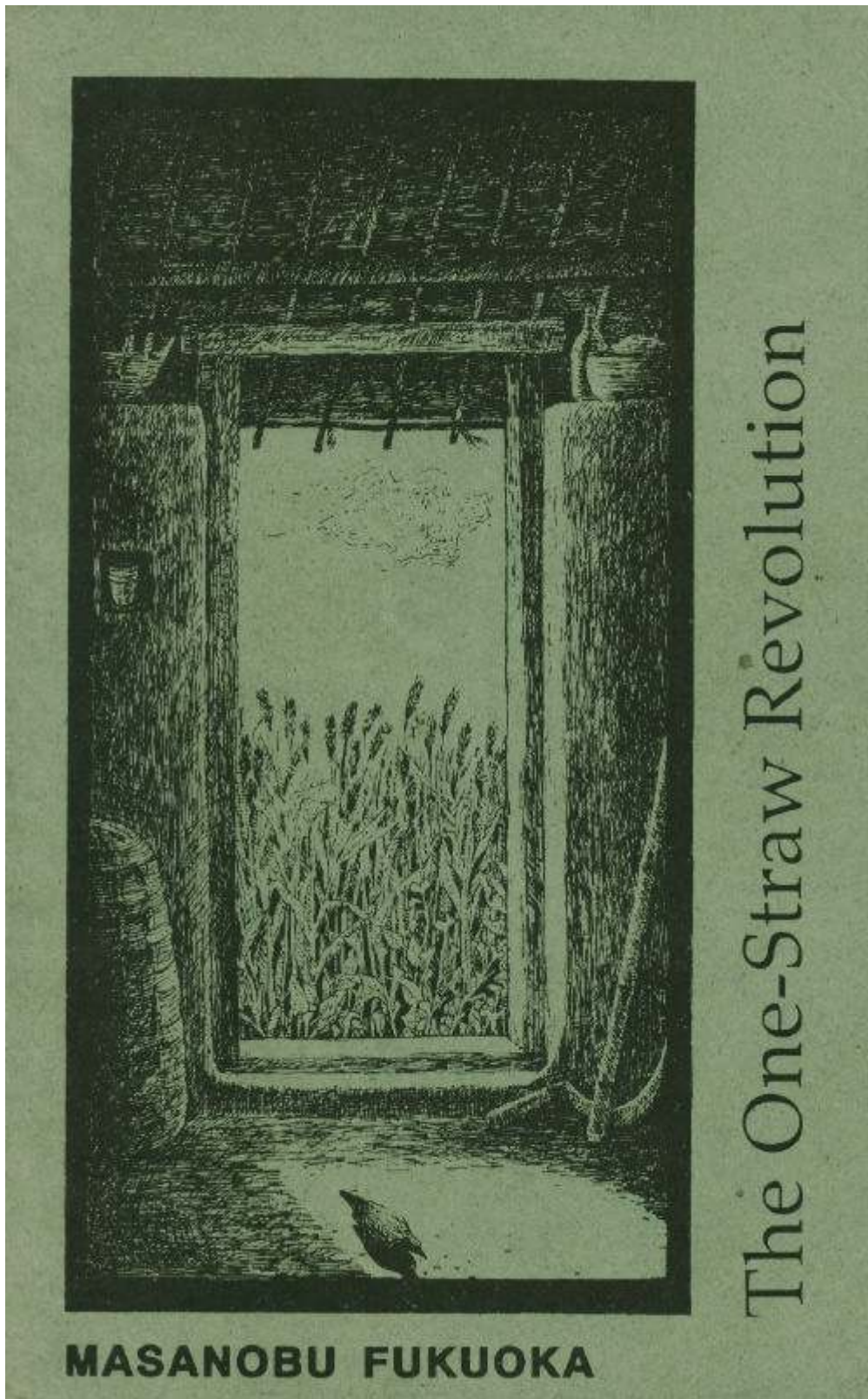
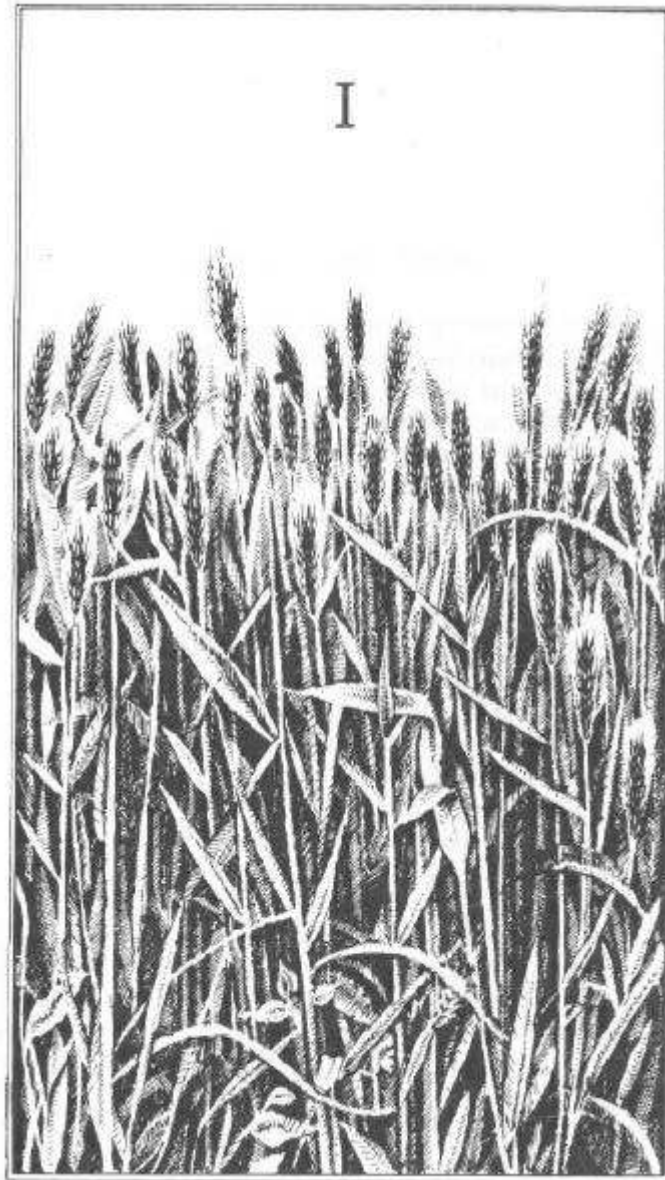

The One-Straw Revolution, by Masanobu Fukuoka, 1978.



The One-Straw Revolution

MASANOBU FUKUOKA



BOOK I

Look At This Grain

I believe that a revolution can begin from this one strand of straw. Seen at a glance, this rice straw may appear light and insignificant. Hardly anyone would believe that it could start a revolution. Nevertheless, I have come to realize the weight and power of this straw. For me, this revolution is very real.

Look at these fields of rye and barley. This ripening grain will yield about 22 bushels (1,300 pounds) per quarter acre. I believe this matches the top yields in Ehime Prefecture. If this equals the best yield in Ehime Prefecture, it could easily equal the top harvest in the whole country since this is one of the prime agricultural areas in Japan...and yet these fields have not been ploughed for twenty-five years.

To plant, I simply broadcast rye and barley seed on separate fields in the fall, while the rice is still standing. A few weeks later, I harvest the rice and spread the rice straw back over the fields. It is the same for the rice seeding. This winter grain will be cut around the 20th of May. About two weeks before the crop has fully matured, I broadcast rice seed over the rye and barley. After the winter, grain has been harvested and the grains threshed, I spread the rye and barley straw over the field.

I suppose that using the same method to plant rice and winter grain is unique to this kind of farming. However, there is an easier way. As we walk over to the next field, let me point out that the rice there was sown last fall at the same time as the winter grain. The whole year's planting was finished in that field by New Year's Day.

You might also notice that white clover and weeds are growing in these fields. Clover seed was sown among the rice plants in early October, shortly before the rye and barley. I do not worry about sowing the weeds—they reseed themselves quite easily.

So the order of planting in this field is like this: in early October, clover is broadcast among the rice; winter grain then follows in the middle of the month.



"And yet these fields have not been plowed for twenty-five years."

In early November, the rice is harvested, and then the next year's rice seed is sown and straw laid across the field. The rye and barley you see in front of you were grown this way. In caring for a quarter-acre field, one or two people can do all the work of growing rice and winter grain in a matter of a few days. It seems unlikely that there could be a simpler way of raising grain.

This method completely contradicts modern agricultural techniques. It throws scientific knowledge and traditional farming craft right out the window. With this kind of farming, which uses no machines, no prepared fertilizer, and no chemicals; it is possible to attain a harvest equal to or greater than that of the average Japanese farm. The proof is ripening right before your eyes.

Nothing at all

Recently people have been asking me why I started farming this way so many years ago. Until now, I have never discussed this with anyone. You could say there was no way to talk about it. It was simply - how would you say it - a shock, a flash, one small experience that was the starting point.

That realization completely changed my life. It is nothing you can really talk about, but it might be put something like this: "Humanity knows nothing at all. There is no intrinsic value in anything, and every action is a futile, meaningless effort." This may seem preposterous, but if you put it into words, that is the only way to describe it.

This "thought" developed suddenly in my head when I was still quite young. I did not know if this insight, that all human understanding and effort are of no account, was valid or not, but if I examined these thoughts and tried to banish them, I could come up with nothing within myself to contradict them. Only the certain belief that this was so, burned within me.

It is generally thought that there is nothing more splendid than human intelligence, that human beings are creatures of special value, and that their creations and accomplishments, as mirrored in culture and history are wondrous to behold. That is the common belief, anyway.

Since what I was thinking was a denial of this, I was unable to communicate my view to anyone. Eventually I decided to give my thoughts a form, to put them into practice, and so to determine whether my understanding was right or wrong. To spend my life farming, growing rice and winter grain-this was the course upon which I settled.

And what was this experience that changed my life?

Forty years ago, when I was twenty-five years old, I was working for the Yokohama Customs Bureau in the Plant Inspection Division. My main job was to inspect incoming and outgoing plants for disease - carrying insects. I was fortunate to have a good deal of free time, which I spent in the research laboratory, carrying out investigations in my speciality of plant pathology. This laboratory was located next to Yamate Park and looked down on Yokohama harbour from the bluff. Directly in front of the building was the Catholic Church, and to the east was the Ferris Girls' School. It was very quiet, all in all the perfect environment for carrying on research.

The laboratory pathology researcher was Eiichi Kurosawa. I had studied plant pathology under Makoto Okera, a teacher at Gifu Agricultural High School, and received guidance from Suehiko Igata of the Okayama Prefecture Agricultural Testing Centre.

I was very fortunate to be a student of Professor Kurosawa. Although he remained largely unknown in the academic world, he is the man who isolated and raised in culture the fungus, which causes *bakanae* disease in rice. He became the first to extract the plant growth hormone, gibberellin, from the fungus culture. This hormone, when a small amount is absorbed by the young rice plants, has the peculiar effect of causing the plant to grow abnormally tall. When given in excess, however, it brings about the opposite reaction, causing the plant's growth to be retarded. No one took much notice of this discovery in Japan, but overseas it became a topic of active research. Soon thereafter, an American made use of gibberellin in developing the seedless grape.

I regarded Kurosawa-san (-san is a formal title of address in Japanese used for both men and women) as my own father, and with his guidance, built a dissection

microscope and devoted myself to research on decay causing resin diseases in the trunk, branches and fruit of American and Japanese citrus trees.

Looking through the microscope, I observed fungus cultures, crossbred various fungi, and created new disease causing varieties. I was fascinated with my work. Since the job required deep, sustained concentration, there were times when I actually fell unconscious while working in the lab.

This was also a time of youthful high spirits and I did not spend all of my time shut up in the research room. The place was the port city of Yokohama, no better spot to fool around and have a good time. It was during that time that the following episode occurred. Intent, and with camera in hand, I was strolling by the wharf and caught sight of a beautiful woman. Thinking that she would make a great subject for a photograph, I asked her to pose for me. I helped her onto the deck of the foreign ship anchored there, and asked her to look this way and that and took several pictures. She asked me to send her copies when the photos were ready. When I asked where to send them, she just said, "To Ofuna," and left without mentioning her name.

After I had developed the film, I showed the prints to a friend and asked if he recognized her. He gasped and said, "That's Mieko Takamine, the famous movie star!" Right away, I sent ten enlarged prints to her in Ofuna City. Before long, the prints, autographed, were returned in the mail. There was one missing, however. Thinking about this later, I realized that it was the close-up profile shot I had taken; it probably showed some wrinkles in her face. I was delighted and felt I had caught a glimpse into the feminine psyche.

At other times, clumsy and awkward though I was, I frequented a dance hall in the Nankingai area. One time I caught sight there of the popular singer, Noriko Awaya, and asked her to dance. I can never forget the feeling of that dance, because I was so overwhelmed by her huge body that I could not even get my arm around her waist.

In any event, I was a very busy, very fortunate young man, spending my days in amazement at the world of nature revealed through the eyepiece of the microscope, struck by how similar this minute world was to the great world of the infinite universe. In the evening, either in or out of love, I played around and enjoyed myself. I believe it was this aimless life, coupled with fatigue from overwork that finally led to fainting spells in the research room. The consequence of all this was that I contracted acute pneumonia and was placed in the pneumothorax treatment room on the top floor of the Police Hospital.

It was winter and through a broken window, the wind blew swirls of snow around the room. It was warm beneath the covers, but my face was like ice. The nurse would check my temperature and be gone in an instant.

As it was a private room, people hardly ever looked in. I felt I had been put out in the bitter cold, and suddenly plunged into a world of solitude and loneliness. I found myself face to face with the fear of death. As I think about it now, it seems a useless fear, but at the time, I took it seriously.

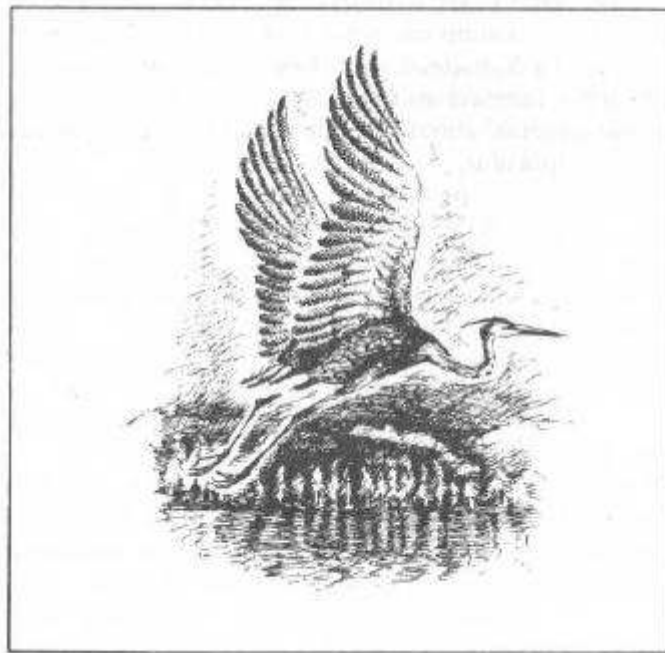
I was finally released from the hospital, but I could not pull myself out of my depression. In what had I placed my confidence until then? I had been unconcerned and content, but what was the nature of that complacency? I was in an agony of doubt about the nature of life and death. I could not sleep, could not apply myself to my work. In nightly wanderings above the bluff and beside the harbour, I could find no relief.

One night as I wandered, I collapsed in exhaustion on a hill overlooking the harbour, finally dozing against the trunk of a large tree. I lay there, neither asleep nor

awake, until dawn. I can still remember that it was the morning of the 15th of May. In a daze, I watched the harbour grow light, seeing the sunrise and yet somehow not seeing it. As the breeze blew up from below the bluff, the morning mist suddenly disappeared. Just at that moment, a night heron appeared, gave a sharp cry, and flew away into the distance. I could hear the flapping of its wings. In an instant, all my doubts and the gloomy mist of my confusion vanished. Everything I had held in firm conviction, everything upon which I had ordinarily relied was swept away with the wind. I felt that I understood just one thing. Without my thinking about them, words came from my mouth: "In this world there is nothing at all..." I felt that I understood nothing (*To "understand nothing," in this sense, is to recognize the insufficiency of intellectual knowledge.*).

I could see that all the concepts to which I had been clinging, the very notion of existence itself, were empty fabrications. My spirit became light and clear. I was dancing wildly for joy. I could hear the small birds chirping in the trees, and see the distant waves glistening in the rising sun. The leaves danced green and sparkling. I felt that this was truly heaven on earth. Everything that had possessed me, all the agonies, disappeared like dreams and illusions, and something one might call "true nature" stood revealed.

I think it would safely be said that from the experience of that morning my life changed completely.



Despite the change, I remained at root an average, foolish man, and there has been no change in this from then to the present time. Seen from the outside, there is no more run-of-the-mill fellow than I, and there has been nothing extraordinary about my daily life. But the assurance that I know this one thing has not changed since that time. I have spent thirty years, forty years, testing whether or not I have been mistaken, reflecting as I went along, but not once have I found evidence to oppose my conviction.

That this realization in itself has great value does not mean that any special value is attached to me. I remain a simple man, just an old crow, so to speak. To the casual observer I may seem either humble or arrogant. I tell the young people up in my orchard again and again not to try to imitate me, and it really angers me if there is

someone who does not take this advice to heart. I ask, instead, that they simply live in nature and apply themselves to their daily work. No, there is nothing special about me, but what I have glimpsed is vastly important.

Returning to the Country

On the day following this experience, May 16th, I reported to work and handed in my resignation on the spot. My superiors and friends were amazed. They had no idea what to make of this. They held a farewell party for me in a restaurant above the wharf, but the atmosphere was a bit peculiar. This young man who had, until the previous day, gotten along well with everyone, who did not seem particularly dissatisfied with his work, who, on the contrary, had wholeheartedly dedicated himself to his research, had suddenly announced that he was quitting. And there I was, laughing happily.

At that time I addressed everyone as follows, "On this side is the wharf. On the other side is Pier 4. If you think there is life on this side, then death is on the other, if you want to get rid of the idea of death, then you should rid yourself of the notion that there is life on this side. Life and death are one."

When I said this, everyone became even more concerned about me. "What's he saying? He must be out of his mind," they must have thought. They all saw me off with rueful faces. I was the only one who walked out briskly, in high spirits.

At that time my roommate was extremely worried about me and suggested that I take a quiet rest, perhaps out on the Boso Peninsula. So I left. I would have gone anywhere at all if someone had asked me. I boarded the bus and rode for many miles gazing out at the chequered pattern of fields and small villages along the highway. At one stop, I saw a small sign, which read, "Utopia." I got off the bus there and set out in search of it.

On the coast, there was a small inn and, climbing the cliff, I found a place with a truly wonderful view. I stayed at the inn and spent the days dozing in the tall grasses overlooking the sea. It may have been a few days, a week, or a month, but anyway I stayed there for some time. As the days passed my exhilaration dimmed, and I began to reflect on just what had happened. You could say I was finally coming to myself again.

I went to Tokyo and stayed for a while, passing the days by walking in the park, stopping people on the street and talking to them, sleeping here and there. My friend was worried and came to see how I was getting along. "Aren't you living in some dream world, some world of illusion?" he asked. "No," I replied, "it's you who are living in the dream world." We both thought, "I am right and you are in the dream world." When my friend turned to say good-bye, I answered with something like, "Don't say good-bye. To part is just to part." My friend seemed to have given up hope.

I left Tokyo, passed through the Kansai area (*Osaka, Kobe, Kyoto*) and came as far south as Kyushu. I was enjoying myself, drifting from place to place with the breeze. I challenged a lot of people with my conviction that everything is meaningless and of no value, that everything returns to nothingness.

But this was too much, or too little, for the everyday world to conceive. There was no communication whatsoever. I could only think of this concept of non-usefulness as being of great benefit to the world, and particularly the present world, which is moving so rapidly in the opposite direction. I actually wandered about with the intention of spreading the word throughout the whole country. The outcome was that wherever I went I was ignored as an eccentric. So I returned to my father's farm in the country.

My father was growing tangerines at that time and I moved into a hut on the mountain and began to live a very simple, primitive life. I thought that if here, as a

farmer of citrus and grain, I could actually demonstrate my realization; the world would recognize its truth. Instead of offering a hundred explanations, would not practising this philosophy be the best way? My method of "do-nothing" (*With this expression Mr Fukuoka draws attention to his method's comparative ease. This way of farming requires hard work, especially at the harvest, but far less than other methods.*) farming began with this thought. It was in the 13th year of the present emperor's reign, 1938.

I settled myself on the mountain and everything went well up to the time that my father entrusted me with the richly bearing trees in the orchard. He had already pruned the trees to "the shape of sake cups" so that the fruit could easily be harvested. When I left them abandoned in this state, the result was that the branches became intertwined, insects attacked the trees and the entire orchard withered away in no time.

My conviction was that crops grow themselves and should not have to be grown. I had acted in the belief that everything should be left to take its natural course, but I found that if you apply this way of thinking all at once, before long things do not go so well. This is abandonment, not "natural farming."

My father was shocked. He said I must re-discipline myself, perhaps take a job somewhere and return when I had pulled myself back together. At that time my father was headman of the village, and it was hard for the other members of the community to relate to his eccentric son, who obviously could not get along with the world, living as he did back in the mountains. Moreover, I disliked the prospect of military service, and as the war was becoming more and more violent, I decided to go along humbly with my father's wishes and take a job.

At that time, technical specialists were few. The Kochi Prefecture Testing Station heard about me, and it came about that I was offered the post of Head Researcher of Disease and Insect Control. I imposed upon the kindness of Kochi Prefecture for almost eight years. At the testing centre, I became a supervisor in the scientific agriculture division, and in research devoted myself to increasing wartime food productivity. But actually during those eight years, I was pondering the relationship between scientific and natural agriculture. Chemical agriculture, which utilizes the products of human intelligence, was reputed to be superior. The question, which was always in the back of my mind, was whether or not natural agriculture could stand up against modern science.

When the war ended, I felt a fresh breeze of freedom, and with a sigh of relief, I returned to my home village to take up farming anew.

Toward a Do-Nothing Farming

For thirty years, I lived only in my farming and had little contact with people outside my own community. During those years, I was heading in a straight line toward a "do -nothing" agricultural method.

The usual way to go about developing a method is to ask "How about trying this?" or "How about trying that?" bringing in a variety of techniques one upon the other. This is modern agriculture and it only results in making the farmer busier.

My way was opposite. I was aiming at a pleasant, natural way of farming (*Farming as simply as possible within and in cooperation with the natural environment, rather than the modern approach of applying increasingly complex techniques to remake nature entirely for the benefit of human beings.*) which results in making the work easier instead of harder. "How about not doing this? How about not doing that?" That was my way of thinking. I ultimately reached the conclusion that there was no need to plough, no need to apply fertilizer, no need to make compost, no need to use insecticide. When you get right down to it, there are few agricultural practices that are really necessary.

The reason that man's improved techniques seem to be necessary is that the natural balance has been so badly upset beforehand by those same techniques that the land has become dependent on them.

This line of reasoning not only applies to agriculture, but to other aspects of human society as well. Doctors and medicine become necessary when people create a sickly environment. Formal schooling has no intrinsic value, but becomes necessary when humanity creates a condition in which one must become educated just to get along.

Before the end of the war, when I went up to the citrus orchard to practice what I then thought was natural farming, I did no pruning and left the orchard to itself. The branches became tangled, the trees were attacked by insects and almost two acres of mandarin orange trees withered and died. From that time on the question, "What is the natural pattern?" was always in my mind. In the process of arriving at the answer, I wiped out another 400 trees. Finally, I felt I could say with certainty: "This is the natural pattern."



"For thirty years I lived only in my farming..."

To the extent that trees deviate from their natural form, pruning and insect extermination become necessary; to the extent that human society separates itself from a life close to nature, schooling becomes necessary. In nature, formal schooling has no function.

In raising children, many parents make the same mistake I made in the orchard at first. For example, teaching music to children is as unnecessary as pruning orchard trees. A child's ear catches the music. The murmuring of a stream, the sound of frogs croaking by the riverbank, the rustling of leaves in the forest, all these natural sounds are music-true music. However, when a variety of disturbing noises enters and confuses the ear, the child's pure, direct appreciation of music degenerates. If left to continue along that path, the child will be unable to hear the call of a bird or the sound of the wind as songs. That is why music education is thought to be beneficial to the child's development.

The child who is raised with an ear pure and clear may not be able to play the popular tunes on the violin or the piano, but I do not think this has anything to do with the ability to hear true music or to sing. It is when the heart is filled with song that the child can be said to be musically gifted.

Almost everyone thinks that "nature" is a good thing, but few can grasp the difference between natural and unnatural.

If a single new bud is snipped off a fruit tree with a pair of scissors it may bring about disorder that cannot be undone. When growing according to the natural form, branches spread alternately from the trunk and the leaves receive sunlight uniformly. If this sequence is disrupted the branches come into conflict, lay one upon another and become tangled, and the leaves wither in the places where the sun cannot penetrate. Insect damage develops. If the tree is not pruned the following year more withered branches will appear.

Human beings with their tampering do something wrong, leave the damage unrepaired, and when the adverse results accumulate, work with all their might to correct them. When the corrective actions appear to be successful, they come to view these measures as splendid accomplishments. People do this over and over again. It is as if a fool were to stomp on and break the tiles of his roof. Then when it starts to rain and the ceiling begins to rot away, he hastily climbs up to mend the damage, rejoicing in the end that he has accomplished a miraculous solution.

It is the same with the scientist. He pores over books night and day, straining his eyes and becoming nearsighted, and if you wonder what on earth he has been working on all that time-it is to become the inventor of eyeglasses to correct nearsightedness.

Returning to the Source

Leaning against the long handle of my scythe, I pause in my work in the orchard and gaze out at the mountains and the village below. I wonder how it is that people's philosophies have come to spin faster than the changing seasons.

The path I have followed, this natural way of farming, which strikes most people as strange, was first interpreted as a reaction against the advance and reckless development of science. But all I have been doing, farming out here in the country, is trying to show that humanity knows nothing. Because the world is moving with such furious energy in the opposite direction, it may appear that I have fallen behind the times, but I firmly believe that the path I have been following is the most sensible one.

During the past few years, the number of people interested in natural farming has grown considerably. It seems that the limit of scientific development has been reached, misgivings have begun to be felt, and the time for reappraisal has arrived. That which was viewed as primitive and backward is now unexpectedly seen to be far ahead of modern science. This may seem strange at first, but I do not find it strange at all.

I discussed this with Kyoto University Professor Iinuma recently. A thousand years ago, agriculture was practiced in Japan without ploughing, and it was not until the Tokugawa Era 300-400 years ago that shallow cultivation was introduced. Deep ploughing came to Japan with Western agriculture. I said that in coping with the problems of the future the next generation would return to the non-cultivation method.

To grow crops in an unploughed field may seem at first a regression to primitive agriculture, but over the years, this method has been shown in university laboratories and agricultural testing centres across the country to be the most simple, efficient, and up-to-date method of all. Although this way of farming disavows modern science, it now has come to stand in the forefront of modern agricultural development.

I presented this "direct seeding non-cultivation winter-grain/rice succession" in agricultural journals twenty years ago. From then on, it appeared often in print and was introduced to the public at large on radio and television programs many times, but nobody paid much attention to it.

Now suddenly, it is a completely different story. You might say that natural farming has become the rage, journalists, professors, and technical researchers are flocking to visit my fields and the huts up on the mountain.

Different people see it from different points of view, make their own interpretations, and then leave. One sees it as primitive, another as backward, someone else considers it the pinnacle of agricultural achievement, and a fourth hails it as a breakthrough into the future. In general, people are only concerned with whether this kind of farming is an advance into the future or a revival of times past. Few are able to grasp correctly that natural farming arises from the unmoving and unchanging centre of agricultural development.

To the extent that people separate themselves from nature, they spin out further and further from the centre. At the same time, a centripetal effect asserts itself and the desire to return to nature arises. But if people merely become caught up in reacting, moving to the left or to the right, depending on conditions, the result is only more activity. The non-moving point of origin, which lies outside the realm of relativity, is passed over, unnoticed. I believe that even "returning-to-nature" and antipollution activities, no matter how commendable, are not moving toward a genuine solution if they are carried out solely in reaction to the over development of the present age.

Nature does not change, although the way of viewing nature invariably changes from age to age. No matter the age, natural farming exists forever as the wellspring of agriculture.

One Reason Natural Farming Has Not Spread

Over the past twenty or thirty years this method of growing rice and winter grain has been tested over a wide range of climates and natural conditions. Almost every prefecture in Japan has run tests comparing yields of "direct seeding non-cultivation" with those of paddy rice growing and the usual ridge and furrow rye and barley cultivation. These tests have produced no evidence to contradict the universal applicability of natural farming.

Therefore, one may ask why this truth has not spread. I think that one of the reasons is that the world has become so specialized that it has become impossible for people to grasp anything in its entirety. For example, an expert in insect damage prevention from the Kochi Prefecture Testing Centre came to inquire why there were so few rice leafhoppers in my fields even though I had not used insecticide. Upon investigating the habitat, the balance between insects and their natural enemies, the rate of spider propagation and so on, the leafhoppers were found to be just as scarce in my fields as in the Centre's fields, which are sprayed countless times with a variety of deadly chemicals.

The professor was also surprised to find that while the harmful insects were few, their natural predators were far more numerous in my fields than in the sprayed fields. Then it dawned on him that the fields were being maintained in this state by means of a natural balance established among the various insect communities. He acknowledged that if my method were generally adopted, the problem of crop devastation by leafhoppers could be solved. He then got into his car and returned to Kochi.

But if you ask whether or not the testing centre's soil fertility or crop specialists have come here, the answer is no, they have not. Moreover, if you were to suggest at a conference or gathering that this method, or rather non -method, be tried on a wide scale, it is my guess that the prefecture or research station would reply, "Sorry, it's too early for that. We must first carry out research from every possible angle before giving final approval." It would take years for a conclusion to be drawn.

This sort of thing goes on all the time. Specialists and technicians from all over Japan have come to this farm. Seeing the fields from the standpoint of his own specialty, every one of these researchers has found them at least satisfactory, if not remarkable. However, in the five or six years since the professor from the research station came to visit here, there have been few changes in Kochi Prefecture.

This year the agricultural department of Kinki University has set up a natural farming project team in which students of several different departments will come here to conduct investigations. This approach may be one step nearer, but I have a feeling that the next move may be two steps in the opposite direction.

Self-styled experts often comment, "The basic idea of the method is all right, but wouldn't it be more convenient to harvest by machine?" Or, "Wouldn't the yield be greater if you used fertilizer or pesticide in certain cases or at certain times?" There are always those who try to mix natural and scientific farming. However, this way of thinking completely misses the point. The farmer who moves toward compromise can no longer criticize science at the fundamental level.

Natural farming is gentle and easy and indicates a return to the source of farming. A single step away from the source can only lead one astray.

Humanity Does Not Know Nature

Lately I have been thinking that the point must be reached when scientists, politicians, artists, philosophers, men of religion, and all those who work in the fields should gather here, gaze out over these fields, and talk things over together. I think this is the kind of thing that must happen if people are to see beyond their specialties.

Scientists think they can understand nature. That is the stand they take. Because they are convinced that they can understand nature, they are committed to investigating nature and putting it to use. However, I think an understanding of nature lies beyond the reach of human intelligence.

I often tell the young people in the huts on the mountain, who come here to help out and to learn about natural farming, that anybody can see the trees up on the Mountain. They can see the green of the leaves; they can see the rice plants. They think they know what green is. In contact with nature morning and night, they sometimes come to think that they know nature. However, when they think they are beginning to understand nature, they can be sure that they are on the wrong track.

Why is it impossible to know nature? That which is conceived to be nature is only the *idea* of nature arising in each person's mind. The ones who see true nature are infants. They see without thinking, straight and clear. If even the names of plants are known, a mandarin orange tree of the citrus family, a pine of the pine family, nature is not seen in its true form.

An object seen in isolation from the whole is not the real thing.

Specialists in various fields gather together and observe a stalk of rice. The insect disease specialist sees only insect damage; the specialist in plant nutrition considers only the plant's vigour. This is unavoidable as things are now.

As an example, I told the gentleman from the research station when he was investigating the relation between rice leaf-hoppers and spiders in my fields, "Professor, since you are researching spiders, you are interested in only one among the many natural predators of the leafhopper. This year spiders appeared in great numbers, but last year it was toads. Before that, it was frogs that pre dominated. There are countless variations."



It is impossible for specialized research to grasp the role of a single predator at a certain time within the intricacy of insect interrelationships. There are seasons when the leafhopper population is low because there are many spiders. There are times when a lot of rain falls and frogs cause the spiders to disappear, or when little rain falls and neither leafhoppers nor frogs appear at all.

Methods of insect control, which ignore the relationships among the insects themselves, are truly useless. Research on spiders and leafhoppers must also consider the relation between frogs and spiders. When things have reached this point, a frog professor will also be needed. Experts on spiders and leafhoppers, another on rice, and another expert on water management will all have to join the gathering.

Furthermore, there are four or five different kinds of spiders in these fields. I remember a few years ago when somebody came rushing over to the house early one morning to ask me if I had covered my fields with a silk net or something. I could not imagine what he was talking about, so I hurried straight out to take a look.

We had just finished harvesting the rice, and overnight the rice stubble and low-lying grasses had become completely covered with spider webs, as though with silk. Waving and sparkling with the morning mist, it was a magnificent sight.

The wonder of it is that when this happens, as it does only once in a great while, it only lasts for a day or two. If you look closely there are several spiders in every square inch. They are so thick on the field that there is hardly any space between them. In a quarter acre, there must be how many thousands, how many millions! When you go to look at the field two or three days later, you see that strands of web several yards long have broken off and are waving about in the wind with five or six spiders clinging to each one. It is like when dandelion fluff or pinecone seeds are blown away in the wind. The young spiders cling to the strands and are sent sailing off in the sky.

The spectacle is an amazing natural drama. Seeing this, you understand that poets and artists will also have to join in the gathering.

When chemicals are put into a field, this is all destroyed in an instant. I once thought there would be nothing wrong with putting ashes from the fireplace onto the fields (*Mr Fukuoka makes compost of his wood ashes and other organic household wastes. He applies them to his small kitchen garden*). The result was astounding. Two or three days later, the field was completely bare of spiders. The ashes had caused the strands of web to disintegrate. How many thousands of spiders fell victim to a single handful of this apparently harmless ash? Applying an insecticide is not simply a matter of eliminating the leafhoppers together with their natural predators. Many other essential dramas of nature are affected.

The phenomenon of these great swarms of spiders, which appear in the rice fields in the autumn and like escape artists vanish overnight, is still not understood. No one knows where they come from, how they survive the winter, or where they go when they disappear.

Therefore, the use of chemicals is not a problem for the entomologist alone. Philosophers, men of religion, artists and poets must also help to decide whether or not it is permissible to use chemicals in farming, and what the results of using even organic fertilizers might be.

We will harvest about 22 bushels (1,300 pounds) of rice, and 22 bushels of winter grain from each quarter acre of this land. If the harvest reaches 29 bushels, as it sometimes does, you might not be able to find a greater harvest if you searched the whole country. Since advanced technology had nothing to do with growing this grain, it stands as a contradiction to the assumptions of modern science. Anyone who will come, see these fields, and accept their testimony, will feel deep misgivings over the question of whether or not humans know nature, and of whether or not nature can be known within the confines of human understanding.

The irony is that science has served only to show how small human knowledge is.



BOOK II

Four Principles of Natural Farming

Make your way carefully through these fields. Dragonflies and moths fly up in a flurry. Honeybees buzz from blossom to blossom. Part the leaves and you will see insects, spiders, frogs, lizards and many other small animals bustling about in the cool shade. Moles and earthworms burrow beneath the surface.

This is a balanced rice field ecosystem. Insect and plant communities maintain a stable relationship here. It is not uncommon for a plant disease to sweep through this area, leaving the crops in these fields unaffected.

Now look over at the neighbour's field for a moment. The weeds have all been wiped out by herbicides and cultivation. The soil animals and insects have been exterminated by poison. The soil has been burned clean of organic matter and microorganisms by chemical fertilizers. In the summer, you see farmers at work in the fields, wearing gas masks and long rubber gloves. These rice fields, which have been farmed continuously for over 1,500 years, have now been laid waste by the exploitive farming practices of a single generation.

Four Principles

The first is NO CULTIVATION, that is, no ploughing or turning of the soil. For Centuries, farmers have assumed that the plough is essential for growing crops. However, non-cultivation is fundamental to natural farming. The earth cultivates itself naturally by means of the penetration of plant roots and the activity of microorganisms, small animals, and earthworms.

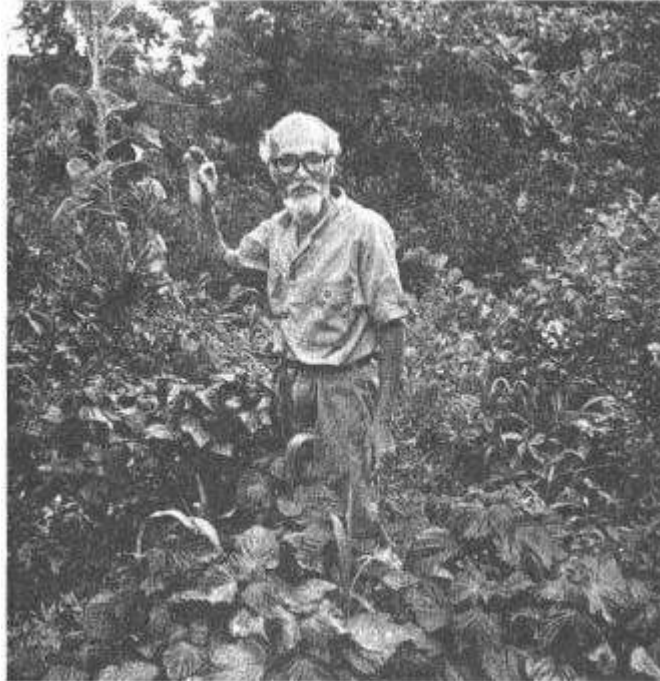
The second is NO CHEMICAL FERTILIZER OR PREPARED COMPOST (*For fertilizer Mr Fukuoka grows a leguminous cover of white clover, returns the threshed straw to the fields, and adds a little poultry manure.*). People interfere with nature and, try as they may, they cannot heal the resulting wounds. Their careless farming practices drain the soil of essential nutrients and the result is yearly depletion of the land. If left to itself, the soil maintains its fertility naturally, in accordance with the orderly cycle of plant and animal life.

The third is NO WEEDING BY TILLAGE OR HERBICIDES. Weeds play their part in building soil fertility and in balancing the biological community. As a fundamental principle, weeds should be controlled, not eliminated. Straw mulch, a ground cover of white clover interplanted with the crops, and temporary flooding provide effective weed control in my fields.

The fourth is NO DEPENDENCE ON CHEMICALS (*Mr Fukuoka grows his grain crops without chemicals of any kind. On some orchard trees, he occasionally uses machine oil emulsion for the control of insect scales. He uses no persistent or broad-spectrum poisons, and has no "pesticide" programme.*). From the time that weak plants developed because of such unnatural practices as ploughing and fertilizing, disease and insect imbalance became a great problem in agriculture. Nature, left alone, is in perfect balance. Harmful insects and plant diseases are always present, but do not occur in nature to an extent, which requires the use of poisonous chemicals. The sensible approach to disease and insect control is to grow sturdy crops in a healthy environment.

Cultivation

When the soil is cultivated, the natural environment is altered beyond recognition. The repercussions of such acts have caused the farmer nightmares for countless generations. For example, when a natural area is brought under the plough very strong weeds such as crabgrass and docks sometimes come to dominate the vegetation. When these weeds take hold, the farmer is faced with a nearly impossible task of weeding each year. Very often, the land is abandoned.



In coping with problems such as these, the only sensible approach is to discontinue the unnatural practices, which have brought about the situation in the first place. The farmer also has a responsibility to repair the damage he has caused. Cultivation of the soil should be discontinued, if gentle measures such as spreading straw and sowing clover are practiced, instead of using man-made chemicals and machinery to wage a war of annihilation, then the environment will move back toward its natural balance and even troublesome weeds can be brought under control.

Fertilizer

I have been known, in chatting with soil fertility experts, to ask, "If a field is left to itself, will the soil's fertility increase or will it become depleted?" They usually pause and say something like, "Well, let's see ... It'll become depleted. No, not when you remember that when rice is grown for a long time in the same field without fertilizer, the harvest settles at about 9 bushels (525 pounds) per quarter acre. The earth would become neither enriched nor depleted."

These specialists are referring to a cultivated, flooded field; if nature is left to itself, fertility increases. Organic remains of plants and animals accumulate and are decomposed on the surface by bacteria and fungi. With the movement of rainwater, the nutrients are taken deep into the soil to become food for microorganisms, earthworms, and other small animals. Plant roots reach to the lower soil strata and draw the nutrients back up to the surface.

If you want to get an idea of the natural fertility of the earth, take a walk to the wild mountainside sometime and look at the giant trees that grow without fertilizer and without cultivation. The fertility of nature, as it is, is beyond reach of the imagination.

Cut down the natural forest cover, plant Japanese red pine or cedar trees for a few generations, and the soil will become depleted and open to erosion. On the other hand, take a barren mountain with poor, red clay soil, and plant pine or cedar with a ground cover of clover and alfalfa. As the green manure (*Ground cover crops such as clover, vetch, alfalfa which condition and nourish the soil.*) enriches and softens the soil, weeds and bushes grow up below the trees, and a rich cycle of regeneration is begun. There are instances in which the top four inches of soil have become enriched in less than ten years.

For growing agricultural crops, also, the use of prepared fertilizer can be discontinued. For the most part, a permanent green manure cover and the return of all the straw and chaff to the soil will be sufficient. To provide animal manure to help decompose the straw, I used to let ducks loose in the fields, if they are introduced as ducklings while the seedlings are still young, the ducks will grow up together with the rice. Ten ducks will supply all the manure necessary for a quarter acre and will also help to control the weeds.

I did this for many years until the construction of a national highway made it impossible for the ducks to get across the road and back to the coop. Now I use a little chicken manure to help decompose the straw. In other areas, ducks or other small grazing animals are still a practical possibility.

Adding too much fertilizer can lead to problems. One year, right after the rice transplanting, I contracted to rent 1 1/4 acres of freshly planted rice fields for a period of one year. I ran all the water out of the fields and proceeded without chemical fertilizer, applying only a small amount of chicken manure. Four of the fields developed normally. However, in the fifth, no matter what I did, the rice plants came up too thickly and were attacked by blast disease. When I asked the owner about this, he said he had used the field over the winter as a dump for chicken manure.

Using straw, green manure, and a little poultry manure, one can get high yields without adding compost or commercial fertilizer at all. For several decades now, I have been sitting back, observing nature's method of cultivation and fertilization. In addition, while watching, I have been reaping bumper crops of vegetables, citrus, rice, and winter grain as a gift, so to speak, from the natural fertility of the earth.

Coping with Weeds

Here are some key points to remember in dealing with weeds:

As soon as cultivation is discontinued, the number of weeds decreases sharply. Also, the varieties of weeds in a given field will change.

If seeds are sown while the preceding crop is still ripening in the field, those seeds will germinate ahead of the weeds. Winter weeds sprout only after the rice has been harvested, but by that time, the winter grain already has a head start. Summer weeds sprout right after the harvest of barley and rye, but the rice is already growing strongly. Timing the seeding in such a way that there is no interval between succeeding crops gives the grain a great advantage over the weeds.

Directly after the harvest, if the whole field is covered with straw, the germination of weeds is stopped short. White clover sowed with the grain as a ground cover also helps to keep weeds under control.

The usual way to deal with weeds is to cultivate the soil. But when you cultivate, seeds lying deep in the soil, which would never have germinated otherwise, are stirred up and given a chance to sprout. Furthermore, the quick-sprouting, fast-growing varieties are given the advantage under these conditions. Therefore, you might say that the farmer who tries to control weeds by cultivating the soil is, quite literally, sowing the seeds of his own misfortune.

“Pest” Control

Let us say that there are still some people who think that if chemicals are not used their fruit trees and field crops will wither before their very eyes. The fact of the matter is that by *using* these chemicals, people have unwittingly brought about the conditions in which this unfounded fear may become reality.

Recently Japanese red pines have been suffering severe damage from an outbreak of pine bark weevils. Foresters are now using helicopters in an attempt to stop the damage by aerial spraying. I do not deny that this is effective in the short run, but I know there must be another way.

Weevil blights, according to the latest research, are not a direct infestation, but follow upon the action of mediating nematodes. The nematodes breed within the trunk, block the transport of water and nutrients, and eventually cause the pine to wither and die. The ultimate cause, of course, is not yet clearly understood.

Nematodes feed on a fungus within the tree's trunk. Why did this fungus begin to spread so prolifically within the tree? Did the fungus begin to multiply after the nematode had already appeared? Alternatively, did the nematode appear because the fungus was already present? It boils down to a question of which came first, the fungus or the nematode.

Furthermore, there is another microbe about which very little is known, which always accompanies the fungus, and a virus toxic to the fungus. Effect following effect in every direction, the only thing that can be said with certainty is that the pine trees are withering in unusual numbers.

People cannot know what the true cause of the pine blight is, nor can they know the ultimate consequences of their "remedy." If the situation is meddled with unknowingly, that only sows the seeds for the next great catastrophe. No, I cannot rejoice in the knowledge that immediate damage from the weevil has been reduced by chemical spraying. Using agricultural chemicals is the most inept way to deal with problems such as these, and will only lead to greater problems in the future.

These four principles of natural farming (no cultivation, no chemical fertilizer or prepared compost, no weeding by tillage or herbicides, and no dependence on chemicals) comply with the natural order and lead to the replenishment of nature's richness. All my fumbings have run along this line of thought. It is the heart of my method of growing vegetables, grain, and citrus.

Farming Among the Weeds

Many different kinds of weeds are growing with the grain and clover in these fields. Rice straw spread over the field last fall has already decomposed into rich humus. The harvest will yield about 22 bushels (1,300 pounds) to the quarter acre.

Yesterday, when Professor Kawase, a leading authority on pasture grasses, and Professor Hiroe, who is researching ancient plants, saw the fine spread of barley and green manure in my fields, they called it a wonderful work of art. A local farmer who had expected to see my fields completely overgrown by weeds was surprised to find the barley growing so vigorously among the many other plants. Technical experts have also come here, seen the weeds, seen the watercress and clover growing all around, and have gone away shaking their heads in amazement.

Twenty years ago, when I was encouraging the use of permanent ground cover in fruit orchards, there was not a blade of grass to be seen in fields or orchards anywhere in the country. Seeing orchards such as mine, people came to understand that fruit trees could grow quite well among the weeds and grasses. Today orchards covered with grasses are common throughout Japan and those without grass cover have become rare.

It is the same with fields of grain. Rice, barley and rye can be successfully grown while the fields are covered with clover and weeds all year long.

Let me review in greater detail the annual seeding and harvesting schedule in these fields. In early October, before the harvest, white clover and the seeds of fast-growing varieties of winter grain are broadcast among the ripening stalks of rice (*White clover is sown about one pound per quarter acre; winter grains 6½ to 13 pounds per quarter acre. For inexperienced farmers or fields with hard or poor soil, it is safer to sow more seed in the beginning. As the soil gradually improves from the decomposing straw and green manure, and as the farmer becomes more familiar with the direct seeding non-cultivation method, the amount of seed can be reduced.*). The clover and barley or rye sprout and grow an inch or two by the time the rice is ready to be harvested. During the rice harvest, the sprouted seeds are trampled by the feet of the harvesters, but recover in no time at all. When the threshing is completed, the rice straw is spread over the field.



"In one day it is possible to make enough pellets to seed several acres."

If rice is sown in the autumn and left uncovered, the seeds are often eaten by mice and birds, or they sometimes rot on the ground, and so I enclose the rice seeds in

little clay pellets before sowing. The seed is spread out on a flat pan or basket is shaken back and forth in a circular motion. Fine powdered clay is dusted over them and a thin mist of water is added from time to time. This forms a tiny pellet about a half-inch in diameter.



In October, after the rice is harvested and the next year's seed is sown, straw is scattered across the field.

There is another method for making the pellets. First, the unhulled rice seed is soaked for several hours in water. The seeds are removed and mixed with moist clay by kneading with hands or feet. Then the clay is pushed through a screen of chicken wire to separate it into small clods. The clods should be left to dry for a day or two or until they can be easily rolled between the palms into pellets. Ideally, there is one seed in each pellet. In one day it is possible to make enough pellets to seed several acres.

Depending on conditions, I sometimes enclose the seeds of other grains and vegetables in pellets before sowing.

Between mid-November and mid-December is a good time to broadcast the pellets containing the rice seed among the young barley or rye plants, but they can also be broadcast in spring (*Rice is sown 4½ to 9 pounds per quarter acre. Toward the end of April, Mr. Fukuoka checks the germination of the fall-sown seed and broadcasts more pellets as needed.*). A thin layer of chicken manure is spread over the field to help decompose the straw, and the year's planting is complete.

In May, the winter grain is harvested. After threshing, all of the straw is scattered over the field.

Water is then allowed to stand in the field for a week or ten days. This causes the weeds and clover to weaken and allows the rice to sprout up through the straw. Rainwater alone is sufficient for the plants during June and July; in August, fresh water is run through the field about once a week without being allowed to stand. The autumn harvest is now at hand.

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