ANALYSIS OF THE FARMING ATTITUDE OF THE AGRICULTURAL MACHINERY OPERATOR: METHOD OF ANALYSIS AND CASE STUDY

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ABSTRACT

Operators' attitudes were categorized by interviews using TAT (Thematic Apperception Test) photos. The characteristics of their actual farm operations were then analyzed in interviews with photos of farm operations. The results indicated the attitude of operators to farm operations which used machinery. This in turn indicates their confidence and willingness in overcoming technical problems. Finally, the Bulletin includes a case study of the attitude of farm operators to the cultivation of Rhodes grass in the Kanto District of Japan.

INTRODUCTION

According to a recent prediction, the number of full-time agricultural workers in Japan is likely to fall each year by 100,000 people. According to this prediction, in only ten years' time the farm work force will have fallen to a mere one and half million, one million less than the current work force. Moreover, half of this remaining work force will be made up of people that are women, or at least 65 years old. The end result will be an increase in the amount of land farmed by each worker. Accordingly, the development of technology that increases labor efficiency will be even more important than today. In addition to the development of technology, the motivation of workers and their attitude to agriculture, are important factors. We need to recognize this.

Agricultural workers do not prefer farm operations which are simple and need little effort. In fact, the opposite is true, they get satisfaction, and are therefore more highly motivated, when they overcome difficulties. This Bulletin examines something which is often ignored: how farm operators feel about the work they do. The term “operator’s attitude” is used to refer to a worker’s personal “attitude” or “stance” toward agricultural operations. This “attitude” includes both the motivation and the level of satisfaction.

We have already reported that a person’s personality and his or her farming performance are closely related (Momoki et al. 1981, Sasaki et al. 2001). In this Bulletin, we discuss a method for analyzing the attitudes of people

Keywords: balanced type, “Dasein realization” model, operator’s attitude, projective method, Thematic Apperception Test,
who operate farm machinery, and the case studies done using this method. Although for convenience we refer to "he", our findings apply equally to the many women in Japan who operate farm machinery. According to Ikeda (1993), the attitudes shown can be categorized into four types:

- **The balanced type.** His attitude is attentive. He is eager to work, and tries to do his job precisely and neatly.
- **The innovator.** He plans operations logically. When he is satisfied with the plan, he implements operations in his own way.
- **The conservative.** He likes to implement operations one by one, in order. He tries to do things as precisely and neatly as he can.
- **The worker who fails to improve.** He can do the basic operations, but fails to acquire techniques that cannot be learned from operation manuals, even though he may want to.

In this Bulletin, we shall discuss the ideal operator, the one we have called the “balanced type”.

**METHOD OF ANALYSIS**

The operators

The observations of the different ways in which people view their work are based on a study of seven farm workers. Two of these were classified as belonging to the “balanced type” and are the primary focus of this report. One had 21 years’ experience and the other only one year's experience of using agricultural machinery (Table 1).

**Perception of photos**

Seeing how people perceive pictures is a way of interpreting how they see the world. The Rorschach Test is a famous test, in which people are shown strange pictures. These pictures do not have any one definite meaning, but can be interpreted in many different ways. The person's responses to the picture represent his true self. The examiner interprets the responses as a way of understanding the person's personal attitudes and assumptions.

TAT (Thematic Apperception Test) is another and similar test, in which people are shown photos and asked to interpret their meaning. The TAT photos used in this study, are the same as those used for a previous study (Momoki et al. 1981), and show agricultural scenes that are familiar to farm workers. The eight photos found to be appropriate for this research are shown in Fig. 1 to Fig. 8.

**Photos of farm operations**

The methods of planning and implementing operations were analyzed according to information acquired through interviews, using photos of farm workers engaged in actual operations (Fig. 9 to Fig. 16). These eight photos show pictures of plowing (Fig. 9 and Fig. 10), harrowing and grading (Fig. 11 and Fig. 12), seeding (Fig. 13 and Fig. 14), and spraying herbicide (Fig. 15 and Fig. 16). It is important that these photos show typical and familiar operations, to allow operators the chance to express their opinions.

In a previous study (Momoki et al. 1981), the use of these TAT photos and photos of actual operations to reveal operators’ attitudes and characteristics of their operations, was verified as an appropriate tool.

### Table 1. Operators’ experiences

<table>
<thead>
<tr>
<th>Operator</th>
<th>Sex</th>
<th>Age</th>
<th>Experience of agricultural work and machine operations</th>
<th>Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Male</td>
<td>47</td>
<td>For 21 years, A regular driver’s license, driving a large specialized tractor (limited to farming)</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Male</td>
<td>30</td>
<td>For 1 year, A regular driver’s licence. Driving both a large vehicle, and a large specialized vehicle</td>
<td></td>
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</tbody>
</table>
METHOD OF ANALYSIS

The operator’s attitude refers to his way of life, and those ideas and objects which attract his interest. More specifically, it refers to his personal attitudes and assumptions with regard to agricultural operations. These are analyzed from information acquired through interviews, using TAT photos.

The interview talks with the farm worker, not as a bystander or critic, but as a sympathizer. He shows the worker the photos, one by one, and allows him to talk freely about the impressions he gets from each photo. The interview is tape-recorded (with the worker's permission), and is later transcribed. The information acquired through the interview using the TAT photos is analyzed, and then categorized, using the "Dasein realization model" proposed by Ikeda (1993, 1997).

The Dasein realization model

The “Dasein realization model” (Ikeda 1993) consists of a vertical axis, which represents the individual “self”, and the horizontal axis, which represents “society,” socialization or the “world” (Fig. 17). The upper part of the vertical axis is the direction of the realization of self, beginning and establishment. The lower part of the vertical axis is the direction of sorrow, anxiety, suffering and dissolution of self.

Movement along the horizontal axis is related to actions shared with a community or associated with a community. The direction of meaning in the model gives a spatial image of the direction of a person’s interests, or the objects of his interest.

These "humanistic directions of meaning" are typically expressed by means of predicates. Thus, special attention must be paid to them in analysis. For example, the upward direction is expressed by standing, climbing, going up or flying, while the downward direction is expressed as going down, falling, dropping, sinking or being captured. Horizontal movement is expressed as walking, going, getting out, looking around, experiencing, knowing, learning, loving, being protected or withdrawing. The vertical and horizontal axes are each divided into three levels: lowness and shallowness, highness and deepness, and infinity for the vertical axis, as well as narrowness, breadth and infinity for the horizontal axis. These different characteristics form concentric circles that form three layers. The predicates that typically express an operator's attitude can be put in either one of the layers.

It should be noted that the projection method is one of many personality test methods. Visual or lingual stimulations are given to person being examined, and his associations and/or independent thought is evaluated. The method is also used in psychology and educational studies (Nakajima et al. 1999).

RESULTS OF THE CASE STUDY

Categorization of operators’ attitudes using TAT photos

Operator A

The interview results for each photo are shown in Table 2 and Fig. 17.

Looking at Fig. 1, A made the commonplace remark “He’s resting during reaping,” and then added, “…a long time ago, say, about 20 years ago. He is holding a sickle, working and resting, so it’s an old image,” and, “He’s tired and just having a short rest, I think.” The comments “resting” and “having a short rest” imply that his interest moved toward “a relieving space.” Then, he added, “…it’s more effective to have rests every now and then,” which means his interest shifted to making the operation efficient; this shows rationalization. From these statements we can see his interest is directed to “going up” on the upper part of the vertical axis in the “Dasein realization model.”

Looking at Fig. 2, he responded, “I don’t think these people are farmers. Because they’re just cutting off the ears, just cutting the tops with sickles. This may be some laboratory or experimental station. I have that impression.” This means that his interest moved to observing, and furthermore directed to “knowing” on the horizontal axis. Then he was reminded of working with a family, saying “And, behind the young men, are their mothers … I see two middle-aged women.” This assertion implies a movement to “a relieving space,” as it did when he first looked at Fig.
1. At this point it was directed to a “comforted” position, which is close to the intersection of the vertical and horizontal axes. Next he said, “Yet, the ears of rice haven’t completely ripened. The heads are still bowed over. It must be just after the flowers have finished. Or something like that,” which followed the comment at the beginning, “They’re cutting ears, just cutting the tops with sickles.” This statement shows his feelings of “anxiety” about harvesting rice before it is fully grown.

Looking at Fig. 3, he responded, “Somehow the sky is a little too dark.” “Well, they’re standing up, they’ve finished their break, and will now resume working, I guess.” and, “The sky is very dark, but probably it isn’t a thunderstorm.” Again, anxiety is found within his stream of consciousness. It is shown in his use of words such as “too dark,” “resume working. I guess,” and “very dark.” This tendency toward anxiety was repeated when he saw Fig. 6, Fig. 7 and Fig. 8. This shows how his interest moved to the “going down” area, found on the lower part of the vertical axis.

When he looked at Fig. 4, he gave ordinary responses such as “… they look like farmers”, but then he displayed an interest in the fact that they are together with companions, commenting, “They’re looking at something, well, talking about something.” “There are five men, and they’re looking at approximately the same point,” and “They are discussing something, or discussing the operation.” While looking at Fig. 5 he again expressed interest that the people are together, with companions. He commented, “They’re chatting with a farmer, I’d say,” and “They’re not doing farm work. They’re talking about something … maybe ‘how was the harvest this fall’ … ‘The rice harvest wasn’t good this year.’ They’re talking like that.” His interest was directed to “being together” and “cooperation” on the horizontal axis.

From the analysis of Operator A’s stream of consciousness, we interpret his attitude to farming as follows. Operator A recognizes the repeated situation with his interest directed to “going down” on the lower part of the vertical axis. However, he handles the situation by directing his interest towards “comforted,” which is close to the intersection of the vertical and horizontal axes, “going up” on the upper part of the vertical axis, and “knowing,” “being together” with companions and “cooperation” on the horizontal axis. In other words, his anxiety inspired by the present situation is interpreted as directed towards “going down” in the “Dasein realization model.” Then he moves from a state of anxiety to that of comforting, namely to the direction of “comforted.” At the same time, his interest is directed to “going up,” “knowing,” “being together” and “cooperation,” which is the process of overcoming “going down” by learning, experiencing and knowing things.

Operator B

The interview results for each photo are shown in Table 3 and Fig. 17.

Looking at Fig. 1, Operator B responded, “He has reaped a certain amount and finished one big part, so he is going to have a break.” This response shows he imagines the workers are tired of working and withdrawing from it. Looking at Fig. 2, he responded, “All family members,” which shows he was imagining working with a family. Both of the responses imply that his interest was moving toward the “comforting space,” i.e. his interest was directed to “comforted,” which is close to the intersection of the vertical and horizontal axes in the “Dasein realization” model.

Then he commented on the difficulties of harvesting rice by hand, when he said, “… reaping by hand. I think it was hard in those days.” When he looked at Fig. 6, he commented, “The field wouldn’t last so long, I guess,” and when he looked at Fig. 7, he commented, “I think the land here would be developed and buildings would be built.” These comments express his anxiety about farmland shrinkage due to industrial development. At this point his interest was directed to “going down” on the lower part of the vertical axis.

Looking at Fig. 3, his comment, “... if they should stop or continue to work,” shows his concern over whether or not the operation should continue or not. This can be interpreted as the movement toward “independence,” which is shown again in his response to Fig. 4. When he looked at Fig. 8, he responded, “I think the boy will become a hog farmer in the future”, which implies the movement toward “hope.” These movements indicate that his
interest was directed to “going up” on the upper part of the vertical axis.

Looking at Fig. 5, he commented, “There are two men in a jacket, so people from an agricultural co-op or somewhere are visiting the farmer and talking about something,” which implies that he is interested in being together with companions. His interest is directed toward “being together” on the horizontal axis.

From the above analysis of the stream of Operator B’s consciousness, his farming attitude is interpreted as follows. Operator B recognizes the repetitive actions with his interest directed to “going down” on the lower part of the vertical axis. However, he handles the situation with his interest moving toward “comforted,” which is close to the intersection of the vertical and horizontal axes, in order to move his mind from anxiety to a “comforting space.” Also, in order to cope with “going down,” which evokes anxious feelings, his interest moves to “going up” on the upper part of the vertical axis, and to “being together” on the horizontal axis.

Approach to actual farm operations

**Operator A**

When Operator A looked at Fig. 9 and Fig. 10 (plowing), he expressed unpleasant feelings and showed concern about a) flattening the plowed soil, b) running the tractor straight, and c) having to look back over his shoulder for a long time. Then he showed the attitude that he would overcome those difficulties by adjusting the top link and getting used to the challenging operations.

When he looked at Fig. 11 and Fig. 12 (harrowing and grading), he didn’t point out difficulties in the operations, saying, “I think the rotary tiller is rather easy to handle.”

When he looked at Fig. 13 and Fig. 14 (seeding), he pointed out difficulties for the operator and the assistant who checked the operation. From the operator’s point of view, he showed concern about a) depth of seeding, b) running the tractor straight, and c) extended operations. From the assistant’s point of view, he showed concern about a) if he could fertilize and seed according to the plan, and b) extended operations. Then, he expressed the method that he would use to overcome the difficulties in seeding. In order to correct the perceived problems, he explained how the operator should cooperate with the assistant, such as discussing and checking the seeding depth, checking the straightness of rows, and starting and stopping the machine according to the assistant’s cues.

When he looked at Fig. 15 and Fig. 16 (spraying herbicide), he showed anxiety and displeasure, expressing concern about a) the state of spraying, b) timing the stopping of the machine at the end of the operation, c) accuracy of spraying, and d) the possibility of getting herbicide on himself. Then, he attempted to deal with the difficulties by running tests with water, becoming accustomed to the operation, and spraying when there was no wind.

**Operator B**

When Operator B looked at Fig. 9 and Fig. 10 (plowing), he expressed concern about a) flattening the plowed soil, b) running the tractor straight, c) making the edges of the furrows straight, d) the possibility of falling asleep in a comfortable tractor cabin, and e) hitting something outside the field. Then he talked about the methods he would use to overcome these difficulties by adjusting the top link, checking plow depth after the first pass as well as after a certain length of plowing, checking if weeds are stuck in the plow, and arranging the entrance/exit in an appropriate position in the field.

When he looked at Fig. 11 and Fig. 12 (harrowing and grading), he showed displeasure, expressing concern about a) a neat finish, b) Vibrations when the tractor moved from compact to loose soil and vice versa c) Vibrations when the tractor worked on uneven ground in the field, and d) hitting something outside the field. In order to overcome these difficulties he suggested adjusting the plowing depth by looking back while running the machine, and turning the tractor with the rotary tiller kept low.

When he looked at Fig. 13 and Fig. 14 (seeding), he showed displeasure, expressing concern about a) whether he could fertilize and seed according to the plan, b) running the tractor straight, c) running the machine straight along the furrow, d) dust during the operation and, e) hitting something outside the field. To overcome these difficulties, he would adjust the
Figs. 1-8. TAT (Thematic Apperception Test) photos

Figs. 9-16. Photos of actual farm operations

Fig. 9. Plowing (1)  
Fig. 10. Plowing (2)  
Fig. 11. Harrowing and grading (1)  
Fig. 12. Harrowing and grading (2)  
Fig. 13. Seeding (1)  
Fig. 14. Seeding (2)  
Fig. 15. Spraying herbicide (1)  
Fig. 16. Spraying herbicide (2)
Table 2. Results of interview with Operator A

<table>
<thead>
<tr>
<th>Response</th>
<th>Direction of meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fig. 1.</strong> This is reaping of rice. He’s resting during reaping. After all, the impression I receive from this is that, well, the impression I get now is, that a long time ago, say, about 20 years ago. Holding a sickle, working and resting, so it’s an old image, I’d say. Probably I don’t think this is the 3-o’clock break. Well, we usually take a break, around here, at ten and three. But he’s smoking holding a sickle, so he’s tired and just having a short rest, I think. After all, depending on your work, you know, continuous working tires you. Well, depending on the kind of work, it’s more effective to have a rest every now and then. This is something like that. I also think he is thinking about something, though.</td>
<td></td>
</tr>
<tr>
<td><strong>Fig. 2.</strong> Probably, I don’t think they’re farmers. Because they’re cutting ears, just cutting the tops with sickles. This may be some laboratory or experimental station. I have that impression. It looks that way. And, behind the young men, are their mothers or, I’m not sure about that, I see two middle-aged women. And, yet, the ears of rice aren’t completely ripened. The heads are bowing. Must be just after the flowers have finished. It’s something like that.</td>
<td></td>
</tr>
<tr>
<td><strong>Fig. 3.</strong> This isn’t a paddy field. Somehow a little bit, the sky is somehow a little bit too dark, and like, probably they have harvested something, well, stood up, they finished the break, stood up, and now resume working, I guess. And the sky is very dark, or, probably it isn’t a thunderstorm, it’s difficult to tell. It is the beginning of the farm work, or it’s just after the break, I don’t know which. I got that impression. I can’t tell what the crop is.</td>
<td></td>
</tr>
<tr>
<td><strong>Fig. 4.</strong> This is an interval between jobs. On the side, on a little bit right back, or behind them, it’s a tractor, I think. A tire of the tractor. Well, they look like farmers, their caps look the same. They’re looking at something, well, talking about something, I think. Approximately, well, there are five men, and, they’re looking at approximately the same point. I don’t know what it is. They are discussing something, or discussing the operation, the tractor. It seems that they are sitting on a machine. Is this a harrow, attached behind the tractor...it seems they’re sitting there. I can’t tell it exactly.</td>
<td></td>
</tr>
<tr>
<td><strong>Fig. 5.</strong> This is probably the veranda of a farmhouse. There they’re chatting with a farmer, I’d say. They’re talking about something over a cup of tea, I guess, but it’s a little bit difficult to tell. Probably the men in the center and on the left are in something like a blazer, say, together wearing a blazer. So, they’re not there for farm work. They’re talking about something, for example, maybe not in the winter, after harvesting or finished the first harvesting, “How was the harvest this fall?”, they’re talking about something like that, I should think. A little bit difficult to tell. “The rice harvest wasn’t good this year.” They’re talking like that, with companions.</td>
<td></td>
</tr>
</tbody>
</table>
top link, put the precise mix of fertilizer and seeds in the hopper, checking to see whether the fertilizer and seeds were going through the pipe and dropping correctly before starting and during the operation, stopping the tractor and adjusting the machine when there is some trouble, checking the remaining amount of fertilizer and seeds in the hopper during the operation, and placing the tractor parallel to the furrow.

When he looked at Fig. 15 and Fig. 16 (spraying herbicide), he showed anxiety and displeasure, expressing concern about a) the attachment of the front weight, b) whether he could spray according to the plan, c) turning the machine in the field, d) hitting something outside the field, and, e) the possibility of getting herbicide on himself. The expressed ways that he would use to overcome the difficulties are: by checking the state of spraying, placing signposts in appropriate positions to center the tractor from, spraying when there is no wind, folding one sprayer arm when he sprays along the edge of the field, and folding the sprayer arms when he turns the tractor.

Analyzing the information acquired through the interviews using photos of actual operations, we found the following patterns in Operators A and B’s farming attitudes.

First, both of them expressed specific concerns, and general anxiety about the predictable operational difficulties. Operator A showed concern about plowing, seeding, and spraying herbicide. Operator B showed concern about plowing, harrowing and grading, seeding, and spraying herbicide. Both of them then expressed their ideas on how to overcome these perceived difficulties.

However, no solutions were given to some difficulties such as extended operations (Operator A) and painful vibrations that occur when the hardness of field soil varies (Operator B). Operator A did not point out any difficulties in harrowing and grading, and
Table 3. Result of interview with Operator B

<table>
<thead>
<tr>
<th>Response</th>
<th>Direction of meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 1. An old man, it may be rude to call him so, but he has reaped a certain amount and finished a large area so he is going to have a break, I think.</td>
<td>Relief</td>
</tr>
<tr>
<td>Fig. 2. All the family members, not like today, are reaping by hand. I think it was hard in those days.</td>
<td>With family, being together. Anxiety</td>
</tr>
<tr>
<td>Fig. 3. Outside, the sky is a little cloudy. Everybody is standing saying what they should do. They’re talking about whether they should stop or continue to work, I think.</td>
<td>Independence Going up</td>
</tr>
<tr>
<td>Fig. 4. I think the people are sitting around talking about something. The man in front is looking down and doing something, so they’re saying the soil is like this or that, I think.</td>
<td>Independence</td>
</tr>
<tr>
<td>Fig. 5. There’s only one man wearing work clothes and there are two men in a jacket, so people from an agricultural cooperative or somewhere are visiting the farmer and talking about something on the veranda, I guess.</td>
<td>With companions, being together</td>
</tr>
<tr>
<td>Fig. 6. She’s farming beside the railroad so it won’t be a field for long, I guess.</td>
<td>Anxiety Going down</td>
</tr>
<tr>
<td>Fig. 7. I see a construction site in the far distance and pylons in front, so I think the land here will be developed and buildings will be built.</td>
<td>Anxiety Going down</td>
</tr>
<tr>
<td>Fig. 8. Those are pigs in the back, those are. This is a pork producer. I see an old man in front and a boy behind him. I think the boy will become a pig farmer in the future.</td>
<td>Hope Going up</td>
</tr>
</tbody>
</table>

Note: The themes of the responses and the predicates that direct the themes are listed in the Direction of Meaning.

gave few responses about the photos.

**Characteristics of the balanced-type operator’s attitude**

We analyzed the information acquired from the interviews using the TAT photos, and categorized the operators’ attitudes according to the “Dasein realization” model. Then we inferred the characteristics of their operations by analyzing their responses in the interviews using photos of actual farm operations.

Facing operational difficulties in an actual operational situation, Operators A and B both feel concern and anxiety i.e. their interest moves to the direction of meaning “going down” on the lower part of the vertical axis in “the Dasein realization model.” Next, Operator A’s interest moves to “going up” on the vertical axis, and “cooperation” on the horizontal axis, while Operator B’s interest moves to “independence” and “going up” on the upper part of the vertical axis, and “being together” on the horizontal axis. These movements suggest that both operators try to overcome their specific concerns and general anxiety about the operations by establishing a detailed operational plan independently, or by cooperating with companions.

The ideally realized self spreads itself in a balanced direction on both the vertical and horizontal axes, with his or her interest moving freely in that area (Ikeda 1993). Both Operator A and Operator B’s interests move downward and upward on the vertical axis as well as on the horizontal axis while they are planning an
operation. Because of this fact, we categorized the two operators as belonging to this “balanced type.” It is thought that the directions of meaning, the positions toward which the balanced-type operator’s interest moves, reflect his mind’s working on planning operations, which in turn is expressed in his actions to solve the problems in actual operations (Kida 1970, Ikeda 1993).

The analysis of these interviews using photos of actual operations proved that the balanced-type operator’s directions of meaning are reflected in his actual operation. This type of operator is attentive, eager to work and intends to do an operation precisely and neatly. This approach to an operation results in his motivation to work.

For example, in plowing, Operator A showed concern about flattening the plowed soil and running the tractor straight. Although Operator B also showed concern for the flattening of plowed soil and running the tractor straight, he also expressed concern about making furrow edges straight, and hitting something while running the tractor outside the field.

To solve these problems, Operator A proposed adjusting the top link and getting some experience of the operation before he started the real work. Operator B also proposed adjusting the top link, as well as checking plow depth after the first pass, checking whether weeds are stuck in the plow, and putting the entrance to the field in an appropriate place.

The solutions put forth by both operators are technically sound from various points of view, which implies that their attitude is attentive and that they are trying to perform operations precisely and neatly. This attitude is seen not only in plowing, but also in harrowing and grading, seeding, and spraying herbicide. It is therefore inferred that the operators tackle difficult problems eagerly. By overcoming these problems, their motivation is enhanced.

“Attentive,” “precise” and “neat” are terms used to describe the balanced-type operator’s attitude, and indicate directions of meaning on the horizontal axis which are then translated into the predicates “being together,” “knowing” and “experiencing.” The term “eager” is found on the upper part of the vertical axis and translates into “going up.” The characteristics of the balanced type are shown in the “Dasein realization” model.

In addition, Operator A and Operator B both temporarily withdraw from specific concerns and general anxiety about actual operations, moving to the directions of meaning “comforting space,” and “comforted.” However, how this movement is expressed in actual actions couldn’t be uncovered by the interviews using photos of actual operations.
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Understanding the points in development and improvement of agricultural machinery, and planning of farm work, by understanding producers’ interests and problems

Farm work is closely related to the attitude which farmers have toward farming. I will use the cultivation of Rhodes grass (Chloris gayama, Kunth), one of the tropical grasses, as an example.

Rhodes grass is grown in the Kanto District of Japan from spring to fall. In early spring, the seeding season, the field will probably not receive enough moisture, for the seedlings to become well established. Because of this, producers usually use a tractor and roller (Fig. 18). They run it at a low speed on the dry field in order to further compact the soil.

However, some producers do not accept this method, because running a roller at a low speed for a long time is physically very demanding. Even though producers have the same goal, their approaches vary depending on their interests. Thus, we can understand what is important in developing and improving agricultural machinery and planning farm work, by understanding the problems that producers face. To get to know both their interests and problems, it is necessary to research the method of crop production. This involves an analysis of farming attitudes.

Elements of crop production and research methods

Fig. 19 shows how human elements can be included in the methods of research into crop production.

Cultivation is established when a “person” adjusts the ecology, the interaction between crops and environments, by means of cultivation methods and farming techniques. When the person decides on a goal, such as the expected harvest, he chooses a certain cultivation theory and its subsequent techniques. Then he begins farming in order to attain this goal. His choice and implementation of the method and techniques follows his experiences and belief. Behind such thinking, however, there is his farming attitude, i.e. the direction his interest is going, or directed towards. This farming attitude is also related to his choice and implementation of methods and techniques. Which methods and techniques he will select can be inferred by analyzing an interview using photos of actual operations. His farming attitude is analyzed with the information acquired from an interview using TAT photos, and categorized using the “Dasein realization model” described earlier in this Bulletin (Momoki 2003).

Technological Development That Utilizes Producers’ Motivation and Satisfaction

Following the aforementioned method, and using the techniques introduced in this Bulletin, a producer’s interest can be understood and taken into account in the development and improvement of agricultural machinery and the planning of farm work.

One of the aforementioned producers, who couldn’t accept the compacting method using a tractor and roller, had the following farming attitudes: he plans operations logically and, when he is satisfied with the plan, implements the operations in his own way. Also, he had an operational belief that physically demanding work should be avoided as much as possible. His interest focused on reducing the labor needed for compacting (Momoki et al. 1982). This is the point of improvement in his compacting work.

He solved the problem by making a machine which used both a rotary hoe and a roller (Fig. 20). The rotary hoe stirs the seeded soil so that the mixture of seeds and soil is adequate. Then the roller compacts the soil. This machine alleviated his concern about the amount of water in the soil while working in the field. He achieved both a labor-saving operation, which agreed with his farming attitude, as well as the stable establishment of Rhodes grass seedlings. This achievement resulted in a production method that gave him satisfaction.

The meaning of the introduction of the concept of farming attitude into agricultural research is that it makes possible technological developments that utilize the characteristics of individual producers.
Goal: e.g. harvest quantity, quality, safety of crops, long lasting production, conservation of environment

Person adjusts ecology by cultivation methods and farming techniques

Cultivation theory, farming techniques

Choice of cultivation methods and farming techniques for the best approach to the goal (consciousness)

Realization of cultivation methods and farming techniques (action)

Farming attitude: Direction of meaning that evokes consciousness and action

Interview using photos of actual operations as stimuli

Interview using TAT photos as stimuli, and categorization of the results using the "Dasein realization model"

Fig. 18. Compact using a tractor and roller

Fig. 19. Elements of crop production and analysis method

Note:
Ecology: interaction between crops and environment

: Relationships between the elements of crop production

: Approach adopted by farmer
Fig. 20. Compacting machine fitted with a rotary hoe and a roller