs primarily in amino acids and nucleic acids. If it is deficient, plant growth rapidly deteriorates. If it is constantly deficient, chlorosis begins to occur on leaves close to the roots. As nitrogen can be transferred from old leaves, young ones show a deficiency symptom later. If nitrogen deficiency appears slowly, a plant becomes weaker and its stems become woody.

Sulfur (S)

Sulfur is a component of vitamins and some amino acids essential to coenzymes and metabolism. Symptoms of sulfur deficiency and nitrogen deficiency are similar because both of them are components of protein. Sulfur deficiency symptoms include chlorosis, undergrowth and accumulation of anthocyan. Unlike nitrogen, the symptoms first appear on mature and young leaves because sulfur cannot easily retransfer to young leaves in most species.

Phosphorus (P)

Phosphorus is a component of major compounds forming plant cells including intermediaries between breathing and photosynthesis, and phospholipids which form plant cell membranes. Phosphorus is also a component of nucleotides used for plant energy metabolism, DNA and RNA. Phosphorus deficiency causes growth delay in young plants, and leaves taking on a dark blue hue. In some species, leaves turn a little purple due to overproduction of anthocyan. Another symptom of phosphorus deficiency is that the stems become thinner and old leaves die. Maturity of plants is also delayed. The element is an important mineral nutrient for energy storage and plant structure.

Silicon (Si)

Plants accumulate a significant amount of silicon in their tissues. An adequate supply of silicon stimulates growth and reproduction. If silicon is deficient, plants easily topple over and become vulnerable to pathogens. Silicon becomes soluble to be mainly accumulated in endoplasmic reticula, cell walls and intercellular space in the form of atypical silica. Silicon can alleviate the toxicities of many heavy metals. It is an important mineral nutrient for energy storage and plant structure.

Boron (B)

Boron is presumed to play an important role in cell elongation, nucleic acid synthesis, hormone response and the functions of the cellular membrane. Its deficiency causes black necrosis on young leaves, and terminal buds. Necrosis of young leaves begins with the basal end of leaves. Stems become abnormally stiff and crumbly. Many branches may shoot out sideways but the end of the stem is easily necrotized because cell division is inhibited. Destruction of internal tissues of fruit and roots causes necrosis and deformity.

Potassium (K)

Potassium exists in the form of K^{+} in plants and plays an important role in the controlling of osmotic pressure in plant cells. It also activates enzymes included in breathing and photosynthesis. If it is deficient, leaves become stained and chlorosis on leaf margins and necrosis between venations of the leaf apex occurs. As potassium can transfer to young leaves, problems begin with mature leaves and progress to the basal end of plants, so leaves become rolled and shrunk.

Calcium (Ca)

Calcium is used for formation of spindle fibers during synthesis of new cell walls and cell division in the form of Ca^{2+}. It is also a signal transmitter of various responses of plants to normal functions of plant cell membrane and hormone signals. Its deficiency causes necrosis in tissues with fast cell division such as at the ends of young leaves. In slow-growing plants, chlorosis occurs first and new leaves are rolled downward, showing malformation.

Magnesium (Mg)

In the form of Mg^{2+}, magnesium activates the enzymes related to breathing, photosynthesis and synthesis of DNA and RNA. It is a major component of chlorophyll that performs photosynthesis. Its deficiency causes chlorosis between veins of leaves. It begins with old leaves because of the mobility of magnesium. Severe deficiency causes leaves to turn yellow or white.

Manganese (Mn)

In the form of Mn^{2+}, it activates a few enzymes in plant cells. Decarboxylase and dehydrogenase included in the tricarboxylic acid cycle (TCA cycle) are specifically activated by manganese. It plays an important role in photosynthetic reaction that generates oxygen in water. If it is deficient, small necrotic spots develop and necrosis occurs between veins of leaves.

Chlorine (Cl)

In the form of Cl^{-}, it is needed for division of water during oxygen generation in the process of photosynthesis. It is also necessary for cell division in leaves and roots. In plants with too little chlorine, the leaves become withered at the end, chlorosis or necrosis occurs in leaves or leaves turn bronze in color due to growth delay. Chlorine ions dissolve very easily in water and they can be easily used in soil as wind brings it from seawater – making chlorine deficiency rare.

Sodium (Na)

In the form of Na^{+}, it is needed for most of the species that fix carbon. Its deficiency causes chlorosis or necrosis or prevents flowering. It stimulates growth through cell expansion and substitutes potassium, a solute with partially osmotic activation.

Iron (Fe)

Iron plays an important role in components of enzymes participating in oxidation-reduction reactions. During electron transport, iron is reversibly oxidized from Fe^{2+} to Fe^{3+}. As with magnesium, its deficiency causes chlorosis between veins of leaves. This symptom begins with young leaves because iron cannot easily transfer from old leaves. Severe deficiency causes entire leaves to turn white.

Zinc (Zn)

Zinc is needed to activate various enzymes and synthesize chlorophyll in the form of Zn^{2+}. If it is deficient, intercalary growth is decreased, causing leaves to stick to the ground. Leaves are small and their margins shrink, showing deformation. These symptoms occur because auxin indole acid cannot be sufficiently produced. In corns and beans, chlorosis occurs between veins of old leaves. White necrotic spots also appear. This chlorosis shows zinc is necessary for production of chlorophyll.

Copper (Cu)

As with iron, copper binds to enzymes participating in oxidation-reduction reactions where Cu^{+} is reversibly oxidized to Cu^{2+}. If it is deficient, leaves become dark green with necrotic spots. Necrotic spots begin with the apiculus of young leaves and extend to the leaf base along with the leaf margins. Leaves are twisted or show deformity.

Nickel (Ni)

Nickel is needed for enzymes that reprocesses some hydrogen gas generated during nitrogen fixation in nitrogen-fixing microorganisms. If it is deficient, plants accumulate urea in their leaves, resulting in necrosis of the apiculus of the leaves. Nickel deficiency is rarely seen in plants growing in soil because they need only a very small amount of nickel.

Molybdenum (Mo)

Mo^{4+} and Mo^{6+}, Molybdenum ions are components of some enzymes including nitrate reductase and nitrogen-fixing enzymes. Nitrate reductase catalyzes the reaction so that nitrate is reduced to nitrite when nitrate is assimilated by plant cells. Nitrogen-fixing enzymes convert nitrogen gas in nitrogen-fixing microorganisms to ammonia. If it is deficient, general chlorosis between the veins of leaves and necrosis on old leaves occur. Flower formation is inhibited and flowers drop off before maturity. The amount of molybdenum required is extremely small – about 1/1,000,000 of the nitrogen – but it is deficient in some soils. If this becomes evident, the addition of a minute amount of molybdenum can dramatically improve the growth of crops and green vegetables.

Cobalt (Co)

Cobalt is in cobalamine, a component of some enzymes contained in nitrogen-fixing microorganisms. Its deficiency stops development and functioning of nitrogen-fixing tubercles. However, nitrogen-fixing plants for which ammonium or nitrogen are provided and non-nitrogen-fixing plants do not need cobalt.

Accumulation of other elements in plant tissues has been identified but their roles have not been revealed. It is not easy to find out the exact roles of elements and the problems caused by their deficiency. JADAM advocates a pure, balanced form of fertilization. It is best to prevent any deficiency of inorganic nutrients. That is why JADAM recommends the use of sea water (which contains over 83 elements), rock solution, and humus soil solution throughout the year.

Table of dilution ratio (unit: cc)

Dilution rate / Water volume(L)	20	30	50	100	150	200	250	300	500	800
18	900	600	360	180	120	90	72	60	36	23
20	900	600	400	200	133	100	80	67	40	25
25	1,250	833	500	250	167	125	100	83	50	31
50	2,500	1,666	1,000	500	333	250	200	167	100	63
70	3,500	2,333	1,400	700	467	350	280	233	140	88
100	5,000	3,333	2,000	1,000	667	500	400	333	200	125
150	7,500	5,000	3,000	1,500	1,000	750	600	500	300	188
300	15,000	10,000	6,000	3,000	2,000	1,500	1,200	1,000	600	375
500	25,000	16,666	10,000	5,000	3,333	2,500	2,000	1,667	1,000	625
700	35,000	23,333	14,000	7,000	4,667	3,500	2,800	2,333	1,400	875
1,000	50,000	33,333	20,000	10,000	6,667	5,000	4,000	3,333	2,000	1,250

Part VI.

Natural Pesticide

"If you can't explain it simply, you don't understand it well enough."
Albert Einstein

Photo: Youngsang Cho

What is awesome about JADAM natural pesticide is that it is easy to make and costs very little.
You will have your pesticide at 1/50 of the cost of chemical pesticides.
Natural pesticides are no less effective than chemical pesticides.

1. Save cost with JADAM natural pesticide (JNP)

Chemical pesticide that cost 10 dollars 10 years ago now cost 100 dollars. The price will keep climbing. The biggest culprit in making farming expensive is chemical pesticide. As shipping and trading of agricultural products become more common, competition becomes more intense. You need to lower cost to survive. Your farming needs to be viable. In this age of globalized competition, you cannot continue to purchase expensive synthetic pesticides. Commercial organic pesticides are even more expensive than chemical ones. They often need to be applied more frequently than chemical pesticides; increasing cost. With JADAM, you can farm without having to buy chemical or organic pesticides. JADAM's natural pesticide can replace commercial pesticides and that too at an ultra-low-cost (ULC). JADAM's knowledge of making effective natural pesticide is number one in the world.

The merits of JADAM natural pesticide (JNP) are: it is easy to make; costs very little; made of substances safe to human; does not develop resistance in pests; provides nutrients to crops; and pest control effect is no less than chemical pesticides. JNP complies with international organic production regulations. It will cost about 1/50 that of buying chemical pesticides.

The most important ingredient in a pesticide is the wetting agent (surfactant). Only when the pesticide has this wetting agent will it effectively penetrate into the target pest. I developed a method of making this wetting agent without heating and named it "JADAM wetting agent (or JWA)." It is a natural surfactant. JWA is the key ingredient of pesticide: it increases wetting, coating and penetrating of the pesticide, and it itself has a pesticide and germicide effect. I also developed a method of making germicide from sulfur without heating and named it "JADAM sulfur (or JS)." It only takes 20 minutes to make JS. JS is no less effective than chemical pesticides. It does not damage plastic or steel pipes like the lime-sulfur mixture. JADAM succeeded in making these methods easy. All along, our aim was to make this method available for farmers; for farmers to make these inputs themselves at home. Chemical pesticide product are the result of millions of dollars of investment, an average farming household cannot make this. But JNP is affordable and available for each individual farmers.

Making natural pesticide at an ultra-low-cost is the completion of JADAM organic farming system. JADAM pesticide is essential in bringing down farming costs to 100 dollars per acre (0.4 ha). Farmers being able to self-sufficiently produce pesticides is very important in bringing farming back to the farmers. It is the cornerstone of claiming independence from commercial capital; making farming viable; and helping spread organic farming. Organic farming has been growing at a slow rate globally and is still being practiced and enjoyed only by

Pesticide cost in Bongha village, Korea (320 acres) 2014

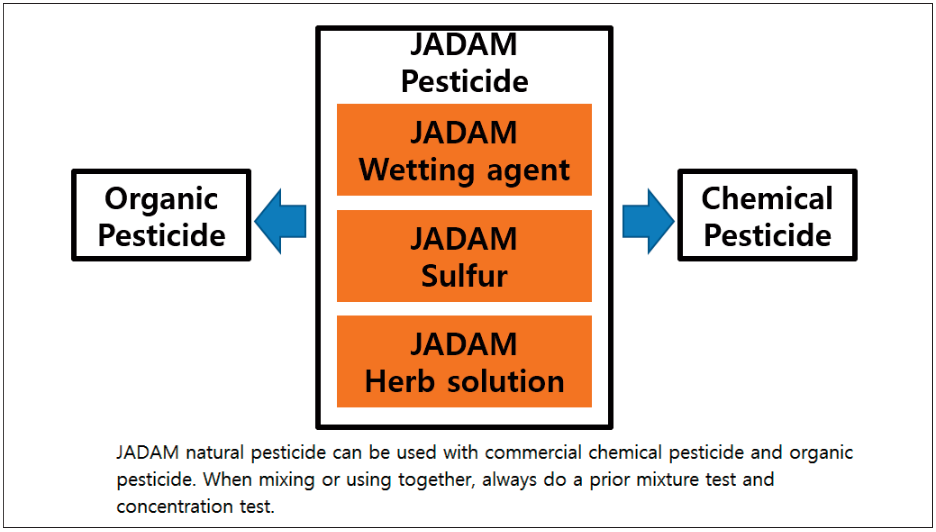
Input	Ingredient	Unit	Volume and cost per application				Volume (Liters)	Cost (Korean Won)
			1st	2nd	3rd	4th	Subtotal	Subtotal
Natural Pesticide	Jadam Oil	Liters	552	765	885	1,005	3,207	
		Cost (₩)	256,128	354,960	410,640	466,320		1,488,048
	Jadam Sulfur	Liters	414	459	590	670	2,133	
		Cost (₩)	213,500	236,710	304,260	345,520		1,100,000
	Jerusalem Artichoke	Liters	322	510	885	960	2,677	
		Cost (₩)	193,200	306,000	531,000	576,000		Self-sufficient
	Korean pasque flower root	Liters				100	100	
		Cost (₩)				98,350		98,350
	Pokeweed	Liters	230	357	590	640	1,817	
		Cost (₩)	34,500	53,550	88,500	96,000		Self-sufficient
	Ginko	Liters	138	153	295	320	906	
		Cost (₩)	20,700	22,950	44,250	48,000		Self-sufficient
	Total						10,840	2,686,400

This is the natural pesticide use and cost of Bongha village, Korea where they have been successfully farming rice for 5 years in JADAM method. They applied JADAM natural pesticide 4 times and it cost 9 dollars per acre. This is ULC. (1 gallon = approx 3.8 liter, 1US dollar = approx 1,200 Korean Won) the few. The reason is because **organic farming in many cases lacks a robust pest control program.** Let's think in a simple way: if the organic pesticides in the market was cheaper than and as effective as chemical pesticides, organic farming would have already become mainstream. I believe JADAM natural pesticide has the potential to change the landscape of agriculture. Had I not solved the technical problems of natural pesticide, my dream of establishing ultra-low-cost organic agriculture would never have come true.

JNP does not need to be limited to organic farming. Even those that practice conventional agriculture can use JADAM method and pesticide. You can even use chemical and JADAM pesticides together. Don't hesitate: just start!

I have kept it my principle not to patent my knowledge. If I patented JADAM sulfur or wetting agent and used the right solely to seek profit, I might have earned large money. I chose not to do so because it is my belief that agricultural knowledge is something of a public asset shared by humanity. I still do not think it is just for this kind of knowledge to be monopolized by a few corporations or individuals for 20 years, put into commercial purpose and benefiting only the few. It is the teachings of Jesus Christ and Karl Marx that are still burning like fire in me. They are the energy that sustain me. Everything JADAM has, JADAM opens. It is available through books, website, smartphone and workshops. What has been opened cannot be patented; that is the basic of patent law. Now JADAM's knowledge belongs to the humanity.

JADAM system is not perfect; it will keep evolving. But we have achieved quite a practical level of success. Even if you are a conventional farmer, try using JADAM pesticide. You can use JADAM pesticide along with the chemical pesticide that you are used to. JADAM pesticide can be used in both organic and conventional production. Try it for yourself; it will drastically cut down your pesticide costs. If you succeed in putting JADAM pesticide at the center and occasionally use commercial pesticides (whether it be organic or chemical), the cost will drop to 1/10. As a beginning, use JADAM pesticide for powdery



JADAM natural pesticide does not need to be limited to organic farming. Even those that practice conventional agriculture can use JADAM method and pesticide. You can even use chemical and JADAM pesticides together. Don't hesitate: just start!

mildew, downy mildew, fungus, aphids, mites and moths; keep using chemical pesticide for the rest. Any start should be light-hearted and comfortable. Try it out without fear or pressure.

Revolution is not achieved through battles. Change becomes real when it seeps into us like water. If JADAM method works, then it will seep into the practices of more and more farmers. Like water, JADAM will free agricultural knowledge from commercial capital. Farming will once again belong to farmers. Farmers will be the masters of their own farming.

JADAM Natural Pesticide Institute

JADAM developed all its inputs in this unsophisticated and underinvested facility. JADAM could establish its technical system in a short time because JADAM's member farmers with their extensive experience helped and joined us in the making. This is the power of sharing. JADAM developed a simple method of scientific experiment so that farmers can easily follow. JADAM plans to build a farm and research center that practice both organic crops and livestock farming

Developed by JADAM Natural Pesticide Institute

JADAM Institute has developed many new products and methods. All these knowledge are shared with the public (go to en.jadam.kr). JADAM website has been running since 2003 and has record of numerous on-site successes.

- Natural wetting agent (no heating)
- Natural sulfur (no heating)
- Natural microorganism solution made with potatoes
- Natural microorganism solution made with mixed grains
- Natural liquid fertilizer made without sugar or molasses
- Natural pesticide against rice bakanae disease
- Natural pesticide against canker, leaf spot
- Natural pesticide against powdery mildew, downy mildew
- Natural pesticide against aphids, mites
- Natural pesticide against tobacco moth, beet armyworm
- Natural pesticide against stinkbug, mealybug
- Natural pesticide against slug, snail
- Natural pesticide against citrus flatid planthopper, leafhopper
- Natural pesticide against rice water weevil (surface spreading agent)
- Comprehensive pesticide for rice
- Eliminating flies from livestock housings
- Complete fertilizer program for crops
- Naphthalene pesticide

2. Why do we need pesticides?

Spraying chemical pesticide is not only expensive but is detrimental to farmers' health and the environment. All farmers dream of a world where they would not need pesticides. Some farmers believe that as technology advances will come a day where science will make all crops so healthy that pests cannot harm them. Some farmers believe that when natural harmony is accomplished, all the pests will be checked by predators just like in nature. Obviously, nature has been doing fine without any pesticides. Those who love nature tend to have a stronger faith in this kind of concept. Many nature-lovers have a "romantic" view of nature; their method of organic farming has no or almost no concept of pesticide. They intrinsically dislike the concept of pesticide. This is understandable. But their approach of farming makes organic farming far less practical.

It is true that if you do a perfect soil management and fertilizer program, the plants will become healthier and there will be less diseases and pests. That is why soil management and fertilizer program is vitally important in JADAM system. But does this solve pest problem? I want to ask people who believe that if plants become healthier there will be less pests this question. "Does a tree want to keep its fruits to itself, or does it want the fruits to be taken? Does a tree not want to spread its seeds far and wide? Then who will do this job for the tree?"

Green fruits start turning red and yellow as they ripe. As they become colorful, their fragrance and taste improve. The tree has colored its fruits; made it attractive and awaits somebody. The insects, birds and animals are valued clients for the trees. For they are the medium for spreading the trees' seeds. Autumn is the season for the tree to start marketing to its clients. Trees are not attached to its fruits; it wants the fruits to be eaten and taken as far as possible. It is the seeds the tree is most interested in; for the seeds to travel far and wide after being consumed by clients. Do you believe the tree will be producing anti-insect, anti-bacterial substances to protect the fruits? Not in autumn. This is where pesticide comes in.

The critical irony of farming lies in that it is a love for nature yet opposing it. The purpose of farming is not to share the fruits with nature but to take them all. Human wants to take all the fruits but the tree wants to give it away to many animals. Trees will attract insects, birds and animals; without pesticide there will not be much left for human. Human cultivation of crops is different from nature's cultivation of plants. That is why pesticide is essential. According to our experience, some leafy vegetables are possible without pesticide, but fruity veggies and fruits are impossible without using pesticides. If you do not have a clear alternative to pesticide, your farming will fail. JADAM's message is simple: farming without pesticide is impossible; start using JNP. Why JNP? Because it is permitted under organic production; it is environment-friendly leaving no pesticide residue in soil or fruits; it is not harmful to human health; it is effective; it is cheap and easy.

Healthy tree means less pests, but it does not mean zero pests. On the contrary, healthier tree with more tasty fruits will attract pests more. Ironical as it may sound, if you have succeeded in soil and fertilizer management, that could actually accelerate your failure by attracting more animals that wish to feed on your produce. It is not convincing enough to sell insect-eaten shabby fruits claiming that they are organic. Why not produce clean fruits organically? Our ancestors used pesticide too. Liquid fertilizers made from human feces, food scrap, green manure all had a peculiar smell that kept pests away. They are still effectively used in fruit farms to keep away stinkbugs and birds. Tobacco, garlic, hot peppers were also used. They did not need to use much because it was the time before chemical fertilizers, when soil had no compaction, roots extended over 1 meter (3.3 ft).

A romantic view of the nature – thinking that nature is full of love, sacrifice, beautiful stories of symbiosis, etc. – is just not real. Every moment, every place, all living forms are struggling to survive; each walks its own path. These movements of individual struggle collectively form the grand picture we call "nature." No creature spends an idle moment; they sleep not a restful night; they know that the moment of death is always close, but for life, they live. In this tension lies the mystery of life. Ecologically we call it "check and balance." It can also be named as the beauty that arises from the ugly, the brightness shining from darkness, life born out of death. It is not romantically beautiful; it is tearfully beautiful. Good and bad are one.

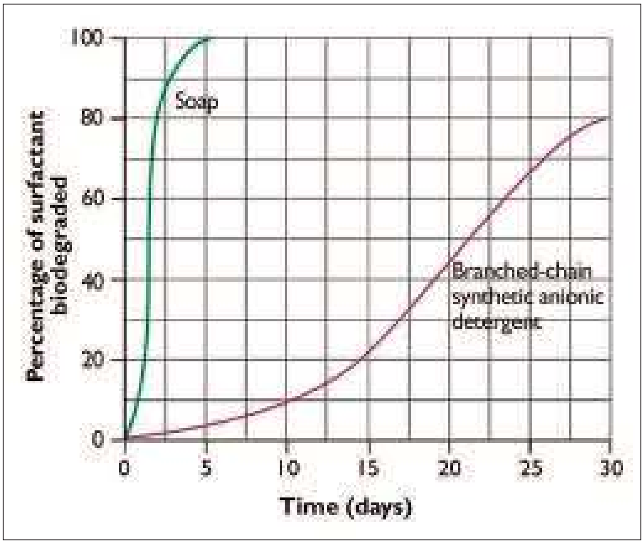
For me, the human existence is nothing special or superior to other creatures. Humans, as humans are, can never break free from the fundamental destiny: we struggle to live and finish in death. Life harbors death. For me, religious beliefs or acts of denying this reality and speaking of "transcending life and death" have no meaning. Suffering is a given; it cannot be avoided. Sexual and material desires are given. Why practice to erase them? Some people who meditate become more sensitive, grumpy and uncomfortable. They believe their minds to have reached peace when below the surface tension builds. Let us accept life as is. Stop dreaming of world beyond.

Sexual and material desires are something that cannot be erased from us. That is why religions prosper; they make us feel guilty for things we can do nothing about; they profit from our suffering and deliver us with messages of impossible salvation. Why is desire bad? It is only natural that we have them. They are the energies that keep life going; the energies that bring our life into full bloom. Do not try to erase; learn to control and live in harmony with those energies. Jesus Christ has taught us to "love your neighbors as yourself." That teaching is how we achieve harmony. I have always tried to understand the secrets of life through farming and I have learnt a lot. My search for natural pesticide gave me much knowledge in the process.

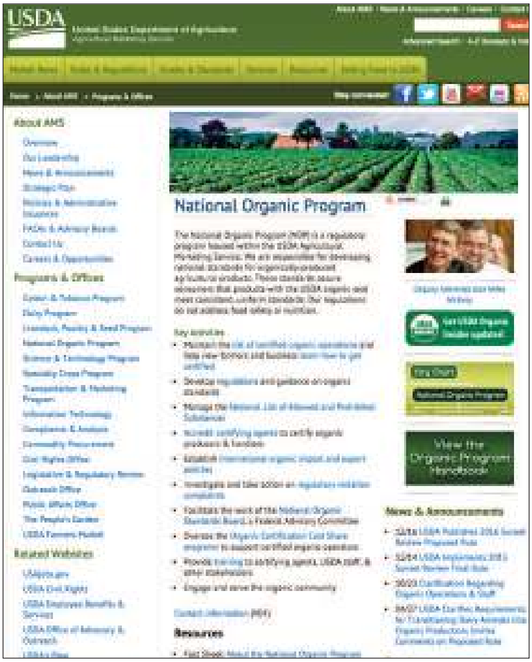
3. Differences between natural and chemical pesticides

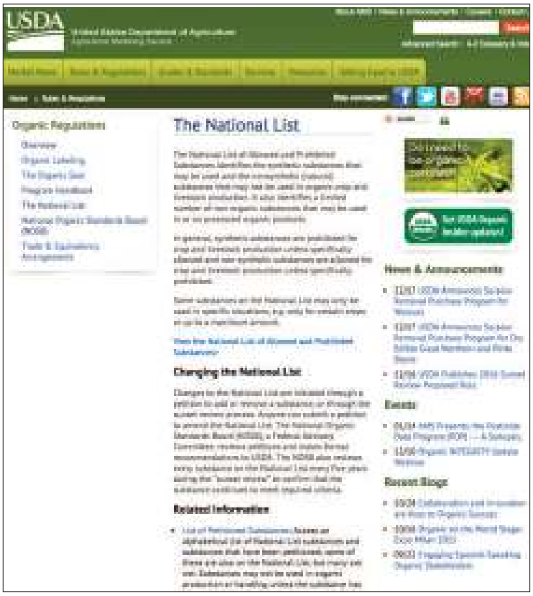
JADAM pesticide is a natural pesticide – let me elaborate about this name "natural" pesticide. JADAM pesticide is made from chemicals such as sulfur, sodium hydroxide and potassium hydroxide. They are made from chemicals so can be called chemical pesticides. The "real" chemical pesticides also have their ingredients coming from naturally-occurring substance (petroleum) so can be called natural pesticide. There is nothing in nature that is not made from chemical bonds. So everything natural is chemical. The earth, in fact the whole universe is "natural." What is there in this nature that occurs outside nature? Why then do we talk of natural, chemical and synthetic? There is a simple criterion: **chemical and natural is divided by whether they are decomposed by microbes.** Chemical pesticides are called "chemical" because they are not fully broken down by microbes. They accumulate in soil and contribute to soil degradation. I do not have any sense of moral superiority because I study natural pesticides. Whether natural or chemical, pesticides kill nevertheless. I believe we have to find method to use less to kill and repel than kill.

Synthetic surfactants contained in chemical pesticides do not break down over 80 percent in nature. Synthetic surfactants are also used in detergents, shampoo and cosmetics. When released to the environ-



Biodegradability comparison of soap and synthetic surfactant. Source: nsd.wikidot.com.





USDA homepage has all the information and regulation about organic farming in the US. www.ams.usda.gov

ment, they cut off sunlight and block oxygen, killing many creatures in water. They are related to algal bloom. They accumulate in the human body; cause cancer, asthma, atopy or other chronic diseases. There is a lack of research into the effects of surfactant in soil; but considering that they are sprayed 100 times in 10 years, the damage will not be small. JADAM does not use this kind of surfactant. Surfactant used in JADAM is made from plant oil and potassium hydroxide. It is made in the same method as natural soap. 99.9% of natural soap were shown to biodegrade in just 5 days. This is why JADAM's pesticides are called natural pesticides.

JADAM natural pesticides all comply with USDA National Organic Program. They are made from safe ingredients included in the National List. Ingredients permitted under organic production have to belong to EPA's Inert Ingredients List 3 or 4. Substances in list 3 have to be designated as food additives. Potassium hydroxide and sodium hydroxide are food additives and belong to EPA's Inert 4B. Inert 4B is described as "Other ingredients for which EPA has sufficient information to reasonably conclude that the current

United States Department of Agriculture
Agricultural Marketing Service
National Organic Program

1400 Independence Avenue SW.
Room 2648-South Building
Washington, DC 20250

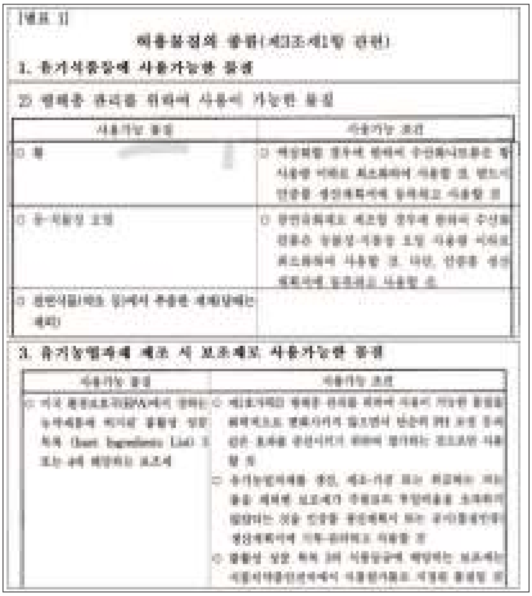
National List Section	Substance	Listing	Sunset/Expiration Date
205.605(b)	Ozone	Ozone.	6/27/2017
205.605(b)	Peracetic acid	Peracetic acid/Peroxyacetic acid (CAS # 79–21–0)—for use in wash and/or rinse water according to FDA limitations. For use as a sanitizer on food contact surfaces.	9/12/2018
205.605(b)	Phosphoric acid	Phosphoric acid—cleaning of food-contact surfaces and equipment only.	6/27/2017
205.605(b)	Potassium acid tartrate	Potassium acid tartrate.	6/27/2017
205.605(b)	Potassium carbonate	Potassium carbonate.	6/27/2017
205.605(b)	Potassium citrate	Potassium citrate.	6/27/2017
205.605(b)	Potassium hydroxide	Potassium hydroxide—prohibited for use in lye peeling of fruits and vegetables except when used for peeling peaches.	5/29/2018
205.605(b)	Potassium phosphate	Potassium phosphate—for use only in agricultural products labeled "made with organic (specific ingredients or food group(s))," prohibited in agricultural products labeled "organic".	6/27/2017
205.605(b)	Silicon dioxide	Silicon dioxide—Permitted as a defoamer. Allowed for other uses when organic rice hulls are not commercially available.	11/3/2018
205.605(b)	Sodium acid pyrophosphate	Sodium acid pyrophosphate (CAS # 7758–16–9)—for use only as a leavening agent.	9/12/2018
205.605(b)	Sodium citrate	Sodium citrate.	6/27/2017
205.605(b)	Sodium hydroxide	Sodium hydroxide—prohibited for use in lye peeling of fruits and vegetables.	6/27/2017
205.605(b)	Sodium hypochlorite	Chlorine materials—disinfecting and sanitizing food contact surfaces, Except, That, residual chlorine levels in the water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (Calcium hypochlorite; Chlorine dioxide; and Sodium hypochlorite).	6/27/2017
205.605(b)	Sodium phosphates	Sodium phosphates—for use only in dairy foods.	6/27/2017
205.605(b)	Sulfur dioxide	Sulfur dioxide—for use only in wine labeled "made with organic grapes." Provided, That, total sulfite concentration does not exceed 100 ppm.	6/27/2017
205.605(b)	Tetrasodium pyrophosphate	Tetrasodium pyrophosphate (CAS # 7722–88–5)—for use only in meat analog products.	9/12/2018

Authorized Distribution: Public

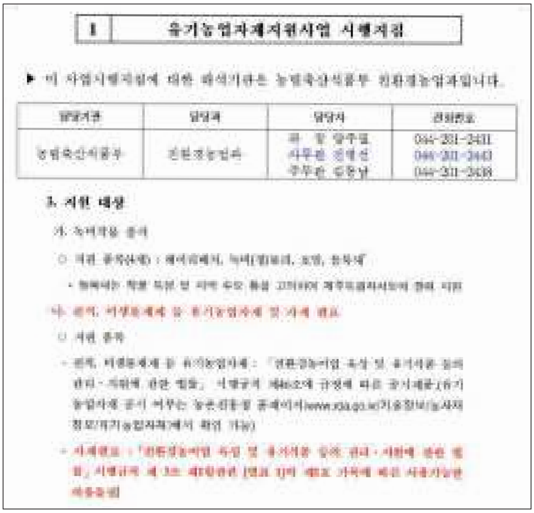
The National List exhibits materials permitted under organic production. www.ams.usda.gov USDA homepage has all the information and regulation about organic farming in the US. www.ams.usda.gov. National List Sunset Dates from USDA. Caustic potash and soda are included here. http://www.ams.usda.gov/sites/default/files/media/NOP-SunsetDates.pdf

use pattern in pesticide products will not adversely affect public health or the environment." JADAM is using these safe 4B materials to develop pesticides that minimize the damage to humans and nature. Under 4B are foods, cheese, natural oil and supplements. Sulfur belongs to a slightly risky category of Inert 4A. In chemical pesticides, more toxic substances in Inert 1, 2, 3 are used.

The making processes of JADAM agent and JADAM sulfur are included in the Appendix 1 "Permitted Substances" of Korea's organic production regulation law (Environmentally Friendly Agriculture and Fishery Law). There was a serious hardship in getting to this stage. In 2010, state agricultural agency had approved all our inputs as permitted for organic production after reviewing



Organic farming regulation of Korea. Making of JADAM sulfur is included in conditions for sulfur and JADAM wetting agent for plant oil. Herbs are also specified. Caustic soda (4B) and caustic potash (4B) became usable. www.law.go.kr



Organically-certified farmers can receive government subsidy of around 50% when purchasing JS and JWA ingredients. Korean pasque flower roots included. Apply in Jan to Feb in local government offices.

them under national and international standards. However, not long after that, another division of the same government agency suddenly removed JADAM inputs from approval list and cancelled organic certification of our member farmers. As the number of farmers making pesticides and fertilizers on their own increased, the sale of commercial ones were dropping. Who else would have had the motivation to persuade the government agencies? I wrote letters to FIBL (Research Institute of Organic Agriculture, Switzerland, Germany and Austria) and OMRI (Organic Materials Review Institute) and received answers that our method and material were in compliance with international standards for organic production. I visited government agencies and explained but they would not listen. The battle went on for two years and I was despondent. I realized what great an enemy we were facing and how much greater an enemy we were to face. Finally, it was with the help of Youngsu Hyeon, a JADAM member, Donggeun Choi, president of the Korean Federation of Sustainable Agriculture Organizations and Seondong Gim, a member of the National Assembly that we were able to win this fight. Mr. Gim took this matter to the parliamentary inspection of the administration and reclaimed the organic approval of JADAM inputs. To make things safer, he included the making processes of JADAM sulfur and wetting agent in the law. Now, there are tens of thousands of farmers making and using JADAM natural pesticide. Ministry of Agriculture even decided to subsidize 50% of the cost of an organically certified farmer purchasing ingredients for JADAM inputs. Such change presents reason for hope.

JADAM brainstorming. We have experimented with many herbs to find the best ones. Farmers worked closely together with us. We sent herb solution samples to 40 farming households and collected data from them. Slowly, JADAM pesticide system was established. This is a product of collective intelligence. Left is Myeongsuk Gim, right if Sanghi Yi, both JADAM staff.

4. Important points in using natural pesticide

If you have already made yourself microorganisms, liquid fertilizers and you go on to succeed making natural pesticides, you will be excited. But always take more care when things look good. Natural pesticides can cause concentration problems (where too strong a solution can harm the plants or the soil) or sometimes cause trouble with a particular plant. Remember that good and bad are one; there is nothing that is always good. The greatest care should be given to this concentration problem. JADAM sulfur, JADAM wetting agent and JADAM herb solution can all cause concentration problem when applied too strong. JADAM provides the basic guideline but there are so many variables taking into account the differences in season, environment, particular crop, weather, etc. that eventually it is up to the individual farmer to verify the safety. Whenever you have made a JNP, always test it in a small area before spraying it in your whole field. This is particularly important if you are going to use natural pesticide together with chemical pesticide. Farmers themselves are responsible for any concentration problems.

Pamphlet and JWA sample provided by JADAM. Perform a water test with JWA.

Good water is extremely important

Only when the pesticide "wets" the target fully, will it be able to control pests and leave no marks on the fruits or leaves. Good wetting property also reduces concentration stress. You must take care to wet the target fully and evenly so as not to leave marks; this is important in producing clean, high quality products. The quality of water plays an important role in determining the wetting power of the pesticide. You must use good water.

JADAM wetting agent is the primary ingredient in natural pesticide. JWA is profoundly affected by the quality of water. Just as soap does not produce bubbles in hard water, JWA will perform poorly when mixed in hard water. Hard water is water with high content of Ca, Mg and Fe. You must do a prior water test to make sure that the water you are using for pesticide is soft. You can do a simple test with JWA. Put in a few drops of JWA in water, the water will keep clear if it is soft water. It will produce lots of foam when shaken. The water on the left has lots of foams and keeps clear. As you go to the right, water becomes murky like milk. Water on far right produced no foam at all.

Pesticide with no wetting power. See how the pesticide breaks into droplets and forms spots of high concentration on the surface. JADAM pesticide, when mixed with JADAM wetting agent, must produce a lot of foam. Only when it produces a lot of foam, will it be effective as pesticide. Foams will be vigorous only in soft water.

Pesticide with wetting power. See the difference in how the pesticide evenly coats the target. This leaves no marks and causes less concentration stress. This greatly increases effectiveness in pest control. Bubbles is the key component of pesticide.

Water on far left is optimum for use as pesticide. Use this water for making JWAs, pesticides, boiling herbs and culturing microbes. Chemical pesticides use synthetic wetting agent which are less affected by water but they still produce little foam in hard water. Their wetting power too is affected by water

JADAM wetting agent water test. Mix a few drops of JWA, the water should remain clear. Shake, then there should be lots of foam

Chemical pesticides are also affected by water. Here, we tested a commercial mite pesticide with hard water. You can see there is little foam. This means weaker wetting power and thus less effectiveness as pesticide.

quality. Selection of water is important also in synthetic pesticides.

If you cannot find soft water around you, use rainwater. Collect rainwater 30 minutes after rain begins. The first 30 minutes of rain contains lots of pollutants so discard it. Rainwater is a typical soft water. This water washes clothes well and your skin also feels smooth after washing in it. If collecting rainwater is not easy for you, I suggest the use of water softener. Water softener has ion-exchange resin in it; when water passes through it, positive ions like Ca, Mg and Fe are removed. There are many such device on sale on the internet. This machine is a must-use for families with members suffering from atopy. Water softeners are widely used for making tap water, public saunas, boiler systems in large buildings, etc. The science behind is quite simple; an individual can easily make one. In our website www.jadam.kr you can see many water softeners made by farmers. JADAM also makes and sells water softeners that produce best water for agricultural purposes. It uses stainless steel frame and filter so is very durable. Use soft water and pesticides will be very effective. It only costs 5 dollars a month.


If you use pesticides with no wetting power, they will leave marks like so and drop the quality of produce. This unevenness can also cause concentration stress.

Spray pesticide when humid

Natural pesticides are less toxic than chemical ones; you need to use it skillfully for best results. On a clear, dry day, pesticide will evaporate instantly and have minimal pest control effect. The higher the moisture level in the air, the longer the pesticide will remain on the target. This applies to chemical pesticides as well. There is a common notion that it is not good to spray pesticide when there is morning dew, but on the contrary, natural pesticides work better when there is dew. That there is dew means that the humidity is nearly 100%; so the pesticide will be very slow to evaporate. Furthermore, the bodies of aphids and mites do not have any dew.

In spring and autumn, spray in early morning. In summer when morning is

JADAM water softener

(150×1100 mm or 6×43.3 in, 27 kg or 60 lb)

Contact: jadamorganic@gmail.com

Developed by Hyunho Cha, Youngsang Cho

What it does

Hard water with lots of Ca, Mg or Fe are not suitable for use as pesticide. Very little foam will form in hard water, the penetration effect of pesticide will be low. JADAM water softener removes Ca, Mg, Fe from the water with ion-exchange resin. The resulting soft water produces lots of foam when mixed with JWA; it is excellent for use as pesticide.

How to install

1.Fix the water softener so that it stands up straight.
2. Connect filter to ①. Connect 15 mm (0.6 in) hose to water input ②. Filter ③ needs frequent cleaning with a toothbrush.
3. Connect 15 mm (0.6 in) hose to water output ⑤. Discard the brownish water that comes out in the beginning.
4. It takes about 30 minutes to produce 500 L (132 gal) of soft water. After it produces about 15 tons (4,000 gal), it can be reused after treating with salt water.
*Always do a water test with JWA before mixing to make pesticide. Take care in winter for freeze damages. **It costs only about 5 dollars a month.**

Capacity

JADAM water softener has 17 L (4.5 gal) of ion-exchange resin in it. 1 L (0.26 gal) of the resin can soften 1 T (264 gal) of water; so this device can soften about 15 T (4,000 gal) of water. If you use 500 L (132 gal) for one-time application, you can use this device to spray pesticide 30 times. **However there can be a big difference depending on water quality.**

Testing softening power

Check regularly to make sure the water softener is properly softening water.

Take a sample from water output of the machine; mix with JWA. The water should keep completely clear if it is soft water. If water shows any sign of murkiness, it is time for salt water treatment.

Reusing resins
Ion-exchanging resin has a limited capacity; for reuse, it has to go through salt water treatment. You can do salt water treatment for about 15 times. The lifespan of the resins is probably 1 year. This means about 5 dollars a month.

Salt water treatment
1.Lower and open hose in ⑤; completely drain the device. Then raise the end of the hose higher than the top of the softener.
2.Dissolve 2.5 kg (5.5 lb) of salt in 7 L (1.85 gal) of water. Remove any impurities from the salt water.
3.Open ④ and pour the salt water into it. Let sit for over 1 hour.
4.Lower the hose in ⑤ and drain the machine.
5.Run clean water through the softener for 10 minutes to wash out the salt water.
6.Take 0.5 L (1.1 lb) of softened water and do a test with JWA. Shake; it should produce lots of foam and keep clear. You can do this salt water treatment about 15 times (the number will vary greatly according to water quality).
*Salt water treatment prolongs resin life.

How to exchange the resin
Open ⑤, remove filter and run water; resins will come out with the water. Remove resins completely. Place filter back in and seal ⑤. Open ④ and put in 14 kg (31 lb) of resin. Do not fill completely.

Hard water on left immediately turns into soft water (right) after running through the device.

Pesticides need to coat the target in order to be effective. To increase wetting power, you must use soft water. The more JWA you add, the more wetting power it has. Picture on left is 0.5 L (1.1 lb) of JWA mixed with 500 L (132 gal) of water. Center is 1.5 L (3.3 lb); right is 3 L (6.6 lb) of JWA. The leaf is taro leaf which even the commercial chemical pesticides cannot wet easily. Use soft water with JWA for best results.

If you spray pesticide on a clear, dry condition, pesticide that reached the target will soon evaporate and be gone. If you spray in humid and cloudy condition, the pesticide will remain on the target for a long time, and even if the pest moves, there will still be pesticide everywhere.

short, spray in the evening of a humid day. To check the humidity, spray water on the plants and see how fast it dries. If it is humid, evaporation will be very slow even in the day. In this case, you can spray in the daytime. In greenhouses, you can spray in a rainy day, or you can increase humidity and spray. Smartphone apps nowadays provide you with information on humidity and dew point of each region.

Selection of nozzle is also important. Nozzles that can make fine particles are best. Finer particles mean that you can use less pesticide but still have high pest control. For best results, spray thoroughly so as to fully and completely wet the plant. In case of fruit trees, if the trees have lots of water sprouts and leaves, the pesticide will not reach all corners and have less effect. Pruning and branch shaping methods can help increase pesticide effect. Make so that the tree can receive full sun and air; it is good both for the trees and pesticide use.

Do a mixture test: Fill 0.5 L (1.1 lb) of water in clear bottle. Get a syringe from the pharmacy; measure and put in 5 cc (0.17 fl oz) of each pesticide you want to mix together. Shake after mixing; check that foam is clear and there is no clotting, then it is successful (like picture).

Then do a concentration test: This is a small-scale of 500 L (132 gal) model (1/1000). Spray this mixture on plant and check for marks or concentration stress.

Always perform a mixture test and concentration test

Do a mixture test: Before applying pesticide to the whole field, make and test in a small-scale like picture. Make a 1/1,000 model and mix the substances you want to use together; check to see there are lots of foam and no clotting. If the substances do not get along well, there will be clotting or less foam. Substances like JLF, JS, JHS (JADAM herb solution) and alcohol mix well with JWA. Substances made with sugar or molasses (liquid fertilizer), vinegar, wood vinegar and seawater all do not form much foam and cause clotting. If you have to use these inputs, dilute to over 1,000 times and use. Do not mix these with pesticides. If you want to mix chemical pesticide with JADAM pesticide, also do a mixing test to check clotting and foam. Some commercial pesticides do not mix well with JWA. Delan fungicide and its family are not good for using together; they can form spots on the plant. After you checked that mixed use is good, spray on a few of your plants to see how they do after 2-3 days. After all this process turns out to be good, then spray on your whole field. Take special care in early stages of plant growth and greenhouse plants where the leaves are soft.

Do a concentration test: There is no pesticide that is free from concentration problem. Even water, when given too much, will harm the plants. Whenever you apply a new pesticide, do a concentration test in a small spot to make sure it is safe; and then extend the application to the whole field. Sometimes there can be weak wetting and clotting of pesticides which cause concentration stress. The spot with the droplet is where mark is left and where there is a strong concentration. Water is extremely important. Concentration problem comes in a few different forms. First, **uneven coating** resulting in higher concentration in various spots (marks will be left on those spots) and thus causing partial concentration problems. Second, **pesticide and crops not getting along;** brown spots may form on edge of leaves or fruits. Third, problem arising from **mixture** with liquid fertilizer or chemical pesticides. In first and second cases, you can check the existence of problem after 2-3 days after testing. Third case is more difficult; it takes weeks to finally observe problems. Always take caution.

How to mix pesticides

To make 500 L (132 gal) of pesticide, first fill 300 L (80 gal) of water in the container. Put in the ingredients (JWA, JS, JHS, etc.) one by one; stirring every time you add one. Finally add water to make 500 L (132 gal) and stir once again. If you mix undiluted JS and JWA together, there will be clotting. In cold weather, ingredients tend to be slow in dissolving so mix more thoroughly. Always mix pesticide right before application and use it up; do not leave leftovers for future uses. In particular, if the solution contains JS, if you use leftover later, they easily create concentration stress. 500 L (132 gal) of pesticide can be applied for an area of approx. 0.33 ha (0.8 ac). But this can vary greatly according to plant size, planting space, etc.

Here are some important points you have to follow in using natural pesticide:

1. Take a sample of water and do a test with JWA. Check that it is soft water.
2. Do a mixing test; do not use if it clots or reduces foam.
3. Spray pesticide when humid.
4. When mixing ingredients with water, do not mix undiluted ingredients together; always mix one by one into the water first.
5. Do a partial concentration test before applying to the whole field.
6. When mixed with chemical pesticides, do a concentration test.
7. Use up the pesticide you made. For natural pesticides, do not use containers that used to hold chemical pesticides.
8. If you keep bees for fertilization, lock the hives before spray; spray; ventilate; and then open the hives.
9. If you immediately sprayed JADAM pesticides, wash before eating. Washing is not necessary for harvesting.
10. Always take care to filter inputs (like JHS) thoroughly before mixing.

5. "I" am the pesticide expert

The knowledge of pesticide seems to belong exclusively to the group of experts and corporations armed with science. There are over 1,000 types of pests that plague the plants. It seems reasonable that only experts can understand the biology and physiology of so many different creatures. Farmers could not even dream of daring to understand this world, let alone make pesticide for themselves. There are over 400 types of chemical pesticide for sale in Korea; they are all specified for each pest and disease. How can a single farmer make 400 different kinds of pesticides? That is impossible. I knew from long ago that if farmers are not able to achieve independence in pesticide, ultra-low-cost will become impossible. I put in all my energy in solving this problem. I have tried for decades to make a system of technology that is readily available for use by farmers. Slowly and slowly, one by one, I found the way. I want to raise again the problem of perspective: what is your perspective; what do you value and disregard; on what grounds do you make judgements; from what angle are you looking at the issue? This is absolutely crucial. Just as the fertilizer program became simple with the perspective of nutritional balance, the pesticide issue also needs the right perspective. Albert Einstein said, "If you can't explain it simply, you don't understand it well enough." I realized that the closer you get to the truth, the simpler it becomes.

The world of natural pesticide as I have discovered couldn't be simpler. JADAM is confident that all farmers can become pesticide experts and that they should do so. I have already suggested that if a couple is farming then the wife should become a pesticide expert. Do not keep buying this ever-expensive product; do not rely on this for farming; make for yourself at 1/50 the cost. I hate pretending to be some philanthropist releasing littles bits of information while keeping the whole body of knowledge to myself. Let us walk this path together. I have opened everything to share. In this world of mad capitalism, I have chosen to do business in the most non-capitalistic way. All of you can become pesticide experts. Simple gadgets in your kitchen is enough for you to begin experiments. You will find that the world of science is not so far away, that it needs not belong solely to the experts. Bring down science to the earth; explain it in language of common sense; let it be something everyone can enjoy. All the textbooks on pesticide introduce more and more complicated theories; nowhere in it do you find a path to independence.

There are over 1,000 different species of pests and pathogens that damage crops. We are used to thinking that we have to study all these individual species, understand their individual biology, conditions for outbreak and methods to deal with the besiegers. Simply put, this is an impossible task for us. The difference between pathogens (bacteria, virus, fungi, etc.) and pests (insects, aphids, mites, etc.) is the size. If you keep "size" in mind, the relation between the two become quite clear. In other words, if you make germicide for germs, increase the dose, and it will be a pesticide for pests. It is quite a revelation that this works. There is no need to develop separate pesticides for pathogens and pests. One pesticide acts as a germicide, fungicide, bactericide, insecticide and pesticide.

Every year, new pesticide products are introduced to the market. They are forever divided into more specified use. Is this specification result of objective science? I do not think so. When cosmetics were first introduced there was just one product. Then it started to diversify. Soon there were cosmetics for each season: spring, summer, autumn and winter. Men and women had to use different ones. Each part of the body needed a different cosmetic. Then came different cosmetics for different functions. Now we have literally thousands of different cosmetics. The same thing has happened in the pesticide industry.

I was inspired when I learnt that one type of anthelmintic kills most parasites. One anthelmintic kills roundworms, whipworms, threadworms and hookworms. This made me think that one pesticide can kill all pests. So I experimented and had a success. Let us not think specified, complicated and diversified products is a proof of more science.

So, it is the size that differentiates pathogens and pests. Let's not trouble ourselves going through hundreds and thousands of different pathogens and pests but rather pick the nastiest two, one from each group. Powdery mildew and aphids would well deserve that name. Most people would agree that farmers spend a large sum of money for pesticides to control these two. We can say if you control powdery mildew you can control most every other pathogen, and if you control aphids you can control most every other pest. This is not a fantasy; it has been practiced and proven. Make small adjustments and the pesticide will work for myriads of other pests. What is more interesting is that pesticide that can control powdery mildew, if made stronger, can control aphids. My experience tells me that this simple methodology can solve about 90 percent of all pest and pathogen problems. The remaining 10 percent should be dealt with by utilizing some other options.

"Natural pesticide workshop" is held regularly in JADAM's Daejeon office.

JADAM hung the names of financial sponsors on a wall in appreciation.

I have finally succeeded in providing a new perspective: pest and pathogen are only different in size; one pesticide can be put to universal use; controlling powdery mildew and aphids is the touchstone for being able to control others. JADAM made pesticide into something anybody can understand and practice. JADAM strongly urges that all farmers become experts themselves. All our methods are SESE (simple, easy, scientific and effective). JADAM wants to make its agricultural knowledge readily available so that it can be shared by everyone, used by anybody, and further developed and improved by everybody.

JADAM has always believed that farming should belong to farmers. That is why we did not commit to selling inputs and ingredients. We want farmers themselves to make and prepare their own inputs. Once we start selling, once we know the taste of money, all our noble dreams may fall. We might have made a lot of money if we sold pesticide to our some 60,000 members. Our income comes mainly from members who register as sponsors on our website (www.jadam.kr) and donate a certain amount of money regularly. If we indeed sold pesticides, we would have tried to sell more, and in the course, we would have started touting our produce and tried to dissuade farmers from making homemade pesticides. That is against the very spirit of JADAM. Making inputs yourself is the basis of ULC. I have had a lot of difficulty in financially sustaining JADAM but after natural pesticide workshop began 7 years ago, workshop has been a wild success. Many people supported our cause and became sponsors. For 10 years, I have never failed to pay salary for my staff. This is not common in Korea. Sponsorship was introduced 14 years ago, and when we moved to a new office in Daejeon, I engraved the names of every sponsor on a wooden card and placed them on one side of our wall. JADAM organic farming and its method of achieving ULC would not have been possible without the help of many people. Sponsors helped us financially, our staff were beside me during hardship and member farmers eagerly shared their knowledge.

Making pesticide now became as easy as cooking rice. All information and knowledge is in our website, being shared real-time. We learn from each other. Try our method and you will find controlling powdery mildew and aphids is no big deal. If you can control the two, you are already an expert. Stop following after the so-called experts; be one yourself. Never, ever resort to buying stuffs. Breaking free from commercial pesticide is an essential step for bringing farming back to farmers. Make your own pesticides, fertilizers and soil improvers; finally JADAM's historic vision will come true. JADAM has solved the pest issue that pestered organic farmers all over the world and blocked organic farming from becoming mainstream.

6. How to do natural pesticide research

I have said that you must become a pesticide expert. Then you must know how to study, experiment and research. I will introduce an easy yet effective method. We don't promote the use of high-tech equipment because that just is not affordable for most farmers. The method I am about to show you is quite unrefined but it gives very practical results. What I suggest is the "cup" method. Use cups to test; it looks pretty shabby but returns practical results. Let's first study natural germicide. We know that there is plenty of information on what natural substances have a germicidal effect. The problem is checking for their efficacy. There

Tools used in JADAM natural pesticide lab. Just add some cups and you are ready. Print a business card with your title as "president of natural pesticide institute" – nothing wrong about that! Simple tools, cups, dishes from the kitchen is all you need to study pesticide and germicide and apply it in your farming. It costs 50 dollars to set up your lab.

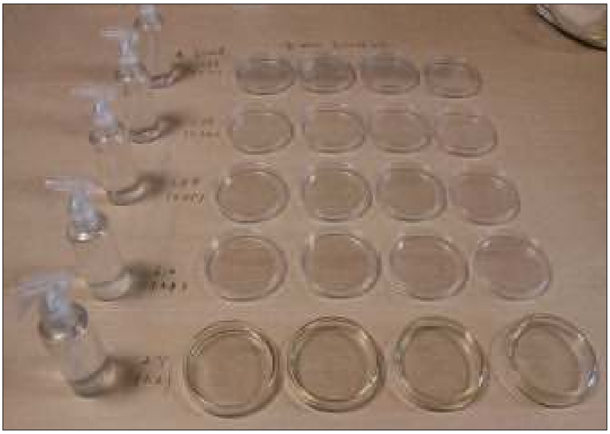
are hundreds of different pathogens and we surely do not have the time and means to test them individually. We know we cannot separate each microorganism; so we mix them all and find out if our germicide kills them all. Leaf mold holds millions of microorganisms in it. Collect it and mix it in water. Pour the same amount of this bacteria-holding water into many cups. Also add the same amount of molasses to feed the microorganisms. Then add germicide starting from zero in incremental quantities in each cup. If the pesticide effectively inhibits the growth of microorganisms (which can be translated into pathogens) you will see less foam. You can find out exactly which germicide is effective and at what dilution rate. Compare the performance of different germicide ingredients. You can also know how long the effect lasts. This test will only take a few days. Apply this to your fields and you will find that the results do not vary greatly. You do not need to stay as a follower of JADAM; with your own methodology, you can surpass JADAM. Go for it!

Add water in cups; add same amount of molasses in each cup; add a few drops of leaf mold water to inoculate the microbes. Cup on left has not added any germicide. Cups on right have been added with varying dose of germicide.
After 2-3 days, you can visibly check the effect of the germicide. The cup on left has been allowed uninhibited multiply of microorganisms; so it serves as a criterion. Bubbles on surface evidence the propagation of microbes. If there are no bubbles at all, the growth of microorganisms has been inhibited completely. Check the dilution ratio when it becomes effective.

Now, for pests. There is already an abundance of information on what natural

JS made without heating has sulfur content of 25%. To check its germicidal effect, we have added different dilution ratios of JS to cups holding water + molasses + leaf mold water. Cup of top left had no JS added; cups to the right have increasing dose of JS. These cups hold 0.5 L (1.1 lb) so are a 1/1000 model of 500 L (132 gal).

After 2-3 days, you can check the propagation of microbes feeding on the molasses with the vigor of the bubbles. Experiment gives us data that 1.5 cc (0.05 fl oz) and 2 cc (0.07 fl oz) of JS made no difference. Observe for over 10 days to see the effect of JS on a prolonged period. We have checked that 1.5 L (0.4 gal) of JS in 500 L (132 gal) solution can perfectly inhibit microbial growth.



These “petri dishes” are commonly used in lab microbiology researches. In each of them, drop in tens of aphids and spray with natural insecticide, close lid. You can observe how aphids react to different doses of pesticide.

If the pest has a larger body, such as the larvae of cabbage white butterfly, tobacco moths and beet armyworm, use larger dish. Different natural ingredients have different effect on the pests. Some make their heads drop, some completely overturn them. The results acquired at the lab are almost precisely repeated on the fields.

This simple experiment tests the repellant effect. See how the stinkbugs run away from cosmos flower. (Mr. Geol Yu, Jadam member)

After checking the effectiveness of natural pesticide, test in different dilutions in the fields. Prepare bottles that contain solutions that are twice, three-times, four-times stronger than the standard usage. Find out at which dilution concentration problem is caused.

substances have pesticide properties. JADAM has long posted on its website information about what plants have those kind of abilities. Our database could certainly be one of the largest collections of information about pest-repelling plants. Try the above method as shown in the pictures and you will see for yourself the effects of natural pesticide. You will also learn what percentage of pests dies and how much time it takes. The great thing about this experiment is that its results are not much different in the fields. Modern science as we know it is truly astounding; however, the founders of it all began on desks and laboratories not much different from ours. JADAM's vision is that all the farmers study, apply and develop their methods and share what they find.

7. JADAM wetting agent (JWA)

JWA is also emulsifier and surfactant. JWA is the most important material in pesticide because it is critical in coating, wetting and delivering the pesticide into the target. Without JWA, you cannot make pesticide. It only costs 50 cents to make 1 L (33.8 fl oz). The amount of JWA you get by following below instructions is enough to be used for around 30 times (diluted in water to make pesticide of 500 L or 132 gal). JWA can be used with commercial organic or chemical pesticides; but always do a mixture test and concentration test before use. JWA can replace machine oil or synthetic wetting agent. Developed by Youngsang Cho.

❶ Prepare a 110 L (29 gal) container that is heat-resistant. Make sure it is clean. Exactly measure and pour in 2.5 kg (0.66 gal) of water; 3.2 kg (7.05 lb) of caustic potash; close lid; and melt it by rolling the container slanted on its side. The water must be soft water in which JWA dissolves clearly. (Test with JWA)
❷ Add 18 L (4.76 gal) of canola oil; mix with electric drill until it becomes like thin mayonnaise. It will take around 10 minutes (longer in summer). Be careful of liquid splashing. Use machine; do not mix manually.
❸ Close lid and let sit for 3 days; it will harden like butter. If it does not harden, or if its layers are separated, use drill to mix again until it becomes like thin mayo. In winter, do it in a warm place.
❹ Add 20 L (5.3 gal) of water; use electric drill to take lumps off the container wall. Do not over mix with drill or else it will become like white cream.
❺ Add 60 L (15.9 gal) of water. Use a clean long stick to manually stir; stir thoroughly including the bottom. It will melt slowly for 24 hours and will be completed. If you make it in a cold place, lumps tend to sink down, and melting into water can be slow. It is important to use clean tools (drill, container, stick, etc.).
❻ Store in tight-sealed container. It has no expiration date.
❼ Mix 3-15 L (0.8-4 gal) with water to make 500 L (132 gal).

To make JNP you basically need four ingredients: JADAM wetting agent, JADAM sulfur, JADAM herb solution and JADAM microorganism solution. Mixing them in different proportions produces different types of pesticide. It can become insecticide or germicide or both. The most important of all is definitely JWA – without it there can be no pesticide. Increasing JWA will make the pesticide stronger. JWA increases the coating and penetration of pesticide substance into the target. Using JWA alone diluted in water is effective in controlling aphids and mites in early stage. Pests do not develop resistance against its repeated use. JWA becomes nutrients for crops; it is moderately effective in improving color and promoting maturity. Use soft water to avoid marks on plants and damaging white powdery coating of certain fruits. Neem oil is quite popular; touted as effective against over 400 pests and diseases. JWA is just as effective. Compared to buying Neem oil, if you make JWA, the cost will be 1/100.

The basic principle of making JADAM wetting agent is the same as making soap out of natural oil. There are many different methods for making natural soap that are readily available. I did research for a long time to develop the easiest method. Widely known method of making soap is to mix water with caustic potash and adjust its temperature; mix with natural oil that also had its temperature adjusted. Then you adjust the pH; add some more substances for aroma; use electric mixer for 3-4 hours; let sit for a few weeks; then melt in water. Water, caustic potash and other ingredients need to be added in different proportions every time. If you actually try making this, it is very difficult. As I repeated this, slowly something dawned upon me. 'Hey, maybe it was somebody's intention to make this difficult after all.' If people try to make natural soap for themselves but soon are exhausted; then they will resort to buying natural soap.

This complicated method of making soap could not be used in farming. I tried to find a radically easier method. My goal was to making it with no heating, in only 10 minutes of mixing and in 3 days of sitting rather than a few weeks. I completely ignored the temperature requirements. I continued experimenting with different amounts and proportions of water, caustic potash and natural oil. After many experiments, I finally found the magic ratio. No heating, only 10 minutes to make. I named this JADAM wetting agent. This probably is the easiest method in the world in making natural liquid soap. The invention of JWA was a complete breakthrough; it opened wide the world of homemade natural pesticides.

The awesome thing about JWA is that it is just like natural soap; 99.9% biodegrades in 5 days when released into the environment. It causes almost zero soil contamination. JWA is very sensitive to water quality. If you use hard water (with high Ca, Mg, Fe), then JWA will be not effective or only marginally effective. You must use soft water; both in making JWA and in mixing JWA to make pesticide. If only hard water is available, use water softener. The reason why we mostly use canola oil instead of soybean oil is because it has a better wetting power. The problem is that most canola and soybean oils are genetically modified (GMO). In Korea, there is no law regulating GMO in natural oil. To avoid using GMO, you can use non-GMO canola oil or sunflower oil, olive oil, grapeseed oil, etc.

Making JWA (100 L or 26 gal)

Ingredients: canola oil 18 L (4.76 gal), caustic potash 3.2 kg (7 lb, KOH 90%), water 82.5 L (21.8 gal)

You will need: 110 L (29 gal) heat-resistant plastic container, electric drill, gloves, safety goggles

- Do not use containers smaller than 110 L (29 gal).
- Do not use aluminum containers.
- Container and all other tools need to be very clean.
- Use soft water that passed JWA water test.
- First water is 2.5 L (0.66 gal) and second is 80 L (21 gal).

Process of making JWA (complete in 4 days, without heating) Photo/preparation: Hyunho Cha

1. Do a JWA water test to make sure the water is soft water. Small bottle holds JWA sample.

2. Put in JWA in 0.5 L (16.9 fl oz) of water; see the changes. Water on right is suitable for making JWA.

3. Prepare clean heat-resistant plastic container of at least 110 L (29 gal). Do not use smaller ones

4.Measure precisely 2.5 L (84.54 fl oz) of water and pour in the container. If you make mistake in exact measurement, you can fail.

5.Put in 3.2 kg (7.05 lb) of caustic potash.

6.Close lid, roll on the side to melt the caustic potash. Be careful of small amount of gas produced.

7.Heat is produced when caustic potash meets water. Make sure it has melted completely.

8.Carefully open canola oil can.

9.Pour in 18 L (4.8 gal) of canola oil.

10.Prepare an electric drill. The blade must be very clean. Slower drill prolongs the mixing time.

11. If you use a container that is too wide, the depth will be shallow and liquid can splash while drill-mixing

12.Make sure you have gloves and safety goggles on. Observe the color change while mixing.

13. Color keeps changing and viscosity increases.
3 minutes passed.

14.Color keeps changing and viscosity increases.
4 minutes passed.

15.Color keeps changing and viscosity increases.
6 minutes passed.

16. Stop mixing when liquid is like thin mayo.
10 minutes passed.

17.Close lid and let sit for 3 days. Keep in a warm place if possible.

18.It will harden during sitting.

19.During the 3 days of sitting, the temperature slowly rises from 60°C (140°F) to 83°C (181°F) and then declines.

20.After 3 days, it will be solid like butter. Color and hardness can differ according to different environmental conditions.

21. Add 20 L (5.3 gal) of water. You must use soft water that passed JWA water test.

22.Use electric drill to mix thoroughly including the bottom to remove anything that remains stuck to the walls.

23.Do not overmix at this stage; the solution can become like white cream.

24.Add 60 L (15.9 gal) of water; use clean wood stick to stir thoroughly with hand.

25. These lumps start melting in water.

26.In cold weathers, lumps tend to sink to the bottom; stir thoroughly including the bottom

27.If added water is small or weather is cold, it can melt slowly.

28.Check thoroughly that there are no remaining lumps sticking to the bottom.

29. Almost all will melt 24 hours from 21. If water is lacking, it will not melt.

30.Pour water up to 3 cm (1.2 in) below the edge. 4 days passed; it is complete.

31.Tightly close lid and store/use. You can put into separate bottles and store.

32.JWA becomes darker as it ages. It will not be clear if water is not soft.

Tips in making and storing

Strong heat is produced in the making of JWA. Be extremely careful. High heat and electric drilling accompany danger; you must put on proper safety gear including gloves, safety goggle, mask, boots and jacket. Use heat-resistant container with a lid. Stainless steel containers are also okay but never use aluminum. To make 100 L (26 gal), container has to be at least 110 L (29 gal). If the container is too big, too much heat will be lost. Small amount of gas is produced in the beginning; work in a well-ventilated place. It is better to make JWA in a warm place. For storage, you can leave the whole contents in the container that you made it; or you can pour into other bottles. Tightly close lid for storage. Plastic bottles commonly used for water are also good. Store in a place that does not drop below freezing point. If JWA froze during storage, you can still use it after thawing it. JWA does not have an expiry date; in fact, its quality improves with age.

How to use JWA

You must use soft water when mixing JWA to make pesticide. Add 3 to 15 liters (0.8-4 gal) of JWA to water to make up 500 liters (132 gal). If you use less than 1.5 L (0.4 gal) of JWA, the pesticide does not disperse evenly which can reduce its effectiveness; cause concentration problems; and leave spray marks/residue. The amount of JWA you use is critical in deciding the efficacy of the natural pesticides. If the problem of pathogen or pests is not serious, use around 3 L (0.8 gal). If the pest problem is growing, use 5 L (1.3 gal). If the problem is serious, increase it up to 15 L (4 gal). Once the problem seems to be under con-

Making JWA in large quantities using machine.

Use containers with lid

You can use JWA as detergent, dishwasher and soap.

trol, reduce it back to 3 L (0.8 gal). If you use JWA at over 10 L (2.6 gal) continuously, it might suppress growth in some crops and damage the white powder coating of some fruits. In cold temperatures, mix JWA in a small amount of water first, and then add. JWA alone can control aphids, mites, and powdery mildew in their early stages. JWA can replace machine oil in winter for pest control in fruit trees. If you add JHS (JADAM herb solution), JS (JADAM sulfur), red clay powder, it makes even better pesticide. Unlike some synthetic wetting agents, JWA has almost no problem with blocking the stoma of leaves. Roughly, you would use JS in 1/5 the quantity of JWA.

Because commercial synthetic wetting agents are often diluted some 4,000 or 5,000 times, some farmers worry that mixing JWA with water in ×50 dilution is using too much wetting agent. This is not to worry because JWA is mostly made of water. If we look at how much oil was used, only 0.54 L (0.14 gal) has gone into 500 L (132 gal) which is about ×926 dilution.

You do not always have to make JWA in 100 L (26 gal) units. You can adjust the total volume; just stick to the ratio. But always use container that is more than 10 percent larger than the volume of JWA you wish to make. Below, I have provided a table for convenience. If you only have a small veggie garden, reduce the scale to 1/10th.

- For 500 L (132 gal), use 3-15 L (0.8-4 gal) in growing season, 10-20 L (2.64-5.28 gal) in winter. For fog machines, use 500 cc (0.13 gal) for 17 liters (4.5 gal).
- Can be applied to all crops.
- Has no expiration date.

- Costs less than 50 cents per liter.
- Improves pesticide-coating effect, increases pesticide effect.
- Apply early morning or at sunset.
- When mixing together with chemical pesticides: use 3-5 L (0.8-1.3 gal) for 500 L (132 gal) after passing mixture test and concentration test.
- If white film forms on top of JWA, remove the film and use.

Table of volumes of each ingredient (handy blender can be used for small amounts)

Making JWA of	5L 1.3 gal	10L 2.6 gal	20L 5.3 gal	40L 10.6 gal	50L 13.2 gal	100L 26.4 gal
Canola oil	0.9L 0.24 lb	1.8L 0.48 lb	3.6L 0.95 lb	7.2L 1.9 lb	9L 2.4 lb	18L 4.8 lb
KOH	0.16 kg 0.35 lb	0.32 kg 0.7 lb	0.64 kg 1.41 lb	1.28 kg 2.82 lb	1.6 kg 3.53 lb	3.2 kg 7.05 lb
Initial water	0.125 L 0.033 gal	0.25 L 0.066 gal	0.5 L 0.132 gal	1 L 0.264 gal	1.25 L 0.33gal	2.5 L 0.66 gal
Added water	4 L 1.06 gal	8 L 2.11 gal	16 L 4.23 gal	32 L 8.45gal	40 L 10.57 gal	80 L 21.13 gal

This is what happens when you over-drill with too little water. If water is not enough, JWA will not melt in water even if you mix with electric drill for a long time. JWA turned into a texture like white cream. Add water up to 3 cm (1.2 in) below the top and wait 2-3 days for bubbles to settle down. Clear JWA will gather below. If the white creamish film does not go away, remove it and use.

Color can change after storing in low temperature. It becomes clear again if it gets warmer again

8. JADAM sulfur (JS)

JADAM sulfur (JS) is also called red clay-sulfur. It is very effective against most diseases, and diseases do not develop resistance. Unlike lime-sulfur mixture, JS is made without heating, does not damage plastic and steel pipes of greenhouses. Effective against black spot, pear rust, powdery mildew, downy mildew, etc. Making 1 L (0.26 gal) of JS (25% sulfur) only costs 50 cents. 100 L (26 gal) of JS can be used 60-100 times (diluted in water to make pesticide of 500 L or 132 gal). JS can be used with commercial organic or chemical pesticides; but always do a mixture test and concentration test before use. Developed by Youngsang Cho.

❶ Prepare a 110 L (29 gal) container that is heat-resistant. Put in 25 kg (55.12 lb) sulfur, 0.5 kg (1.1 lb) phyllite, 0.5 kg (1.1 lb) red clay, 1.5 kg (3.3 lb) sea salt. Strictly adhere to the sequence. Do not use containers that cannot stand heat. Wear protective gloves, shoes, jacket and goggles.
❷ Put in 20 kg (44.1 lb) caustic soda; pour in exactly 50 L (13.21 gal) of water. Pour the water in at once. Take caution: if water is too little or weather is too hot, it can over-boil. If weather is warmer than 27°C (80.6℉), pour 54 L (14.3 gal) of water.
❸ Use 1.2 m (3.9 ft) long wooden stick to gently and thoroughly stir so that ingredients are well mixed with water. Do not use metal (aluminum) sticks.
❹ Temperature will exceed 80°C (176℉) and sulfur will start to melt. Have 1-2 L (0.26-0.53 gal) of water handy to add in in case it over-boils.
❺ Check with the stick that there is no remaining sulfur on the bottom. Stir thoroughly and dissolve completely. If you stir slowly for 20 minutes while the heat is high, all the sulfur will melt.
❻ Add second water of 32 L (8.45 gal) (if first water was 54 L or 14.3 gal, add 28L or 7.4 gal). Keep stirring. Let sit for 1-2 days. Take out the clear upper portion, put in thick plastic bottles for storage. If you leave it in the container you made it, layers with different sulfur concentration can form. Do not use the bottom sediments. If there are particles, you must use felt filter to clean the liquid before use. No expiry.

❼ Mix 0.5-2 L (0.13-0.53 gal) with water to make 500 L (132 gal). Start from 0.5 L (0.13 gal) for greenhouses, and 1 L (0.26 gal) for open fields; increase in 0.2 L (0.05 gal) increments. Use 1 L (0.26 gal) during flowering of fruit trees. For fog machines, use 0.1 L (0.026 gal) for 17 L (4.5 gal).
❽ Use JS only when disease has broken out. If you use too much repeatedly, it can cause growth problems. Grapes, persimmons, walnuts and greenhouse crops are sensitive to JS; take caution in increasing the dose.

Sulfur had excellent germicidal effect so was used in farming for centuries. But farmers cannot use it easily because it melts at around 113°C (235.4℉), but does not mix with water. Since the boiling point of water is 100°C (212℉), boiling water is not able to melt it. Boiling point of oil is above 200°C (392℉) so can melt sulfur. However, oil does not mix with water so cannot be used as pesticide. This is why lime-sulfur method was introduced which uses the intense heat produced by lime. This method is widely used to date. The problem of lime sulfur is that you need a very strong heat in the process and is difficult to do with simple apparatuses. It takes a very long time to make. Lime sulfur can cause serious concentration problems when used during growth period; so has been mostly limited to use for winter. Worse still, it can damage the plastic and steel pipes in a greenhouse.

To overcome the shortcomings of lime sulfur, Mr. Geunho Gim developed a method that does not use lime to melt sulfur. I was impressed and have since thought hard on coming up with a method that can make sulfur easily available for use for everybody. I did not want expensive machines or too high a heat being a necessity in the making. Moreover I wanted to raise the sulfur level to increase the germicidal effect and to minimize the byproduct to reduce environmental footprint.

If JADAM could come up with a method that, for example, allows anybody to melt sulfur in a gas stove, that would be an innovation. The whole world would be surprised. I continued my experiments but to no avail. I finally concluded that such thing was impossible. Then I came across this information that lye (caustic soda, or sodium hydroxide) was being used for making sulfur when I participated in a workshop organized by Mr. Giwhal Bak of Yesan. I came back and observed the water-lye reaction through various experiments. But melting 100 percent of the sulfur was not easy. I pressed on with my experiment. I added many different ingredients and carefully controlled the ratio of water, lye and sulfur. After nearly 100 experiments, I found the method to completely liquefy sulfur. I still do not forget the rapture I felt at that time. My small kitchen was my lab; it was around 3am that I knew that I finally made it.

But I wanted to make even further progress. I wanted a method where you do not need heating at all; do not need steel containers but can use plastic containers; and shorten the making time to less than 10 minutes. This time it was easier. After about 10 more experiments, I finally found the way. I named this “JADAM sulfur.” What I immediately did, instead of patenting it, was to disclose this knowledge. Cost was less than 50 cents per liter (0.26 gal); it could be made simply in less than 10 minutes without having to heat it; and it could be made in plastic containers. How easier could it get? The whole nation was excited. All over the nation, members sent reports on the result of putting this method to practice. It was extremely effective. JS caused very little concentration problem unlike other sulfur products even when used during plant growth. Another great feature of JS is that it does not damage the plastic and steel pipes of the greenhouses. Below is explanation with pictures.

Making JS (100 L or 26 gal)

Ingredients: sulfur 25 kg or 55 lb (99.9%), caustic soda 20 kg or 44 lb (98%, NaOH), water 82 L (21.7 gal), phyllite powder 0.5 kg (1.1 lb), red clay powder 0.5 kg (1.1 lb), sea salt 1.5 kg (3.3 lb)

You will need: 110 L (29 gal) heat-resistant plastic container, wood stick, mask, boots, jacket, gloves, safety goggles

[Very high heat is produced. Spill over of liquid can occur due to boiling. Take extreme caution...]

- Do not use containers smaller than 110 L (29 gal).
- Do not use aluminum containers.
- First water is 50 L or 13 gal (54 L or 14.3 gal in summer); second water is 32 L or 8.5 gal (28 L or 7.4 gal in summer).

Process of making JS (complete in 24 hours, without heating)

Photo/preparation: Hyunho Cha

1.These are ingredients for making JS.

2.Wear safety gloves and boots.

3.Wear safety goggles.

4.Wear mask for safety.

5. Have two containers ready.

6.Put 50 L (13.2 gal) of water in one container. Put 54 L (14.3 gal) if hotter than 27°C (80.6°F).

7.Add 25 kg (55.1 lb) of sulfur. Do it slowly so that dust will not rise.

8.Strictly adhere to the sequence.

9. Add 0.5 kg (1.1 lb) of red clay powder. If you do not have red clay powder, use very fine rock powder.

10.Add 0.5 kg (1.1 lb)of phyllite powder. This can also be replaced with very fine rock powder. This powder makes JS clear.

11.Add 1.5 kg (3.3 lb) of sea salt. Rock powder and sea salt reinforces minerals.

12.Add 20 kg (44.1 lb) of caustic soda. Do it slowly so that dust does not form.

13.Pour in water that was in another container. Pour at once. If you pour it divided in small quantities, overheating can result.

14.After water has been filled, use wood stick to stir slowly and thoroughly. Particularly stir the bottom so nothing is left un-melted.

15. Use wood stick about twice the depth of the container.

16.Stir thoroughly to melt all the sulfur at the bottom.

Video on making JS is available at en.jadam.kr

17.Sulfur rises to surface.

18.Keep stirring and temperature keeps rising. 3 minutes passed.

19.When temperature exceeds 80°C (176°F), sulfur starts to melt. 4 minutes passed.

20.Temperature approaches 90°C (194°F), melting is accelerated. 5 minutes passed.

21. Liquefied sulfur becomes visible. 6 minutes passed.

22.If water is too little or weather is too hot, it can over-boil. Have 2 L (0.53 gal) of water handy to pour in that case.

23.Temperature approaching 100°C (212°F). Keep stirring.

24.Keep stirring in circular motion. 10 minutes passed.

25.Use a big ladle or dipper to wash off all the sulfur on the walls.

26.Keep checking the bottom to make sure no sulfur is left. Keep stirring.

27.Mix while it is hot to melt sulfur.

28.There are small particles of sulfur on the surface. Temperature started to drop. 15 minutes passed.

29. After 24, you can use electric drill for mixing. Do not use machine before that stage because it is dangerous.

30.No sulfur is left on the bottom.

31.Sulfur has melted completely. Sulfur content is 40%. If you leave it as is, crystals will form when cold.

32. Add second water of 32 L (8.45 gal). Add 28 L (7.4 gal) if first water was 54 L (14.3 gal).

33. For 110 L (29 gal) containers, the solution will fill up to about 3 cm (1.2 in) below the edge.

34.Stir well for the last time.

35.100 L (26.4 gal) of JS has been completed.

36.JS appears black before sitting.

37.Close lid and let sit for 24 hours.

38.24 hours after sitting. 24 hours passed.

39.JS from the upper portion. The mixture of phyllite, red clay powder and sea salt gives you this clear sulfur solution.

40.Do not keep the JS in the container it was made. Place them in separate bottles. Do not use thin-walled bottles for storage.


41.This thick-walled container is good for storing JS.

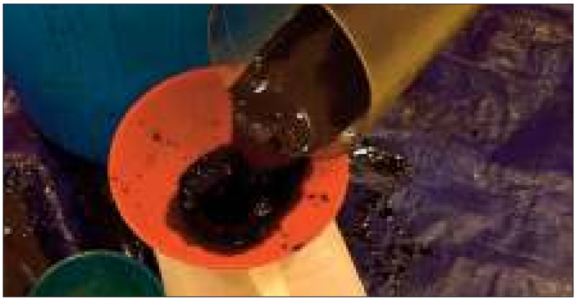

42.Take out the upper portion being careful not to agitate the sediments.

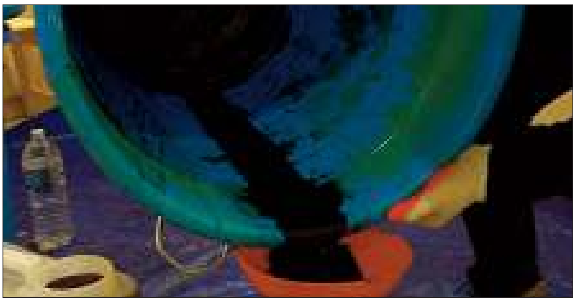

43.Place in storage containers. Have 5 containers (20 L or 5.3 gal size) ready.


44.As you go deeper, take more care that the deposits do not rise.


45. We obtained 80 L (21.1 gal) of clear JS through sitting.


46.This is JS with sediments after taking out 80 L (21.1 gal) of clear JS.


47. Also pour JS with sediments into a storage container.


48.Transfer everything that is left in the container to storage container.

49.What remain at the bottom of the container are phyllite and red clay powders that have not melted completely.

50.The storage container with sediments should be marked separately and let sit again.

51.Seal containers air-tight. If JS comes in contact with air, it can form white crystals.

52.JS in a bottle with sulfur content of 25%.

Tips in making and storing

Strong heat is produced in the making of JS. Be extremely careful. You must put on proper safety gear including gloves, safety goggle, mask, boots and jacket. JS produces higher heat than JWA. Always put safety first. Use heat-resistant plastic containers with lid. Stainless steel containers work but never use aluminum. Make sure the container is about 10% larger than the volume you wish to make. If the container is too big, the surface area increases so more heat will escape. Some gas can be emitted in the beginning; work in a well-ventilated place. Unlike JWA, JS cannot be stored in the large container that was used for making because upper portion will have low concentration and bottom part high concentration. Divide it into smaller containers for storage. Do not use commonly used water bottles with thin walls. Use thick-walled bottles. Do not store in below freezing temperatures. If JS froze, you can thaw it and use. There is no expiry.

How to use JS

Use 0.5-2 L (0.13-0.53 gal) of JS for 500 L (132 gal). If you add more

Spray bottle with JS diluted 10 times with water. It is effective against athlete's feet and eczema. Careful if you have sensitive skin.

than 2.5 L (0.66 gal), concentration problem can occur. If you do not use JS with JWA, JS can leave marks on plants, germicide effect will decrease and concentration problem can happen. For greenhouse plants, start from 0.5 L (0.13 gal), for open fields, start from 1 L (0.26 gal). See how it goes and increase in increments of 0.2 L (0.053 gal). Do not use JS throughout the year. Use only when there is disease problems or possibility of it. Do not use when you do not have disease problems. If you continue using JS, it can stunt plant growth. Take special care in early stages of growth or plants in greenhouses; their leaves are soft. Some persimmons, walnuts and grapes are sensitive to sulfur; take caution when increasing the dose. Always do mixture test and concentration test when you want to use JS with other commercial chemical pesticides. Do not spray at noon – except, for instance, pear rust.

JS is very effective against powdery mildew, downy mildew and fungus. It also works against black spot and canker. JS is no less effective than commercial germicides. To increase power, increase JWA to over 5 L (1.3 gal) and JS up to 2 L (0.53 gal), for 500 L or 132 gal. JS can replace lime sulfur for winter fruit tree pest control. Use around 5 L (1.3 gal) before sprouting or flowering; around 1 L (0.26 gal) when flower buds are becoming larger. JS 2 L (0.53 gal) with JWA 3 L (0.79 gal) for 500 L (132 gal) can be used to drop flowers to control flower numbers when used immediately after flowers come to full bloom. But this method is quite risky and you need to have fully done tests in prior. Use soft water for best results.

Facts about JADAM sulfur

Taking advantage of the prevailing popularity of sulfur, some people advertise that you have to use "detoxified" sulfur. This is a cheap scam, a fraud. These people say that if you use "untreated" sulfur instead of "detoxified" sulfur, then the poison in the sulfur will ruin your crops. I would not even mention this problem if companies sold their product at a reasonable price but they in fact are hoodwinking many farmers and selling at extravagant prices.

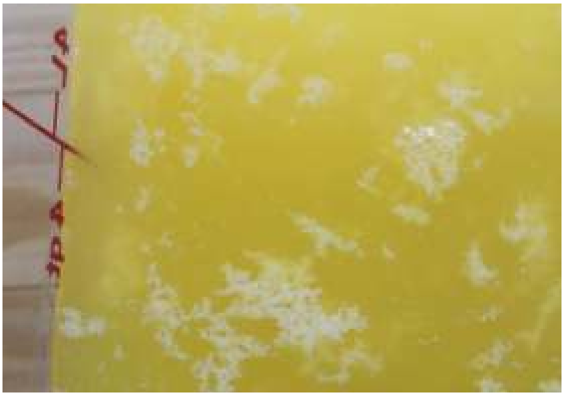
Let's think scientifically. If something is "detoxified" that means it had some toxin that was removed by a treatment process. Then please tell me what toxins were held in the sulfur in the first place when the purity of sulfur we use is 99.9%? These people should be able to say what toxins were there originally and how much of them were removed through "detoxification." However, all they ever say is that their end-product sulfur does not contain any lead (Pb), cadmium (Cd), chrome (Cr) and arsenic (As). They stress that to remove these toxins, they have to detoxify sulfur. The four heavy metal substances that they reference are not found in the 99.9% pure sulfur in the first place. Nothing was detoxed because there were no toxins to detox. The sulfur JADAM uses is very cheap; about 1 dollar for 1

Large machines like this can produce JS in a large volume. Picture: Gyeongho Yu

JADAM Sulfur Analysis Result (Content of S is the mean of JADAM's analysis values)

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
11.6	79.55	2.02	1.17	0.18
C/N %	P_2O_5 %	S %	CaO %	MgO %
11.37	0.043	24.6	0.005	-
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
15.650	5.307	-	1.747	0.907
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	0.04	-	-	-

Water has to be clear after mixing. Soft water, when mixed with JWA and JS, will remain clear and have good foam. This indicates a good quality pesticide. Bubbles are the key in pesticide



Clotting means problem. If water is not good, clotting can happen. You must change to soft water. Rainwater is typical soft water. If you use this clotted pesticide, you will have bad results – and many blocked nozzles.

kg (2.2 lb). To further elaborate, I have provided a table of substance analysis for the sulfur we use. Lead, cadmium, and arsenic were not found whereas a very small amount of chrome [0.04 ppm (mg•kg-1)] was detected but at a level 1/2,000th of the legal standard. This is negligible; it is even smaller than heavy metal detected in other liquid fertilizers. JS does not have to be always made in 100 L (26 gal). You can increase or decrease the size while keeping the ratios. For gardening purposes, use 1/10th scale.

Table of volumes of each ingredient (handy blender can be used for small amounts)

Making JS of	5L 1.3 gal	10L 2.6 gal	20L 5.3 gal	40L 10.6 gal	50L 13.2 gal	100L 26.4 gal
Sulfur	1 kg 2.2 lb	2.5 kg 5.51 lb	5 kg 11.02 lb	10 kg 22.05 lb	15 kg 33.07 lb	25 kg 55.12lb
NaOH	0.8 kg 1.76 lb	2 kg 4.4 lb	4 kg 8.8 lb	8 kg 17.6 lb	12 kg 26.5 lb	20 kg 44.1 lb
Initial water	2 L 0.53 gal	5 L 1.32 gal	10 L 2.64 gal	20 L 5.3 gal	30 L 7.9 gal	50 L 13.2 gal
Added water	1.28 L 0.34 gal	3.2 L 0.85 gal	6.4 L 1.69 gal	12.8 L 3.38 gal	19.2 L 5.07 gal	32 L 8.45 gal

- For 500 L (132 gal), use 0.5-2 L (0.13-0.53 gal) in growing season, 5 L (1.3 gal) in winter pest control. For fog machines, use 0.1 L (0.03 gal) for 17 L (4.5 gal).
- Can be applied to all crops.
- No expiry date.
- Costs 50 cents per liter (0.26 gal).
- JS is germicide against diseases. If used in strong dilution, it can also kill insects.
- Apply in early morning or at sunset. Avoid hot times of the day.
- Does not damage the plastic sheet or the steel pipes of the greenhouse.
- Always do mixture test and concentration test when you want to use JS with other commercial chemical pesticides. Do not use continuously; use only when in need to combat diseases.

- **NaOH** : It is better to use products that come in forms larger than powder (like flakes). If the purity is very high, like 100 percent, you might need to reduce the amount slightly compared to when you are using 98 percent purity.
- **Sulfur** : Some sulfur products produce some black debris and oil film on top of the solution after the making is finished. In this case, remove the particles and oil layer, and then use.

Making of lime sulfur. This needs high heat and takes a very long time. Photo: Jongsang Lee

If initial water is too small, intense heat will solidify sulfur. Once solidified, it will not melt.

9. JADAM herb solution (JHS)

JWA and JS can control diseases and some pests but to control wider range of insects including cabbage white butterfly caterpillars, tobacco moth, beet armyworm, stinkbug, thrips, you need JADAM herb solution (JHS). Use Jerusalem artichoke as the basic pesticide. For stronger JHS, use gingko, and then Korean pasque flower root (KPFR) for even stronger JHS. This is how you make them:

❶ Cut fresh plant into pieces; put them in a mesh bag with a rock (to sink it); put the bag in a pot. For pressure pots, add water to just submerge the mesh bag of plant; for normal pots, add about 30% more water. For 1 kg (2.2 lb) of fresh plant, add 4 L (1 gal) of water for pressure pot and 5 L (1.3 gal) for ordinary pot; for 1 kg (2.2 lb) of dried plant, add 20 L (5.3 gal) for pressure pot, 25 L (6.6 gal) for ordinary pot. The water must be soft water in which JWA mixes clearly.
❷ Boil for 4 hours in pressure pot (5 hrs in ordinary pot). Use high heat first, bring to boil, then lower to medium and maintain boil. You will get JHS around 70% of the volume of the water you added. After finishing boil, drip the bag and obtain the remaining water. You must use mesh bags particularly when the particles are small like KPFR.
❸ If you want to store JHS, pour the solution while it is still boiling into heat-resistant bottles until completely full, close lid tightly and lay it on the side for long storage. Use gloves when handling hot liquids. The whole bottle including the opening will be sterilized due to heat. The smaller the bottle, the easier the long storage.
❹ Keep in cool and dark place. Cold storages are also good.
❺ When using JHS, do not use the sediments, filter if not clear.
❻ Mix 3-20 L (0.8-5.3 gal) with water to make 500 L (132 gal). For fog machines, use 10 L (2.6 gal) for 17 L (4.5 gal).

JWA and JS can deal with some of the pests but for better effect, we recommend using JADAM herb solutions. You do not need professional knowledge to do so. Observe plants and trees; see which ones repel insects; have strong smell. Most of those plants have repelling or killing effect of insects. Common plants all around you can become valuable asset. Some of the easily available varieties with strong insect-repelling effect include: Jerusalem artichoke (Helianthus tuberosus), gingko, pokeweed, water pepper (Persicaria hydropiper), bracken (Pteridium) and foxglove (Digitalis purpurea). Red spider lily (Lycoris radiata) and the root of Korean pasque flower (Pulsatilla koreana) are highly poisonous. It took me a while to realize that many of the common plants were effective as pesticide. At first, I experimented with expensive herbs used in oriental medicine. But using expensive and rare herbs was against the spirit of JADAM. JADAM had to be SESE (simple, easy, scientific, effective). I never imagined that Jerusalem artichoke could become a pesticide. There is not a single bit of information in all the world that mentions that Jerusalem artichoke has poisonous property. It is food for us! Mr. Jeongho Gim of Gimcheon first found out about this property of Jerusalem artichoke. I interviewed him and learnt that Jerusalem artichoke was not only effective for diabetes but also had pesticide effect. This piece of information greatly opened up the world of herbal pesticide for JADAM. Jerusalem artichoke is easily grown and available anywhere in the world. They grow tall so do not even need weeding. Boil its leaves, branches and roots to get herb solution; mix with JWA and use as pesticide. It will control aphids, mites and most moths.

There are many methods of obtaining herb solution including brewing herbs in vinegar, wood vinegar or alcohol, but JADAM recommends boiling the herbs. This method is cheap, easy and can get strong solutions. Imagine boiling chicken in water and leaving the chicken in vinegar or alcohol. Which soup would you like to eat? Boiling certainly brings out a lot of nutrients from the chicken. You can use a large pot to make a large quantity and store them in vacuum and sterile conditions for 1-2 years. Large pressure pots are optimum but ordinary pots can also be used. But if you are using latter, boil 1-2 hours longer. The JHS you get by boiling

These are some herbal oil you get after deep frying strong-scented herbs in canola oil. Using these in making JWA is another promising field that can make pesticide use even simpler.

herbs mix well with JWA; they do not clot; they form much foam. If you use high-pressure double pots used in oriental medicine, you can get stronger solutions faster. Herbal solutions made from brewing in vinegar or wood vinegar do not mix well with JWA; those from alcohol mix well.

Herbs with strong scent such as peppermint, Korean mint, cinnamon bark, star anise (Illicium verum), rosemary, lavender, hot pepper, mustard, pepper, etc. can be deep fried in oil. Poisonous substance will melt into the oil. Oil also has the advantage of keeping the flavor for a long time. I plan to upgrade JWA by using this oil instead of canola and name it herbal JADAM wetting agent (H-JWA). If this is successful, water plus H-JWA will be sufficient to control pests. It makes things even simpler. There is also “fresh juice” method where you blend fresh herb and use; but JADAM advises against it because it is a hard work, not as effective, and can leave sticky substances on the fruit.

You can get herbal solution from tobacco leaves, garlic, hot pepper and gingko fruits by leaving them in water instead of boiling. Herbs that are not easily decomposed can be made with this method without boiling. For tobacco leaves, leave in water for 15 days, hot pepper and gingko fruits (including peel) for 1 month, minced garlic for 1 month.

If the bottle inflates during storage, it indicates failure in sterilization; the

Jerusalme artichoke. Insects do not like to touch this plant. Use the whole plant including branches, leaves and roots; boil and obtain JHS. You can cut them in autumn, dry and use. It is assumed that inulin – good for diabetes – in the plant somehow acts as pesticide

Gingko. The tree has the perfect defense mechanism against pests and diseases. Use fresh leaves, fallen leaves and fruits.

Korean pasque flower. Root is used. It is used to promote blood circulation in oriental medicine. It has the strongest pesticide effect of all. Collect seeds in mid-May; sprout them in a tray (takes about 10 days); transplant. Grow them in full sun. (photo: unknown)

Red spider lily. Used in oriental medicine for tumor. If you plant its roots, they will repel moles and snakes. Use the roots for JHS.

Mass producing herbal solution using large high-pressure pot. Photo: Gyeongho Yun

microbes have begun feeding on the herbal solution. If decomposition began, JHS loses its effectiveness. Once you open a container, use it up in 1-2 days. Use small bottles for storage because large ones are hard to fill up, harder to use up at once and are more prone to microbial attack. After your autumn harvest, prepare JWA, JS and many different JHSs for next year's farming.

Jerusalem artichoke, gingko, Korean pasque flower and red spider lily are commonly used herbs in JADAM organic farming. Grow them around your farm; become self-sufficient; reduce cost.

Process of making JHS

Photo/preparation: Hyunho Cha

1.This is commercially available dried Korean pasque flower root. You can buy this from JADAM.

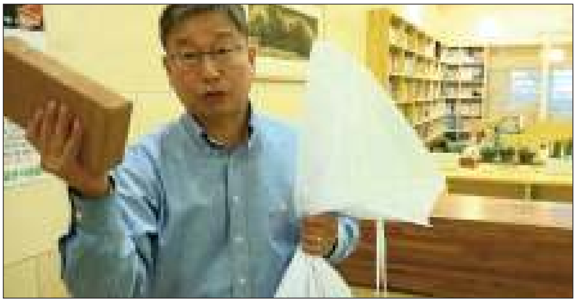
2.Mark issued by Korean Ministry of Food and Drug Safety approving good medical practice.

3. Prepare 100 L (26.4 gal) container and gas burner. Work in a well-ventilated area.

4.Add 75 L (19.8 gal) of water to boil 3 kg (6.6 lb) of dried KPFR.

5. Prepare a fine mesh bag (60×70 cm, 24×28 in). Easily available on the internet.

6.Put KPFR in mesh bag.



7. Put in heavy rocks or brick in the bag to sink it.

8.Tie the bag and put it in water.


9. Start fire at high.


10.As temperature rises, white foam is seen.


11.Keep high heat until boil.


12.Leave lid slightly open so that the contents do not spill out.


13. Reduce to medium heat. If you keep boiling in high heat, too much liquid will be lost through evaporation.


14.Maintain a gentle boil.


15. Take out the bag after approx. 5 hrs.


16.Keep water slightly boiling for disinfection as you take the liquid for storage.

Video on making JHS is available at en.jadam.kr

17. Put the JHS in heat-resistant bottles.

18.Make sure the liquid is completely full. Squeeze slightly until no air is left, then seal with lid.

19.Immediately lay the bottle on its side. Hot liquid will enter the small air pockets around the lid and disinfect it completely.

20.For large farms, use large containers like this one. Use heat-resistant ones with tight lid.

21.Pour slowly; if you pour fast there will be much bubbles.

22.Fill up as much as you can.

23. Lay on its side. Place in cold storage for long term keeping.

24.There is almost nothing remaining in the pot if you use mesh bag.

As shown in the analysis results below, JHSs also function as excellent fertilizers which is unimaginable with chemical pesticides. Add 3 to 20 liters (0.8-5.3 gal) of JHS to water to make up 500 liters (132 gal). JHS cause little concentration stress.

Korean pasque flower root JHS analysis

pH	EC (1:5) ds/m	OM %	T-C %	T-N %
6.9	0.67	0.21	0.12	0.01
C/N %	P_2O_5 %	K_2O %	CaO %	MgO %
9.25	0.070	0.071	0.015	0.005
Na_2O %	Fe $mg{\cdot}kg^{-1}$	Mn $mg{\cdot}kg^{-1}$	Zn $mg{\cdot}kg^{-1}$	Cu $mg{\cdot}kg^{-1}$
0.002	15.885	1.376	0.253	0.012
Cd $mg{\cdot}kg^{-1}$	Cr $mg{\cdot}kg^{-1}$	Ni $mg{\cdot}kg^{-1}$	Pb $mg{\cdot}kg^{-1}$	As $mg{\cdot}kg^{-1}$
-	-	-	0.101	-

- Use 3-20 L (0.8-5.3 gal) for 500 liters (132 gal). For fog machines, use 10L (2.6 gal) for 17L (4.5 gal).
- Can apply to all crops.
- Can keep 1 years when well-sterilized.
- Only costs your labor.
- Can expect germicide and insecticide effects. Also acts as fertilizer.
- Use water that passed JWA water test (soft water). Do not use sediments. Filter when particles are present.

◀ Making JHS in plastic container with electric coiled water heater
This is another method of making JHS. Use the heat-resistant 110 L (29 gal) container that you used for making JWA. Put in the ingredients and stick in an electric coiled water heater. Keep the temperature at about 120°C (248°F) and let it boil. Do it in a warm place, protected from cold. This consumes a lot of electricity. Use earth leakage breaker. Attaching a valve at the bottom is convenien

▶ "Selection of 100 Herbs for Pesticide" Written by Geol Yu of JADAM

Jerusalem artichoke JHS

Use leaves and roots collected from spring to autumn.

Garden balsam JHS

Use leaves and roots collected from spring to autumn.

Foxglove JHS

Use leaves collected from spring to autumn

Tobacco JHS

Use leaves collected from spring to autumn. Dried ones are also good.
It can also be made by brewing in water for 15 days.

Red spider lily JHS

Use roots collected from autumn to winter.

Monkshood JHS

Use leaves and roots collected in autumn.

Oleander JHS

Use leaves collected from spring to autumn.

Bracken JHS

Use leaves collected from spring to autumn

Sophora root JHS
Use roots collected in autumn.

Garlic JHS
Use bulbs.

Korean pasque flower root JHS

Use roots collected in autumn.

Hot pepper JHS

Use fruits collected in autumn. .

Peppermint JHS

Use leaves collected from spring to autumn.

Pyracantha JHS

Use fruits collected in autumn.

10. Making pesticide from microorganism solution

Conventional agriculture focuses on selecting a few microorganisms that have antagonistic characteristics (prey on, compete, suppress, etc.) against pathogens; and then mass producing them. That is why research and development in microorganisms is led by professional scientists and requires huge investment and human resources. An individual farmer cannot do this. But if you only change your thinking; things will become radically different. For a microbe, **area** equals food. Most pathogens are heterotrophs, meaning that they cannot fix carbon and thus rely on feeding other organic matter for energy. Simply put, they need food. Food comes from the “area” that the pathogens have occupied. The area can be the skin of animal or the leaves or branches of a plant. In most cases, they have a nasty habit of feeding on “living” things. If you take away the area, the pathogens lose food and you win the battle. How do you do that? The idea of a pesticide is to kill and wipe out the disease-causing organisms; but this is neither the best nor the only method.

JADAM’s method is to “crowd out” the pathogens. Don’t bother killing them. Just bring in millions and millions of microorganisms to that “area.” Leaf mold from the mountains is the treasure house of microbes. JADAM microorganism solution has been cultured from that and has a very high number of microbes per volume. Don’t bother selecting a particular microorganism; just use it as a whole. Increase the kinds and number of microbes in the “area” and the pathogens lose dominance. This is farming based on logic; science based on common sense.

I have experimented this theory with my own body. I had skin disease (athlete’s foot) in my fingernails. Normally you’d have to take antibiotics for three months. I cured it simply by putting in my fingers in water and leaf mold mixture frequently. When my children had diarrhea or stomachache, I fed them leaf mold water; surprisingly they were cured instantly. This might not be for everyone but through such experiments and experiences I learnt the power of microorganisms. Actually many people can experience this. If you have athlete's foot, walk around barefoot and it will be cured. This is the power of microorganisms. Power comes from diversity and number. Mold that causes athlete's foot is a tough one; barely able to kill with three months dosage of antibiotics. But diversity and population of microorganisms simply disables the mold. This means that JMS itself is a germicide. Applying JMS regularly to the soil and leaves prevents any pathogen from gaining dominance. JMS increases the kinds and number of microorganisms which in effect crowds out disease-causing organisms.

JMS has multi-benefits. It improves soil quality, increases available nutrients for plants and helps them grow. Seen from a pesticide perspective, JMS acts as an occupying force. Since "area" equals food for pathogens which are heterotrophs; when JMS takes away the area, pathogens lose power. Don't bother identifying, selecting, targeting and killing the disease-causing organisms.

This is a battle of numbers. If you do not secure enough number, you cannot win. Imagine that currently there are 1 million harmful bacteria in

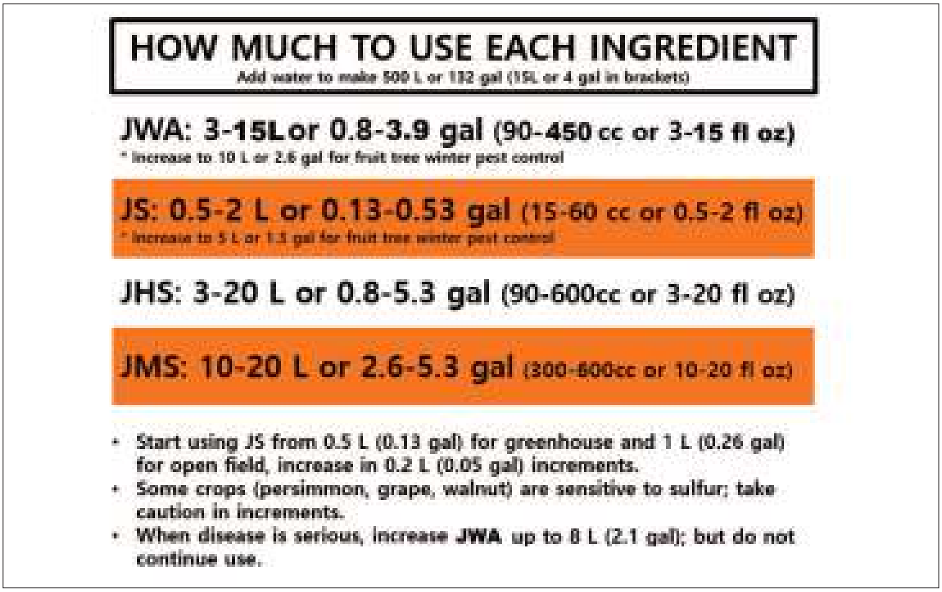
This is JADAM microorganism solution (JMS) made by feeding boiled potato to microorganisms from leaf mold. 1 ml (0.03 fl oz) holds about 0.1 to 1 billion microorganisms


Taking a bath in JMS. Skin problems (eczema, athlete's foot) will be gone. The naked guy is me, 5 years ago.

1 square centimeter of the leaf of your crop, totally feasting on the plant. You cannot expect to beat them if you only put in an army of a few hundred. Increase the number. How do you do that? When JMS reaches peak in its foam, that is when there is the highest number of microorganisms present. 1 milliliter (one drop) will hold about 0.1 billion microorganisms. Spray this all over the field, soil and plants, and you can effectively occupy the area, take it away from pathogens. When applying, mix 10-20 L (2.6-5.3 gal) of JMS into water to make 500 L (132 gal) and add 3 L (0.8 gal) of JWA. You must use JWA or else, the microorganisms will not be coated evenly and leave marks on the plant. If you put in too much JMS, say over 20 L (5.3 gal), microorganisms will instantly break down JWA and make it ineffective.

- Use 10-20 liters (2.6-5.3 gal) for 500 liters (132 gal).
- Use for all crops.
- Use when foam reaches peak on the surface.
- Builds resistance against pathogens and pests, improves soil quality, helps root settlement.
- If you mix with JHS (herbal solution), it can kill insects. If you do not mix with JWA, it will be less effective and leave marks on the plants. Particularly use soft water to culture microorganism solution for foliar application.

11. How much of each ingredient to use – concentration problem



Any material, when abused, will cause concentration stress. This problem of concentration has to be carefully addressed if you are to use homemade pesticides. If you've used a weak homemade pesticide, then you can increase its concentration; however, if you've used a strong one, then the damage is already done. It can disturb the growth and metabolism of plants; directly impacting the yield and quality. For perennial fruit trees, the impact can continue on to next year. The above is a general guideline that you should follow. The guideline is helpful but is by no means perfect. Always do small-scale experiments on your farm to check for any concentration problems on your own before moving onto the entire field. JWA, JMS, JHS are essentially nutrients so do not cause serious problems; but be careful with JADAM sulfur.

JADAM wetting agent: Use 3 to 8 L (0.8-2.1 gal) to make up 500 L (132 gal). If you increase JWA, pesticide and germicide effects increase. If you want to make stronger pesticide, increase JWA to above 8 L (2.1 gal) but bring it back down to 3 L (0.8 gal) after pest has come under control. If infestation is serious, use 10 L (2.6 gal); but use only once. If you continue to use overly strong concentration, it can harm the plants and damage the white powdery coating on some fruits. For fog machines where you use less water, for 17 L (4.5 gal), use 10 L (2.6 gal) of JHS, 0.5 L (0.13 gal) of JWA and 0.1 L (0.026 gal) of JS.

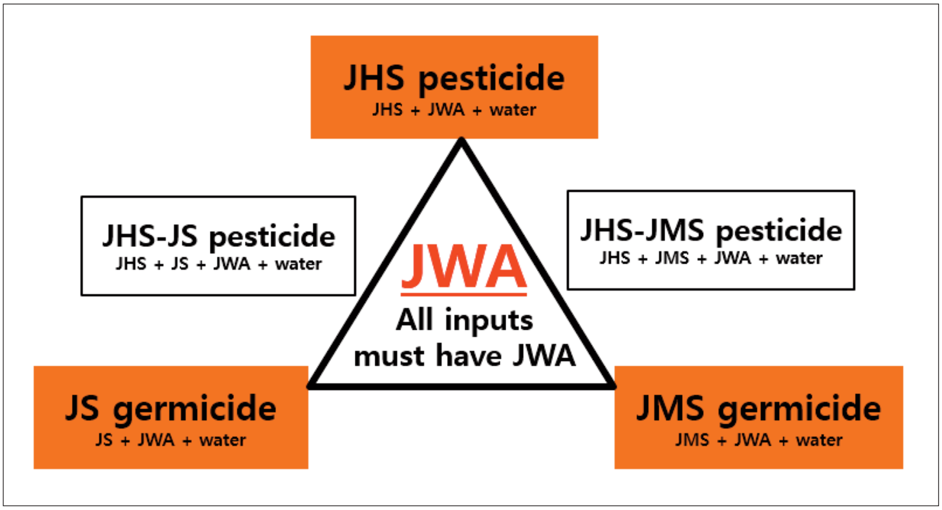
JADAM sulfur: Start from 1 L (0.26 gal) for 500 L (132 gal). For very soft plants growing in greenhouses, start from 0.5 L (0.13 gal). Increase gradually in small increments of 0.2 L (0.053 gal). In general, when JS exceeds 2.5 L (0.66 gal), concentration stress will result, burning the edges of the leaves. Apple and pepper are relatively resistant against strong concentrations, but there are some crops that are particularly sensitive such as persimmons, grapes and walnuts. Use extra caution for them.

JADAM herbal solution and JWA: When you increase JHS for higher pesticidal effect, you must increase the JWA together. Water is extremely important in JADAM pesticide. Use soft water. Hard water will compromise the wetting property of JWA and the pesticide will be ineffective. Always do a mixture test and concentration test before applying to the whole field. The final pesticide you get after mixing all the ingredients should produce vigorous foam when shaken. Weak foam (like beer) means weak effect.

How often to apply: There is no rule for this. Different regions, climate, plants, diseases, pests all call for different approach. Generally, you will use natural pesticide in 2-days shorter cycle compared to chemical pesticides. Application in early stage of growth is important because leaves are tender and prone to pest damage. Spray thoroughly. Use repeatedly when infestation is serious. In this case, take out the JS and use only JHS and JWA. You can have 2-3 hours term or 12 hours term between first and second applications. You can spray in the evening and again next morning.

When to apply: Apply when humid. If pesticide evaporates, it is ineffective. What we want to do is to coat the pest and/or pathogens with pesticidal substance and keep them wet for as long as possible. Early morning and sunset are good times for application.

12. JADAM natural pesticide program



The figure illustrates the world of JNP. It is quite simple. Notice that everything converges towards the JADAM wetting agent in the center. Without JWA, there is no pesticide. The amount of JWA can increase or decrease the power of the pesticide.

When JADAM sulfur and JADAM wetting agent are combined they produce "JS germicide." Rather than increasing the amount of sulfur which can cause serious concentration stress, increase the JWA content up to 6 L (1.6 gal). You can add JADAM herb solution and make "JS-JHS pesticide."

JHS plus JWA produces "JHS pesticide." Neither of these ingredients cause much concentration problems. As for JHS you can start from 3 L (0.8 gal) and increase it up to 20 L (5.3 gal). When increasing JHS, always increase JWA together. You can add JADAM microorganism solution or JADAM sulfur. If JADAM microorganism solution and JWA come together, you get "JMS germicide." Do not use JMS undiluted as they break down JWA; limit it to below 20 L (5.3 gal). You can add JADAM herb solution to this to get "JMS-JHS pesticide." You can make stronger pesticide by increasing JHS and JWA. If the pesticide doesn't seem to work, make it stronger.

JADAM pesticide is intended to be an "all-purpose" pesticide. It functions as bactericide, germicide, fungicide and insecticide. There is no "you have to use this product for this disease and another for that, and buy another for this pest." With JADAM pesticide, you do not need separate pesticide for different pests, diseases or plants. Say you grow a few different plants; you can still spray the same pesticide on all of them. For example, pesticide for apple works fine for pear. So you need only one pesticide to work with. It makes work much simpler. Different combinations of JWA, JS, Jerusalem artichoke JHS, gingko JHS and Korean pasque flower root JHS will control almost all pests and diseases. Jerusalem artichoke controls aphids, mites and moths. Gingko can control all that Jerusalem artichoke controls plus mulberry suckers, Citrus flatid planthoppers and leafhoppers. KPFR can deal with almost all pests that Jerusalem artichoke and gingko fail to.

What about soil disinfectant? This, again, becomes easy if you think that controlling pest aboveground is same as underground. If you apply gingko JHS plus JWA on soil, you get some soil disinfecting effect. You can use JS plus JWA for soil disinfection, but we do not recommend this method. If you use JS on soil, it can harden the soil so is a loss in long-term. Rather than JS, use JMS to increase and boost microbial ecology in soil. JMS method can even control soil nematodes. Many find it difficult to tackle nematodes but it is not so difficult in JADAM method. Just increase the diversity and number of microbes.

Some important tips in using JADAM natural pesticide are: choose soft water and mix the ingredients well; coat the plants thoroughly; use only very clear liquids and filter out any particles from JHS. Follow this advice carefully if you want smooth and clean fruits and leaves. Test the water with JWA; if the water turns murky and has not much foam, do not use that water. If you cannot change water to soft water, try increasing the volume of JWA or use commercial synthetic wetting agents. If you are organic certified, check that the purchased wetting agents that are permitted substances. There are commercial wetting agents that are permitted for organic production, but they are very expensive. If you only have hard water and have to buy commercial wetting agents, we suggest that you instead install water softener and make JADAM wetting agent yourself. Water softener only costs around 5 dollars a month to operate.

You cannot continue high-cost farming; keep buying expensive pesticides. Switch to JADAM where you can farm at 100 dollars per acre (0.4 ha). Make your farming ultra-low-cost. Make it strong and viable; able to survive any changing economic conditions. JADAM's method of making natural pesticide yourself is completely new to the world. You might be stupefied by this shocking new system of farming that we present but our method has been proven in our members' farms, in fact, it has evolved with the participation of our member farmers. Trust me. It works.

Machines used in Bongha village (CEO Jeongho Gim), Korea, where 160 households came together to farm in JADAM method over 132 ha (330 acres). They produce JADAM pesticide in large scale using these machines. Left is high-pressure pot for boiling herbs. Center is for making JADAM sulfur. Right is JADAM wetting agent. JADAM method can be easily practiced for areas over hundreds of hectares/acres.

Controlling aphids with JHS pesticide (500 L or 132 gal, JWA 5 L or 1.3 gal + Jerusalem artichoke JHS 5 L or 1.3 gal)

1.Aphids common in the back of cucumber leaves.

2.Jerusalem artichoke JHS pesticide has been applied. Because of JWA, they have been coated completely.

3.3 hours after spray. All aphids have died.

4.24 hours after spray. Aphids changed in color

1. Aphids in the back of pepper leaves.

2.Jerusalem artichoke JHS pesticide has been applied. Because of JWA, they have been coated completely.

3. 24 hours after spray. Aphids have shrunk as moisture evaporated.

4.This is the power of Jerusalem artichoke JHS. Surprisingly Jerusalem artichoke is edible for humans.

1. Powdery aphids in the back of peach leaves. These aphids are very hard to control because of the white powder on their body.

2.The power of JWA – it has wet the aphids completely; pesticide is delivered into their system. You must use soft water.

3.3 hours after spray. All aphids have died.

4. Along with the aphids, pesticide will kill pesky larvae as well.

1. Spiraea aphid have infested in the leaf back of apple trees. These leaves have hair; you need to spray thoroughly.

2.With JWA, pesticide has completely coated the target.

3. Wetting power is the key in pesticide. If you increase JWA, you get more wetting power.

4.24 hours after spray. About 95% has been controlled.

Jadam organic farming has its origin in 1967

Hankyu Cho started advocating Natural Farming from 1967. He strongly opposed chemical fertilizer and chemical pesticide that were rushing into Korea at that time, and has done so rest of his life. Government oppression could not stop him. Mr. Cho ran his own farm to teach Natural Farming. This Natural Farming is the foundation of today's Jadam organic farming system.

Left is Hankyu Cho, below him is the author and his son, Youngsang Cho. Hankyu Cho's seminars were intensive, lasting about a week.

13. Examples of JADAM natural pesticide programs

Cautions in using Jadam natural pesticides (JNP)

• Always do a mixture test and concentration test prior to full application.
• Spray pesticide early morning, late evening or on cloudy (humid) days.
• For making pesticide, use water (soft water) that passed Jadam wetting agent water test.
• When mixing JNPs with commercial pesticide or liquid fertilizers, always do mixture and concentration tests. Do not mix or use together with Delan-family pesticides.
• Use JNP at least 7 days after spraying commercial chemical pesticide.
• Do not use Jadam sulfur throughout crop's growth; only use 2 to 3 times when necessary.
• Persimmon, grape, walnut, and perilla are sensitive to Jadam sulfur; take caution when increasing dose.
• For greenhouse and protected cultivation, start using Jadam sulfur from 0.5 L (0.13 gal) and up; for open fields, use from 1 L (0.26 gal) and up. Increase in 0.2 L (0.05 gal) increments.
• When more than 10 L (2.6 gal) of JWA is mixed into 500 L (132 gal), do not continue use in that strong a concentration.
• If you mix vinegar, wood vinegar, sea water, sea salt, liquid fertilizers made using sugar or molasses, there will be little foam. In that case, dilute at about 1,000 rate.
• Always filter the JNP before use so that they do not leave marks on the plants. Only use top clear portion of Jadam herbal solution (JHS).
• JNP can be mixed with JLF. In this case, increase JWA.
• JNP is most effective when sprayed at early stage of disease or pest outbreak. You should adjust the application of JNP according to the level of infestation.
• If you have bees in your greenhouse, make sure they are all in the hives, shut the entrance of hives, then spray. Only open the hives again after fully ventilating the greenhouse.
• When increasing JHS, always increase JWA together to have strong effects.
• After spraying JNP, do not re-use leftovers.
• Make sure when spraying, the target (pests, diseased area, plant itself) is fully wet.

How to mix pesticides: Half fill the pesticide barrel with water. Add each pesticide (JWA, JS, JHS) in separately. Mix after adding in each of them. Fill up the barrel with water. Mix thoroughly again. Mix more when cold. Do not mix JWA and JS together; they will clot. Always mix them separately into water first

1. Rice bakanae disease (immerse 48 hours in cold water)

Developed by Seonseop Jeong, Youngsu Hyeon, Seonsu Gim, Youngsang Cho

• JADAM sulfur 5 L (1.3 gal)

(Add water to make 500 L (132 gal)) (for 20 L (5.3 gal), use JS 0.2 L (0.053 gal))

- Immerse the rice seeds in above solution (just use cold water) for 48 hours; then wash thoroughly with water.
- In case of government-supplied variety, rinse and rub 3 times, and then immerse in the sulfur solution.
- For rice seeds with thick husks, use 7 L (1.85 gal) of JS.
- This seed disinfection method can be applied to other seeds. Immerse seeds for around 30 minutes (time can vary).
- For waxy rice and colored rice, use 7 L (1.85 gal) of JS.
- If rice seedlings are diseased in seedbed, mix 1.5 L (0.4 gal) of JS and 3 L (0.8 gal) of JWA with water to make 500 L (132 gal), and spray.
- This solution can replace chemical seed disinfectant; it can also be used for garlic and onions.

Result of using no. 1 on rice bakanae disease

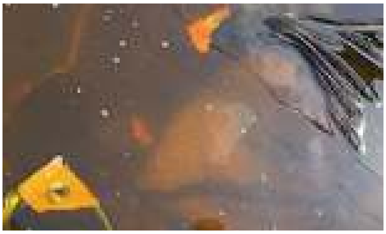
Photo: Seonsu Gim, Hyunho Cha


Rice bakanae has been controlled with no. 1


Rice seedlings with bakanae disease.


Rice seedlings with bakanae disease.


1.Put rice seeds in small porous bags.


2.Leave in cold water solution for 48 hours.


3.White film will form on surface.


4.Rinse very thoroughly with water and start sprouting.


5.Growing rice on tray.


6.Rice bakanae has been completely eliminated.

2. Water rice weevil

Developed by Seongmin Bak, Youngsang Cho

•Mix 3 L (0.8 gal) of JADAM wetting agent in 5 L (1.3 gal) of water; stir well.
•Add 0.5 L (0.132 gal) of JS and stir.
•Add 3 L (0.8 gal) of canola oil and mix with drill (manual or electrical) for 10 minutes.

- Above is a water surface-spreading agent. Water rice weevils inhabit in the dikes of the rice paddy.
- First apply 500 L or 132 gal (water + JWA 5 L or 1.3 gal + JS 2 L or 0.52 gal) once or twice on the dikes of the rice paddy early in the morning; transplant the rice; then sprinkle the above surface-spreading agent undiluted once or twice on the water surface. Make it new every time you use. Use soft water. 1 L (0.26 gal) of surface spreading agent can cover 0.1 ha (1/4 ac).
- Drill a hole in the lid of a plastic bottle; put the agent in it; shake the bottle to sprinkle the pesticide.
- Sprinkle in early morning when there is little wind.
- You can use 20 L (5.3 gal) sized backpack sprayer; take out the nozzle and sprinkle.
- Use repeatedly when infestation is serious.
- Apply intensively on waterways where cold water is entering the field. This does not kill water snails.

Making and using no. 2

Photo: Youngsang Cho


Damage done by rice water weevil


1.Add JWA to water and stir


2.Add JS and stir.


3.Add canola oil and stir.


4.Surface spreading agent completed.


5.Sprinkle on surface.


6.Pesticide is starting to spread out on the surface.


7.Pesticide spreading over wide area.


8.Pesticide has formed a film on the surface.

3. Pest control solution for rice

(Effective against brown planthopper, Asiatic rice borer, armyworm, rice leaf roller, rice blast, rice sheath blight, smut, stinkbug, etc.) Developed by Youngsang Cho

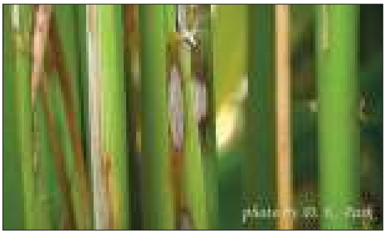
- **JWA 5 L (1.3 gal)**
- **JS 2 L (0.53 gal)**
- **Jerusalem artichoke JHS 5 L (1.3 gal)**
- **Korean pasque flower root JHS 5 L (1.3 gal)**

- If pest and/or disease infestation is serious, increase JWA and Korean pasque flower root JHS to over 10 L (2.6 gal). You can use only KPFR JHS and take out Jerusalem artichoke JHS.
- If you increase JWA and KPFR JHS, it will become stronger.
- For black stinkbugs, use over 10 L (2.6 gal) of JWA and over 15 L (4 gal) of KPFR JHS.
- For leaf blight, use over 12 L (3.17 gal) of JWA and over 2.5 L (0.66 gal) of JS.

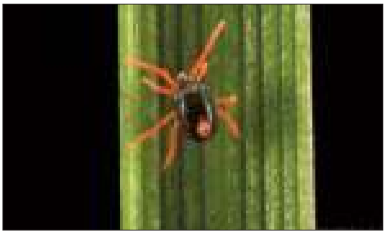
Pests and diseases you can control with no. 3

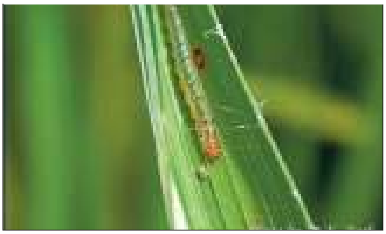

Black stinkbug (photo: Deog-ki Park)


Rice blast (photo: Deog-kee Park)


Rice sheath blight (photo: Deog-kee Park)


Larvae of rice moth (Naranga aenescens Moore)


Earth mite (photo: Deog-kee Park)


Rice leaf roller (photo: Deog-kee Park)


Smut (photo: Eunsang Yu)


Rice blast (photo: Deog-kee Park)


Brown planthopper (photo: Deog-kee Park)

4. Powdery mildew, downy mildew, fungal diseases

Developed by Youngsang Cho

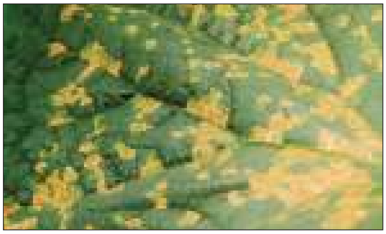
- **JWA 3 L (0.8 gal)**
- **JS 1.2 L (0.3 gal)** Mix above ingredients with water to make 500 L (132 gal)

- You must use good water (soft water) to make JNP for effectiveness.
- Use JMS regularly to prevent disease through diversity.
- Do not rely only on JNP; change environmental conditions that are favorable for fungus.
- Add JHS and increase JWA to 5 L (1.3 gal) if you want to control pests together.
- Apply this JNP in early stage of disease outbreak for best results.
- JS can cause concentration damage to young and soft leaves, greenhouse plants, grapes, persimmon, walnut and perila. Always do a concentration test before full-field application. When increasing JS, increase in 0.2 L (0.05 gal) increments.
-Do not use JS regularly throughout the season; use only 2-3 times when there is disease problem.

Diseases you can control with no. 4


Powdery mildew on melon (photo: unknown)


Powdery mildew on sesame (photo: unknown)


Downy mildew (photo: unknown)

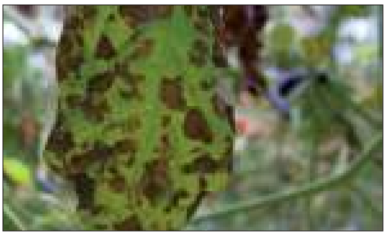

Leaf fungus (photo: unknown)


Powdery mildew on strawberry (photo: Deog-kee Park)


Grey mold on strawberry (photo: unknown)


Green mold on tangerine


Black spot on tangerine (photo: Jehun Mun)


Black spot on tangerine (photo: Jehun Mun)

5. Canker, black spot, pear rust, brown blotch diseases

Developed by Jaun Gu, Hiseok Bak, Youngsang Cho

- **JWA 5 L (1.3 gal)**
- **JS 1.5 L (0.4 gal)** Mix above ingredients with water to make 500 L (132 gal)

- You must use good water (soft water) to make JNP for effectiveness.
- Use JMS regularly to prevent disease through diversity.
- Add JHS and increase JWA to 5 L (1.3 gal) if you want to control pests together.
- Do not use JS regularly throughout the season; use only 2-3 times when there is disease problem.
- If pepper canker is serious, increase JWA to 10 L (2.6 gal) and JS to 2 L (0.53 gal); apply every 2 days for total application of two or three times.
- For pear rust, it is effective to apply around 11am on a clear day.
- Do not re-use leftover JNP that contains JS.
- Number 5 is stronger than no. 4.

Diseases you can control with no. 5


Canker on pepper (photo: Hyunho Cha)


Pear rust (photo: unknown)


Black spot on pear (photo: unknown)

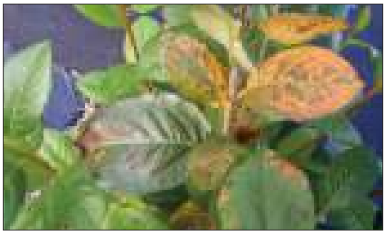

Rice leaf blight (photo: unknown)


Black spot on plum (photo: unknown)


Powdery mildew on rose (photo: unknown)


Brown blotch (photo: unknown)


White rot on mulberry (photo: unknown)


Brown blotch on chokeberry (photo: unknown)

6. Aphid and mite

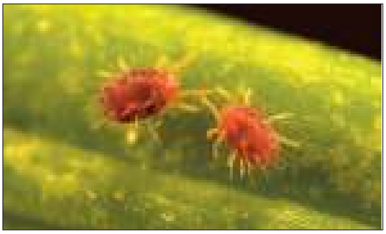
Developed by Jeongho Choi, Youngsang Cho

- **JWA 5 L (1.3 gal)**
- **Jerusalem artichoke JHS 5 L (1.3 gal)** Mix above ingredients with water to make 500 L (132 gal)

- You can replace Jerusalem artichoke with ginkgo or Korean pasque flower root or pokeweed.
- You must use good water (soft water) to make JNP for effectiveness.
- Add 1 to 2 L (0.26 to 0.53 gal) of JS (for 500 L or 132 gal) to also have disease control effect. JS is also effective on mites.
- If you increase JWA and JHS to about 10 L (2.6 gal) for 500 L (132 gal), pesticide will become very strong. In this case, watch out for concentration problems.
- If JS is not used, you can use JNP consecutively.
- If there are a lot of pests, spray at evening and re-spray next morning.
- If you add 0.5 kg (1.1 lb) of red clay powder for 500 L (132 gal), pesticidal effect increases.
- Leaf-rolling aphids should be intensively controlled from early stage of plant growth when new sprouts appear.

Pests you can control with no. 6

Photo: Deog-kee Park


Mite on tangerine


Silverleaf whitefly


Aphid (Taiwanomyzus montanus)


Cotton aphid (Aphis gossypii)


Turnip aphid (Lipaphis pseudobrassicae)


Spider mite


Mealy plum aphid


Aculops lycopersi


Earth mite

7. Moth

(tobacco moth, beet armyworm, scale, slug moth, diamondback moth, oriental fruit moth, etc.)

Developed by Hyunho Cha, Youngsang Cho

- **JWA 8 L (2.1 gal)**
- **Jerusalem artichoke JHS 15 L (4 gal)**

Mix above ingredients with water to make 500 L (132 gal)

- If infestation is serious, apply at sunset followed by another application early next morning.
- The more JWA and JHS, the stronger the pesticide will be.
- You can replace Jerusalem artichoke with pokeweed, ginkgo, Korean pasque flower root.
- To control pathogens at the same time, add 1 to 2 L (0.26 to 0.53 gal) of JS for 500 L (132 gal).
- For hairy pests like slug moth larvae (Thosea sinensis), repeatedly apply and wet them thoroughly.
- If you add 0.5 kg (1.1 lb) of very fine red clay powder, it increases effectiveness.
- For some nocturnal moths, it can be better to spray at the evening.
- No. 7 is stronger than no. 6. When JS is not used, spray consecutively for better results.

Pests you can control with no. 7

Photo: Deog-kee Park


Citrus mealybug (Planococcus citri)


Arrowhead scale (Unaspis yanonensis)


Tobacco moth larva

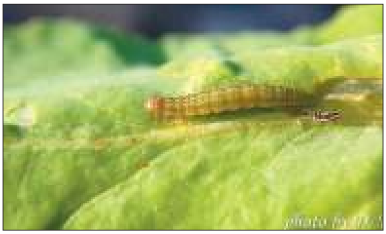

Cabbage moth larva


Fruitworm moth larva


Perilla leaf moth larva


Slug moth larva


Diamondback moth larva


Diamondback moth larva

8. Citrus flatid planthopper, leafhopper, mulberry sucker, spot clothing wax cicada

Developed by Taehwa Bak, Hyunho Cha, Youngsang Cho

- **JWA 10 L (2.64 gal)**
- **Gingko JHS 15 L (4 gal)**

Mix above ingredients with water to make 500 L (132 gal)

- Use ginkgo leaves and/or fruit peels. Bracken or KPFR can replace ginkgo.
- If JS is not used, you can spray in 1-2 days.
- This can be used as soil pesticide when the amount of JWA and ginkgo JHS is halved.
- If you increase JWA and JHS, the pesticide will become stronger.
- Do not continue use with JWA exceeding 10 L (2.6 gal). The strong concentration can damage plants (damaging the white powdery coating of fruits or stunting growth).
- If you add 0.5 kg (1.1 lb) of very fine red clay powder, it increases effectiveness.
- Use good water (soft water) for best wetting effect.
- No. 8 is stronger than no. 7 and 6.

Pests you can control with no. 8


Ricanid plant hopper (photo: Deog-kee Park)


Mulberry sucker (photo:Deog-kee Park)

Slug moth larva (photo: Deog-kee Park)

Rice green leafhopper (photo: Deog-kee Park)


Citrus flatid planthopper adult (photo: Sujeong An)


Citrus flatid planthopper nymph (photo: Sujeong An)


Spot clothing wax cicada adult (photo: Sujeong An)


Spot clothing wax cicada nymph


Wooly apple aphid (photo: Deog-kee Park)

9. Stinkbug, thrip, greenhouse whitefly, turnip moth, flea beetle, pear sucker, fruit fly, onion fly, mosquito, grasshopper, etc.

Developed by Youngsang Cho

- **JWA 10 L (2.64 gal)**
- **Korean pasque flower root JHS 15 L (4 gal)** Mix above ingredients with water to make 500 L (132 gal)

- This is the strongest of all JADAM pesticides. Korea pasque flower root can be replaced with oleander.
- If infestation is serious, increase JWA up to 15 L (4 gal) and KPFR JHS to 20 L (5.3 gal).
- If JS is not used, you can apply this twice a day, or between 1-2 days.
- This can be used as soil pesticide when the amount of JWA and KPFR JHS is halved.
- If you add 0.5 kg (1.1 lb) of very fine red clay powder, it increases effectiveness.
- No. 9 includes the effect of all 6, 7 and 8.

Pests you can control with no. 9

Photo: Deog-kee Park


Bean bug (Riptortus clavatus)


Silverleaf whitefly (photo: unknown)


Turnip moth larva

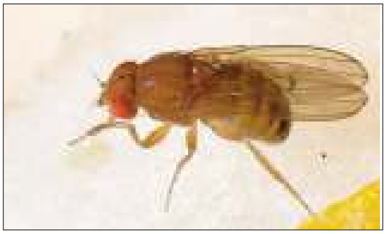

Pear psylla


Greenhouse whitefly


Tangerine thrips


Winter cherry bug (Acanthocoris sordidus)


Mosquito


Fruit fly

10. Slug, Snail

Developed by Youngsang Cho

- **JWA 3 L (0.8 gal)**
- **Sodium hydroxide 1.5 kg (3.3 lb)** Mix above ingredients with water to make 500 L (132 gal)

- Dissolve caustic soda in a small quantity of water first and then mix with rest of the water.
- If you add JHS, it can control aphids, mites and moths.
- VERY IMPORTANT: Make sure it does not touch the skin when spraying!!
- To add germicidal effect (control diseases), add 1-2 L (0.26-0.53 gal) of JS.
- If desired, add 0.5 kg (1.1 lb) of very fine red clay powder to increase effectiveness.
- Sodium hydroxide(Caustic soda) can be added to any JNP for increased strength. However always do a concentration stress test.
- Never touch caustic soda with bare hands; wear protective gloves.
- Use good water (soft) to maximize wetting effect.

Pests you can control with no. 10

Photo: Deog-kee Park


Acusta despecta


Slug


Winged mite


Tobacco aphid


Hayhurstia atriplicis


Sallow aphid (aphis farinosa)


Azalea white mite


Velvet mite


Aphid (Uroleucon torajicola)

11. JMS pesticide (for prevention of diseases and pests)

Developed by Youngsang Cho

- **JADAM microorganism solution 20 L (5.3 gal)**
- **Jerusalem artichoke JHS 5 L (1.3 gal)**
- **Gingko JHS 5 L (1.3 gal)**
- **JWA 3 L (0.8 gal)**

Mix above ingredients with water to make 500 L (132 gal)

- Use this regularly for prevention, before diseases or pests break out.
- Foliar application of JMS increases microbial diversity and prevents the dominance of a particular pathogen.
- If disease breaks out, replace JMS with JS; if pest occurs, replace JMS and gingko solution with KPFR solution.
- You can use both JHS or use just one.
- Increase JWA and JHS to strengthen pesticidal effect.
- If desired, add 0.5 kg (1.1 lb) of fine red clay powder for higher effect.

Diseases and pests you can prevent with no. 11

Photo: Deog-kee Park


Powdery mildew on strawberry


Leaf fungus on tomato


Powdery mildew on cucumber


Moth larva (genus Dichocrocis)


Cotton aphid


Moth larva (genus Cabera)


Daikon leaf beetle (Phaedon brassicae)


Tobacco moth


Beet armyworm

12. All-purpose pesticide (for both pests and diseases)

Developed by Youngsang Cho

- **JS 1.5 L (0.4 gal)**
- **JWA 6 L (1.6. gal)**
- **Jerusalem artichoke JHS 5 L (1.3 gal)**
- **KPFR JHS 10 L (2.6 gal)**

Mix above ingredients with water to make 500 L (132 gal)

- If pest infestation is serious, increase KPFR JHS to 15 L (4 gal).
- As for JS, start from 0.5 L (0.13 gal) and gradually increase for greenhouses; from 1 L (0.26 gal) for open fields. Increase in 0.2 L (0.05 gal) increments.
- Grapes, persimmons, walnuts and perilla are sensitive to JS; always do a prior concentration test
- It is okay to use only KPFR JHS for herbal solution.
- If you increase JWA and JHS, you get stronger pesticide.

Pests you can prevent with no. 12

Photo: Deog-kee Park


Stinkbug (Arma custos)

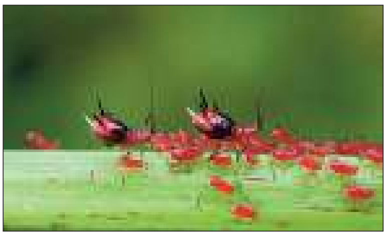

Thrips


Pear psylla


Stinkbug (Homalogonia obtusa)


Onion fly maggot


Turnip moth eggs


Aphid (Taiwanomyzus montanus)


Cucumber moth (Palpita indica)


Stinkbug (genus Eysarcoris)

13. Fruit trees winter pest control

Developed by Chanmo Gim

- **JWA 10 L (2.6 gal)**
- **JS 5 L (1.3 gal)**
- **Find red clay powder 2 kg (4.4 lb)** Mix above ingredients with water to make 500 L (132 gal)

- For fruit trees that do not shed leaves, reduce JWA to below 2 L (0.53 gal).
- Apply once after leaves fall; 1-2 times between late-Feb and budding in spring.
- Add JHS and increase JWA to get stronger pesticide.

How to make fine red clay powder (developed by Chanmo Kim, Goseong)
Dissolve red clay in water. Filter with felt. Let the filtered water sit for 1 hour; fine particles will settle at bottom. Discard the upper water. Dry the particles in shade; you get fine red clay powder. Slice the lump in about 2 kg (4.4 lb) and dissolve in water to use for winter pest control. When spraying, keep stirring or run an aerator so that the clay particles do not sink.

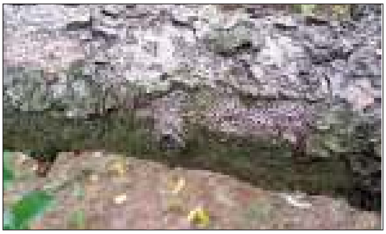
Making no. 13 and diseases and pests that it can control


1.Fine red clay powder. Photo: Young-Sang cho


2.Measure 2 kg (4.4 lb) and dissolve in water.


3.Filter out large particles.


4.Use air pump so that clay will not sink down.


Valsa canker (photo: unknown)


Scale (photo: Deoggi Bak)


Arrowhead scale (photo: Deoggi Bak)


Pear sucker (photo: Deoggi Bak)


Moss disease (photo: unknown)

14. Soil foundation

(Effective against soil nematodes, verticillium wilt, virus diseases)

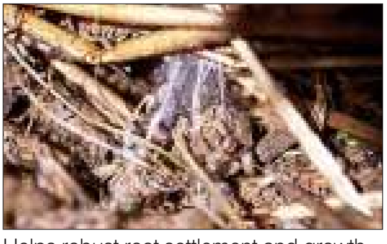
Developed by Youngsang Cho

- **JMS 500 L (132 gal) for up to 3.3 ha (8 ac)**
- **Sea salt 0.5 kg (1.1 lb) for 0.1 ha (1/4 ac) (Melt it in 20 L or 5.3 gal water, then add)**
- **Phyllite solution 20 L (5.3 gal) for 0.1 ha (1/4 ac)**
- **Wild grass and crop residues JLF 20 L (5.3 gal) for 0.1 ha (1/4 ac)**

- This is the most technique in Jadam organic farming. It solves most soil-borne disease problems and helps high yield.
- Apply this generously and often before sprouting or flowering of fruit trees and transplanting of crops.
- High yield is determined at early stage of plant growth. How well the root settles right after transplanting decides the yield.
- Mix this solution with water for greenhouse. Water generously so that the water takes these inputs deeper than 1 meter (3.3 ft). For open fields, apply undiluted before rain, or also mix into water; fully soak the soil.
- Apply this to soil 3-4 times a month during growth.
- Increase the volume of sea salt, phyllite solution and JLF in same ratio for areas larger than 0.1 ha (1/4 ac). For areas smaller than 0.1 ha (1/4 ac), take out sea salt.
- Phyllite solution is upper portion of the water that you get after adding 60 kg (132 lb) of phyllite to 500 L (132 gal) of water, stirring and settling. Keep adding water after use, and continue to use for one year. (You can directly sprinkle phyllite powder onto the soil)
- Adjust water volume so that JMS is diluted at around ×20; the rest at ×100.

Effects of no. 14 and diseases and pests that it can control

Photo: YoungSang Cho


Helps robust root settlement and growth

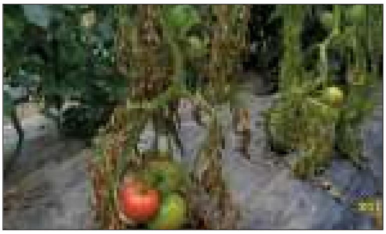

Balanced extension of the root


Strong roots lead to high yield


Phytophthora blight (Photo: Deog-kee Park)


Canker on pepper (Photo:Deog-kee Park)


Root knot nematode (photo: unknown)


Wilt (photo: unknown)


Virus disease (photo: unknown)


Root knot nematode (photo: unknown)


Zonate leaf spot is destroying conventional farm (left) but Jadam persimmon trees are untouched (right). Result of use of no. 14.

New experiment with foam gun

Mix 5 L (1.3 gal) of JWA and 5 L (1.3 gal) of Jerusalem artichoke JHS with water to make 500 L (132 gal)

Developed by Hyunho Cha, Youngsang Cho

I have experimented on the method to maximize the pesticide effect of Jerusalem artichoke because this plant is easily available anywhere in the world. I tried to find a way where you do not even need gingko or Korean pasque flower. That is why we tried a foam gun. This cannot be applied for large areas but is feasible in gardening or urban veggie gardens. We have sprayed JADAM pesticide using commonly used foam gun for car wash and the results were very successful.

This is a foam gun for car wash easily available through internet shopping. It costs around 100 dollars.

Here, we changed the nozzle of a motor-sprayer to foam gun nozzle. (Demonstration by Hyunho Cha)

Normally Jerusalem artichoke JHS plus JWA is not strong enough to control stinkbugs. But not with a foam gun.

The moment foam was sprayed, moth was trapped in foam and killed.

Normally Jerusalem artichoke JHS cannot control flies. But when hit with foam, it died instantly.

14. Herbal smoker

Herbal smoker is particularly effective in controlling pests in short plants. The herb smoker is particularly useful inside a greenhouse in winter, because if you apply water-based pesticide, the inside becomes too humid. You can avoid this problem with smokers. It is very effective in controlling tiny pests like mites, silverleaf whitefly, greenhouse whitefly, leaf miner fly, etc. Smoke fills up the entire enclosed space, seeping into the tiniest holes. Tobacco is commonly used, but many other plants are thought to be effective. If the plant material is too dry, it will not produce as much smoke. Make sure it is adequately wet before stuffing it in the smoker. Smoke the house after 7 pm in a cloudy day. Place one or two smokers per every 330 square meters (0.08 ac) of the greenhouse.

Shut the windows of the greenhouse, take out the beehives, place the smoker on the floor, light it and come out. The smoke sinks down on cloudy days and that is more effective in enshrouding the plants. Next morning, open the windows, let the smoke out and put the beehives back in. Tobaccos can leave smell on the fruits so do not use them near harvest. If you spray JMS the smell will go away quickly. Herb smoking method has enormous potential. Building on this method, I believe greenhouse farming can go completely chemical-free with ease. Find and use plants other than tobacco. Plants like gingko, peppermint, clove, Korean mint and Japanese pepper with strong pesticidal effect or scent would be very useful. This is a very interesting and promising area that remains to be studied.

1. Using oil tin can as smoker.

2. Use the sharp tip of a hammer to punch holes

3. Punch holes on all four sides.

4. Make slightly larger holes on the bottom.

5. You can attach a wire hanger for conven-ience.

6. Place a coal briquette in the can and light the fire.

7. Put in the herb; spray water on the herb for more smoke.

8. As coal burns, smoke is produced.

9. More smoke coming out as time passes.

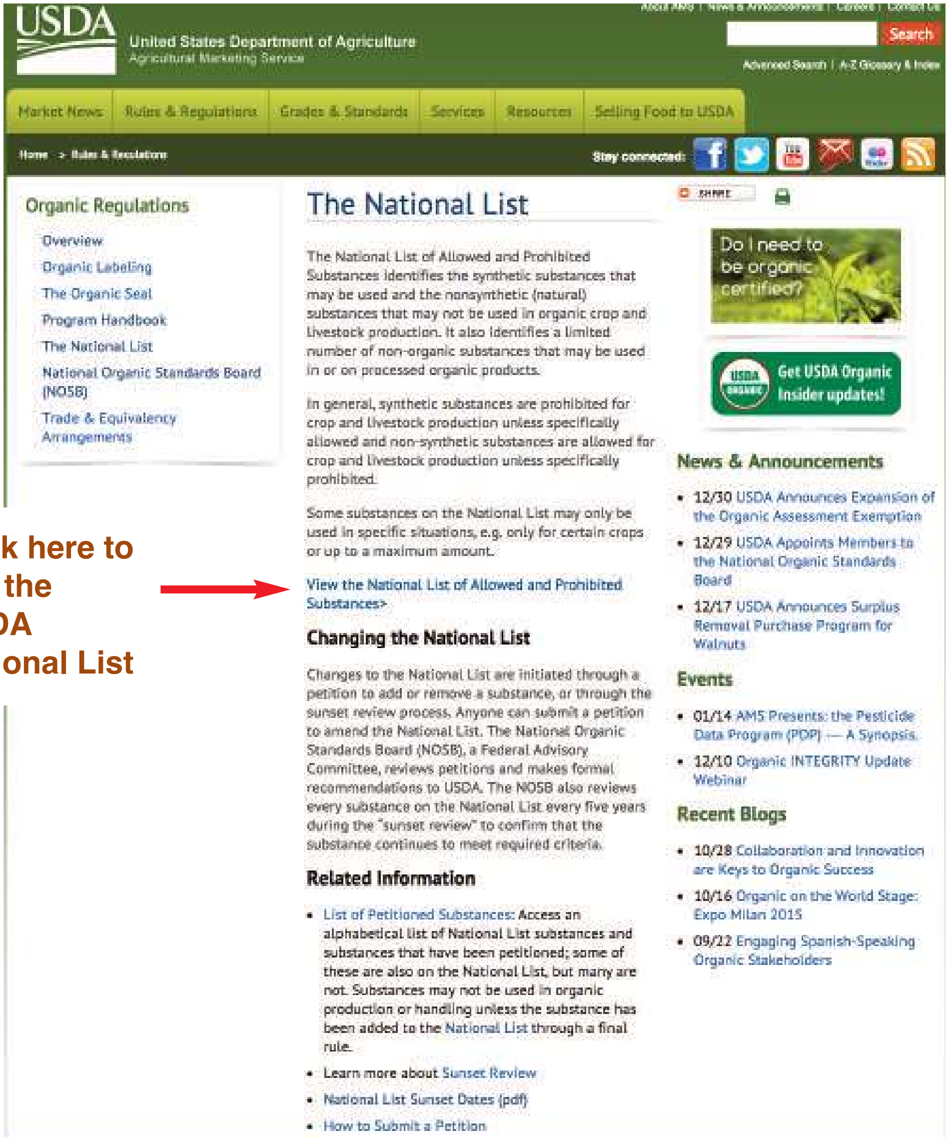
10. The smoke can keep going for over 2 hours. .

JADAM organic farming is practiced for growing rice, pepper, cabbage and persimmon on a large-scale of 134 ha (330 ac) in Bongha village, Korea. (CEO Jeongho GIM)

Bongha made and used approx. 10,000 L (2,640 gal) of Jadam pesticide in a year which cost around $2,300. That is $7 per acre (0.4 ha).

❒ Resource: USDA National List

http://www.ams.usda.gov/rules-regulations/organic/national-list



USDA United States Department of Agriculture
Agricultural Marketing Service

About AMS | News & Announcements | Careers | Contact Us
Search
Advanced Search | A-Z Glossary & Index

Market News | Rules & Regulations | Grades & Standards | Services | Resources | Selling Food to USDA

Home > Rules & Regulations
Stay connected:

Organic Regulations

- Overview
- Organic Labeling
- The Organic Seal
- Program Handbook
- The National List
- National Organic Standards Board (NOSB)
- Trade & Equivalency Arrangements

The National List

The National List of Allowed and Prohibited Substances identifies the synthetic substances that may be used and the nonsynthetic (natural) substances that may not be used in organic crop and livestock production. It also identifies a limited number of non-organic substances that may be used in or on processed organic products.

In general, synthetic substances are prohibited for crop and livestock production unless specifically allowed and non-synthetic substances are allowed for crop and livestock production unless specifically prohibited.

Some substances on the National List may only be used in specific situations, e.g. only for certain crops or up to a maximum amount.

View the National List of Allowed and Prohibited Substances>

Changing the National List

Changes to the National List are initiated through a petition to add or remove a substance, or through the sunset review process. Anyone can submit a petition to amend the National List. The National Organic Standards Board (NOSB), a Federal Advisory Committee, reviews petitions and makes formal recommendations to USDA. The NOSB also reviews every substance on the National List every five years during the "sunset review" to confirm that the substance continues to meet required criteria.

Related Information

- List of Petitioned Substances: Access an alphabetical list of National List substances and substances that have been petitioned; some of these are also on the National List, but many are not. Substances may not be used in organic production or handling unless the substance has been added to the National List through a final rule.
- Learn more about Sunset Review
- National List Sunset Dates (pdf)
- How to Submit a Petition

SHARE

Do I need to be organic certified?

USDA ORGANIC Get USDA Organic Insider updates!

News & Announcements

- 12/30 USDA Announces Expansion of the Organic Assessment Exemption
- 12/29 USDA Appoints Members to the National Organic Standards Board
- 12/17 USDA Announces Surplus Removal Purchase Program for Walnuts

Events

- 01/14 AMS Presents: the Pesticide Data Program (PDP) — A Synopsis.
- 12/10 Organic INTEGRITY Update Webinar

Recent Blogs

- 10/28 Collaboration and Innovation are Keys to Organic Success
- 10/16 Organic on the World Stage: Expo Milan 2015
- 09/22 Engaging Spanish-Speaking Organic Stakeholders

Click here to see the USDA National List

The National List of Allowed and Prohibited Substances

Back to Top

§205.600 Evaluation criteria for allowed and prohibited substances, methods, and ingredients.

The following criteria will be utilized in the evaluation of substances or ingredients for the organic production and handling sections of the National List:

(a) Synthetic and nonsynthetic substances considered for inclusion on or deletion from the National List of allowed and prohibited substances will be evaluated using the criteria specified in the Act (7 U.S.C. 6517 and 6518).

(b) In addition to the criteria set forth in the Act, any synthetic substance used as a processing aid or adjuvant will be evaluated against the following criteria:

(1) The substance cannot be produced from a natural source and there are no organic substitutes;

(2) The substance's manufacture, use, and disposal do not have adverse effects on the environment and are done in a manner compatible with organic handling;

(3) The nutritional quality of the food is maintained when the substance is used, and the substance, itself, or its breakdown products do not have an adverse effect on human health as defined by applicable Federal regulations;

(4) The substance's primary use is not as a preservative or to recreate or improve flavors, colors, textures, or nutritive value lost during processing, except where the replacement of nutrients is required by law;

(5) The substance is listed as generally recognized as safe (GRAS) by Food and Drug Administration (FDA) when used in accordance with FDA's good manufacturing practices (GMP) and contains no residues of heavy metals or other contaminants in excess of tolerances set by FDA; and

(6) The substance is essential for the handling of organically produced agricultural products.

(c) Nonsynthetics used in organic processing will be evaluated using the criteria specified in the Act (7 U.S.C. 6517 and 6518).

Back to Top

§205.601 Synthetic substances allowed for use in organic crop production.

In accordance with restrictions specified in this section, the following synthetic substances may be used in organic crop production: *Provided*, That, use of such substances do not contribute to contamination of crops, soil, or water. Substances allowed by this section, except disinfectants and sanitizers in paragraph (a) and those substances in paragraphs (c), (j), (k), and (l) of this section, may only be used when the provisions set forth in §205.206(a) through (d) prove insufficient to prevent or control the target pest.

(a) As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems.

(1) Alcohols.

(i) Ethanol.

(ii) Isopropanol.

(2) Chlorine materials—For pre-harvest use, residual chlorine levels in the water in direct crop contact or as water from cleaning irrigation systems applied to soil must not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act, except that chlorine products may be used in edible sprout production according to EPA label directions.

(i) Calcium hypochlorite.

(ii) Chlorine dioxide.

(iii) Sodium hypochlorite.

(3) Copper sulfate—for use as an algicide in aquatic rice systems, is limited to one application per field during any 24-month period. Application rates are limited to those which do not increase baseline soil test values for copper over a timeframe agreed upon by the producer and accredited certifying agent.

(4) Hydrogen peroxide.

(5) Ozone gas—for use as an irrigation system cleaner only.

(6) Peracetic acid—for use in disinfecting equipment, seed, and asexually propagated planting material. Also permitted in hydrogen peroxide formulations as allowed in §205.601(a) at concentration of no more than 6% as indicated on the pesticide product label.

(7) Soap-based algicide/demossers.

(8) Sodium carbonate peroxyhydrate (CAS #-15630-89-4)—Federal law restricts the use of this substance in food crop production to approved food uses identified on the product label.

(b) As herbicides, weed barriers, as applicable.

(1) Herbicides, soap-based—for use in farmstead maintenance (roadways, ditches, right of ways, building perimeters) and ornamental crops.

(2) Mulches.

(i) Newspaper or other recycled paper, without glossy or colored inks.

(ii) Plastic mulch and covers (petroleum-based other than polyvinyl chloride (PVC)).

(iii) Biodegradable biobased mulch film as defined in §205.2. Must be produced without organisms or feedstock derived from excluded methods.

(c) As compost feedstocks—Newspapers or other recycled paper, without glossy or colored inks.

(d) As animal repellents—Soaps, ammonium—for use as a large animal repellant only, no contact with soil or edible portion of crop.

(e) As insecticides (including acaricides or mite control).

(1) Ammonium carbonate—for use as bait in insect traps only, no direct contact with crop or soil.

(2) Aqueous potassium silicate (CAS #-1312-76-1)—the silica, used in the manufacture of potassium silicate, must be sourced from naturally occurring sand.

(3) Boric acid—structural pest control, no direct contact with organic food or crops.

(4) Copper sulfate—for use as tadpole shrimp control in aquatic rice production, is limited to one application per field during any 24-month period. Application rates are limited to levels which do not increase baseline soil test values for copper over a timeframe agreed upon by the producer and accredited certifying agent.

(5) Elemental sulfur.

(6) Lime sulfur—including calcium polysulfide.

(7) Oils, horticultural—narrow range oils as dormant, suffocating, and summer oils.

(8) Soaps, insecticidal.

(9) Sticky traps/barriers.

(10) Sucrose octanoate esters (CAS #s—42922-74-7; 58064-47-4)—in accordance with approved labeling.

(f) As insect management. Pheromones.

(g) As rodenticides. Vitamin D_3.

(h) As slug or snail bait. Ferric phosphate (CAS # 10045-86-0).

(i) As plant disease control.

(1) Aqueous potassium silicate (CAS #-1312-76-1)—the silica, used in the manufacture of potassium silicate, must be sourced from naturally occurring sand.

(2) Coppers, fixed—copper hydroxide, copper oxide, copper oxychloride, includes products exempted from EPA tolerance, *Provided*, That, copper-based materials must be used in a manner that minimizes accumulation in the soil and shall not be used as herbicides.

(3) Copper sulfate—Substance must be used in a manner that minimizes accumulation of copper in the soil.

(4) Hydrated lime.

(5) Hydrogen peroxide.

(6) Lime sulfur.

(7) Oils, horticultural, narrow range oils as dormant, suffocating, and summer oils.

(8) Peracetic acid—for use to control fire blight bacteria. Also permitted in hydrogen peroxide formulations as allowed in §205.601(i) at concentration of no more than 6% as indicated on the pesticide product label.

(9) Potassium bicarbonate.

(10) Elemental sulfur.

(j) As plant or soil amendments.

(1) Aquatic plant extracts (other than hydrolyzed)—Extraction process is limited to the use of potassium hydroxide or sodium hydroxide; solvent amount used is limited to that amount necessary for extraction.

(2) Elemental sulfur.

(3) Humic acids—naturally occurring deposits, water and alkali extracts only.

(4) Lignin sulfonate—chelating agent, dust suppressant.

(5) Magnesium sulfate—allowed with a documented soil deficiency.

(6) Micronutrients—not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing.

(i) Soluble boron products.

(ii) Sulfates, carbonates, oxides, or silicates of zinc, copper, iron, manganese, molybdenum, selenium, and cobalt.

(7) Liquid fish products—can be pH adjusted with sulfuric, citric or phosphoric acid. The amount of acid used shall not exceed the minimum needed to lower the pH to 3.5.

(8) Vitamins, B_1, C, and E.

(9) Sulfurous acid (CAS # 7782-99-2) for on-farm generation of substance utilizing 99% purity elemental sulfur per paragraph (j)(2) of this section.

(k) As plant growth regulators. Ethylene gas—for regulation of pineapple flowering.

(l) As floating agents in postharvest handling.

(1) Lignin sulfonate.

(2) Sodium silicate—for tree fruit and fiber processing.

(m) As synthetic inert ingredients as classified by the Environmental Protection Agency (EPA), for use with nonsynthetic substances or synthetic substances listed in this section and used as an active pesticide ingredient in accordance with any limitations on the use of such substances.

(1) EPA List 4—Inerts of Minimal Concern.

(2) EPA List 3—Inerts of unknown toxicity—for use only in passive pheromone dispensers.

(n) Seed preparations. Hydrogen chloride (CAS # 7647-01-0)—for delinting cotton seed for planting.

(o) As production aids. Microcrystalline cheesewax (CAS #'s 64742-42-3, 8009-03-08, and 8002-74-2)-for use in log grown mushroom production. Must be made without either ethylene-propylene co-polymer or synthetic colors.

(p)-(z) [Reserved]

[65 FR 80637, Dec. 21, 2000, as amended at 68 FR 61992, Oct. 31, 2003; 71 FR 53302 Sept. 11, 2006; 72 FR 69572, Dec. 10, 2007; 75 FR 38696, July 6, 2010; 75 FR 77524, Dec. 13, 2010; 77 FR 8092, Feb. 14, 2012; 77 FR 33298, June 6, 2012; 77 FR 45907, Aug. 2, 2012; 78 FR 31821, May 28, 2013; 79 FR 58663, Sept. 30, 2014; 80 FR 77234, Dec. 14, 2015]

Back to Top

§205.602 Nonsynthetic substances prohibited for use in organic crop production.

The following nonsynthetic substances may not be used in organic crop production:

(a) Ash from manure burning.

(b) Arsenic.

(c) Calcium chloride, brine process is natural and prohibited for use except as a foliar spray to treat a physiological disorder associated with calcium uptake.

(d) Lead salts.

(e) Potassium chloride—unless derived from a mined source and applied in a manner that minimizes chloride accumulation in the soil.

(f) Sodium fluoaluminate (mined).

(g) Sodium nitrate—unless use is restricted to no more than 20% of the crop's total nitrogen requirement; use in spirulina production is unrestricted until October 21, 2005.

(h) Strychnine.

(i) Tobacco dust (nicotine sulfate).

(j)-(z) [Reserved]

[68 FR 61992, Oct. 31, 2003]

Back to Top

§205.603 Synthetic substances allowed for use in organic livestock production.

In accordance with restrictions specified in this section the following synthetic substances may be used in organic livestock production:

(a) As disinfectants, sanitizer, and medical treatments as applicable.

(1) Alcohols.

(i) Ethanol-disinfectant and sanitizer only, prohibited as a feed additive.

(ii) Isopropanol-disinfectant only.

(2) Aspirin-approved for health care use to reduce inflammation.

(3) Atropine (CAS #-51-55-8)—federal law restricts this drug to use by or on the lawful written or oral order of a licensed veterinarian, in full compliance with the AMDUCA and 21 CFR part 530 of the Food and Drug Administration regulations. Also, for use under 7 CFR part 205, the NOP requires:

(i) Use by or on the lawful written order of a licensed veterinarian; and

(ii) A meat withdrawal period of at least 56 days after administering to livestock intended for slaughter; and a milk discard period of at least 12 days after administering to dairy animals.

(4) Biologics—Vaccines.

(5) Butorphanol (CAS #-42408-82-2)—federal law restricts this drug to use by or on the lawful written or oral order of a licensed veterinarian, in full compliance with the AMDUCA and 21 CFR part 530 of the Food and Drug Administration regulations. Also, for use under 7 CFR part 205, the NOP requires:

(i) Use by or on the lawful written order of a licensed veterinarian; and

(ii) A meat withdrawal period of at least 42 days after administering to livestock intended for slaughter; and a milk discard period of at least 8 days after administering to dairy animals.

(6) Chlorhexidine—Allowed for surgical procedures conducted by a veterinarian. Allowed for use as a teat dip when alternative germicidal agents and/or physical barriers have lost their effectiveness.

(7) Chlorine materials—disinfecting and sanitizing facilities and equipment. Residual chlorine levels in the water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act.

(i) Calcium hypochlorite.

(ii) Chlorine dioxide.

(iii) Sodium hypochlorite.

(8) Electrolytes—without antibiotics.

(9) Flunixin (CAS #-38677-85-9)—in accordance with approved labeling; except that for use under 7 CFR part 205, the NOP requires a withdrawal period of at least two-times that required by the FDA.

(10) Furosemide (CAS #-54-31-9)—in accordance with approved labeling; except that for use under 7 CFR part 205, the NOP requires a withdrawal period of at least two-times that required that required by the FDA.

(11) Glucose.

(12) Glycerin—Allowed as a livestock teat dip, must be produced through the hydrolysis of fats or oils.

(13) Hydrogen peroxide.

(14) Iodine.

(15) Magnesium hydroxide (CAS #-1309-42-8)—federal law restricts this drug to use by or on the lawful written or oral order of a licensed veterinarian, in full compliance with the AMDUCA and 21 CFR part 530 of the Food and Drug Administration regulations. Also, for use under 7 CFR part 205, the NOP requires use by or on the lawful written order of a licensed veterinarian.

(16) Magnesium sulfate.

(17) Oxytocin—use in postparturition therapeutic applications.

(18) Parasiticides—Prohibited in slaughter stock, allowed in emergency treatment for dairy and breeder stock when organic system plan-approved preventive management does not prevent infestation. Milk or milk products from a treated animal cannot be labeled as provided for in subpart D of this part for 90 days following treatment. In breeder stock, treatment cannot occur during the last third of gestation if the progeny will be sold as organic and must not be used during the lactation period for breeding stock.

(i) Fenbendazole (CAS #43210-67-9)—only for use by or on the lawful written order of a licensed veterinarian.

(ii) Ivermectin (CAS #70288-86-7).

(iii) Moxidectin (CAS #113507-06-5)—for control of internal parasites only.

(19) Peroxyacetic/peracetic acid (CAS #-79-21-0)—for sanitizing facility and processing equipment.

(20) Phosphoric acid—allowed as an equipment cleaner, *Provided*, That, no direct contact with organically managed livestock or land occurs.

(21) Poloxalene (CAS #-9003-11-6)—for use under 7 CFR part 205, the NOP requires that poloxalene only be used for the emergency treatment of bloat.

(22) Tolazoline (CAS #-59-98-3)—federal law restricts this drug to use by or on the lawful written or oral order of a licensed veterinarian, in full compliance with the AMDUCA and 21 CFR part 530 of the Food and Drug Administration regulations. Also, for use under 7 CFR part 205, the NOP requires:

(i) Use by or on the lawful written order of a licensed veterinarian;

(ii) Use only to reverse the effects of sedation and analgesia caused by Xylazine; and

(iii) A meat withdrawal period of at least 8 days after administering to livestock intended for slaughter; and a milk discard period of at least 4 days after administering to dairy animals.

(23) Xylazine (CAS #-7361-61-7)—federal law restricts this drug to use by or on the lawful written or oral order of a licensed veterinarian, in full compliance with the AMDUCA and 21 CFR part 530 of the Food and Drug Administration regulations. Also, for use under 7 CFR part 205, the NOP requires:

(i) Use by or on the lawful written order of a licensed veterinarian;

(ii) The existence of an emergency; and

(iii) A meat withdrawal period of at least 8 days after administering to livestock intended for slaughter; and a milk discard period of at least 4 days after administering to dairy animals.

(b) As topical treatment, external parasiticide or local anesthetic as applicable.

(1) Copper sulfate.

(2) Formic acid (CAS # 64-18-6)—for use as a pesticide solely within honeybee hives.

(3) Iodine.

(4) Lidocaine—as a local anesthetic. Use requires a withdrawal period of 90 days after administering to livestock intended for slaughter and 7 days after administering to dairy animals.

(5) Lime, hydrated—as an external pest control, not permitted to cauterize physical alterations or deodorize animal wastes.

(6) Mineral oil—for topical use and as a lubricant.

(7) Procaine—as a local anesthetic, use requires a withdrawal period of 90 days after administering to livestock intended for slaughter and 7 days after administering to dairy animals.

(8) Sucrose octanoate esters (CAS #s-42922-74-7; 58064-47-4)—in accordance with approved labeling.

(c) As feed supplements—None.

(d) As feed additives.

(1) DL-Methionine, DL-Methionine-hydroxy analog, and DL-Methionine-hydroxy analog calcium (CAS #'s 59-51-8, 583-91-5, 4857-44-7, and 922-50-9)—for use only in organic poultry production at the following maximum levels of synthetic methionine per ton of feed: Laying and broiler chickens—2 pounds; turkeys and all other poultry—3 pounds.

(2) Trace minerals, used for enrichment or fortification when FDA approved.

(3) Vitamins, used for enrichment or fortification when FDA approved.

(e) As synthetic inert ingredients as classified by the Environmental Protection Agency (EPA), for use with nonsynthetic substances or synthetic substances listed in this section and used as an active pesticide ingredient in accordance with any limitations on the use of such substances.

(1) EPA List 4—Inerts of Minimal Concern.

(2) [Reserved]

(f) Excipients, only for use in the manufacture of drugs used to treat organic livestock when the excipient is: Identified by the FDA as Generally Recognized As Safe; Approved by the FDA as a food additive; or Included in the FDA review and approval of a New Animal Drug Application or New Drug Application.

(g)-(z) [Reserved]

[72 FR 70484, Dec. 12, 2007, as amended at 73 FR 54059, Sept. 18, 2008; 75 FR 51924, Aug. 24, 2010; 77 FR 28745, May 15, 2012; 77 FR 45907, Aug. 2, 2012; 77 FR 57989, Sept. 19, 2012; 80 FR 6429, Feb. 5, 2015]

Back to Top

§205.604 Nonsynthetic substances prohibited for use in organic livestock production.

The following nonsynthetic substances may not be used in organic livestock production:

(a) Strychnine.

(b)-(z) [Reserved]

Back to Top

§205.605 Nonagricultural (nonorganic) substances allowed as ingredients in or on processed products labeled as "organic" or "made with organic (specified ingredients or food group(s))."

The following nonagricultural substances may be used as ingredients in or on processed products labeled as "organic" or "made with organic (specified ingredients or food group(s))" only in accordance with any restrictions specified in this section.

(a) *Nonsynthetics allowed:*

Acids (Alginic; Citric—produced by microbial fermentation of carbohydrate substances; and Lactic).

Agar-agar.

Animal enzymes—(Rennet—animals derived; Catalase—bovine liver; Animal lipase; Pancreatin; Pepsin; and Trypsin).

Attapulgite—as a processing aid in the handling of plant and animal oils.

Bentonite.

Calcium carbonate.

Calcium chloride.

Calcium sulfate—mined.

Carrageenan.

Dairy cultures.

Diatomaceous earth—food filtering aid only.

Egg white lysozyme (CAS # 9001-63-2)

Enzymes—must be derived from edible, nontoxic plants, nonpathogenic fungi, or nonpathogenic bacteria.

Flavors, nonsynthetic sources only and must not be produced using synthetic solvents and carrier systems or any artificial preservative.

Gellan gum (CAS # 71010-52-1)—high-acyl form only.

Glucono delta-lactone—production by the oxidation of D-glucose with bromine water is prohibited.

Kaolin.

L-Malic acid (CAS # 97-67-6).

Magnesium sulfate, nonsynthetic sources only.

Microorganisms—any food grade bacteria, fungi, and other microorganism.

Nitrogen—oil-free grades.

Oxygen—oil-free grades.

Perlite—for use only as a filter aid in food processing.

Potassium chloride.

Potassium iodide.

Sodium bicarbonate.

Sodium carbonate.

Tartaric acid—made from grape wine.

Waxes—nonsynthetic (Carnauba wax; and Wood resin).

Yeast—When used as food or a fermentation agent in products labeled as "organic," yeast must be organic if its end use is for human consumption; nonorganic yeast may be used when organic yeast is not commercially available. Growth on petrochemical substrate and sulfite waste liquor is prohibited. For smoked yeast, nonsynthetic smoke flavoring process must be documented.

(b) *Synthetics allowed:*

Acidified sodium chlorite—Secondary direct antimicrobial food treatment and indirect food contact surface sanitizing. Acidified with citric acid only.

Activated charcoal (CAS #s 7440-44-0; 64365-11-3)—only from vegetative sources; for use only as a filtering aid.

Alginates.

Ammonium bicarbonate—for use only as a leavening agent.

Ammonium carbonate—for use only as a leavening agent.

Ascorbic acid.

Calcium citrate.

Calcium hydroxide.

Calcium phosphates (monobasic, dibasic, and tribasic).

Carbon dioxide.

Cellulose—for use in regenerative casings, as an anti-caking agent (non-chlorine bleached) and filtering aid.

Chlorine materials—disinfecting and sanitizing food contact surfaces, *Except*, That, residual chlorine levels in the water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (Calcium hypochlorite; Chlorine dioxide; and Sodium hypochlorite).

Cyclohexylamine (CAS # 108-91-8)—for use only as a boiler water additive for packaging sterilization.

Diethylaminoethanol (CAS # 100-37-8)—for use only as a boiler water additive for packaging sterilization.

Ethylene—allowed for postharvest ripening of tropical fruit and degreening of citrus.

Ferrous sulfate—for iron enrichment or fortification of foods when required by regulation or recommended (independent organization).

Glycerides (mono and di)—for use only in drum drying of food.

Glycerin—produced by hydrolysis of fats and oils.

Hydrogen peroxide.

Magnesium carbonate—for use only in agricultural products labeled "made with organic (specified ingredients or food group(s))," prohibited in agricultural products labeled "organic".

Magnesium chloride—derived from sea water.

Magnesium stearate—for use only in agricultural products labeled "made with organic (specified ingredients or food group(s))," prohibited in agricultural products labeled "organic".

Nutrient vitamins and minerals, in accordance with 21 CFR 104.20, Nutritional Quality Guidelines For Foods.

Octadecylamine (CAS # 124-30-1)—for use only as a boiler water additive for packaging sterilization.

Ozone.

Peracetic acid/Peroxyacetic acid (CAS # 79-21-0)—for use in wash and/or rinse water according to FDA limitations. For use as a sanitizer on food contact surfaces.

Phosphoric acid—cleaning of food-contact surfaces and equipment only.

Potassium acid tartrate.

Potassium carbonate.

Potassium citrate.

Potassium hydroxide—prohibited for use in lye peeling of fruits and vegetables except when used for peeling peaches.

Potassium phosphate—for use only in agricultural products labeled "made with organic (specific ingredients or food group(s))," prohibited in agricultural products labeled "organic".

Silicon dioxide—Permitted as a defoamer. Allowed for other uses when organic rice hulls are not commercially available.

Sodium acid pyrophosphate (CAS # 7758-16-9)—for use only as a leavening agent.

Sodium citrate.

Sodium hydroxide—prohibited for use in lye peeling of fruits and vegetables.

Sodium phosphates—for use only in dairy foods.

Sulfur dioxide—for use only in wine labeled "made with organic grapes," Provided, That, total sulfite concentration does not exceed 100 ppm.

Tetrasodium pyrophosphate (CAS # 7722-88-5)—for use only in meat analog products.

Tocopherols—derived from vegetable oil when rosemary extracts are not a suitable alternative.

Xanthan gum.

(c)-(z) [Reserved]

[68 FR 61993, Oct. 31, 2003, as amended as 68 FR 62217, Nov. 3, 2003; 71 FR 53302, Sept. 11, 2006; 72 FR 58473, Oct. 16, 2007; 73 FR 59481, Oct. 9, 2008; 75 FR 77524, Dec. 13, 2010; 77 FR 8092, Feb. 14, 2012; 77 FR 33298, June 6, 2012; 77 FR 45907, Aug. 2, 2012; 78 FR 31821, May 28, 2013; 78 FR 61161, Oct. 3, 2013]

Back to Top

§205.606 Nonorganically produced agricultural products allowed as ingredients in or on processed products labeled as "organic."

Only the following nonorganically produced agricultural products may be used as ingredients in or on processed products labeled as "organic," only in accordance with any restrictions specified in this section, and only when the product is not commercially available in organic form.

(a) Casings, from processed intestines.

(b) Celery powder.

JADAM

Organic Farming

JADAM's ultimate objective is to bring farming back to farmers. Through JADAM's method, farming can become ultra-low-cost, completely organic, and farmers can once again become the masters of farming. Farmers will possess the knowledge, method and technology of farming. When organic farming becomes easy, effective and inexpensive, it can finally become a practical alternative. Farmers, consumers and Mother Nature will all rejoice in this splendid new world we wish to open

About JADAM JADAM means "people that resemble nature." It is an organization of farmers that practices, studies and advances the JADAM organic farming system. Greatest feature of JADAM method is that it is ultra-low-cost, easy to do, completely organic and that it works. JADAM is a global network of farmers sharing knowledge, connecting experience and building on improvements; it is a continuously evolving system. JADAM system is practical; only methods that stand the test of growers will survive. JADAM is not a simple gathering of trial-and-error data; it has its unique theories and philosophy. Study JADAM and your eyes will open to a new world of soil management, microorganisms, nutrition and pests.

en.jadam.kr

05520
ISBN 978-89-89220-17-6 (EPUB)