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Discussion

Chairman: A. U. Kahn
D. H. Truong
H. Kaburaki

Discussion

Chairman : This is our concluding session. We have heard some interesting papers today and the last two days and we hope that the discussion will be quite lively and informal. I will start to read some of the questions which have been suggested for discussion. Earlier, we requested the participants to submit their questions, and I have here a lot of them. These have been arranged in three sections. First, the technical problems have been grouped together; second, the economic problems; third, problems of a general nature. Now, we want to do the technical problems first, so, the first question is on the trafficability of agricultural machinery. Now, Dr. Kaburaki, would you like to suggest any specialist on this.

Trafficability of agricultural machinery

Kaburaki : Yes, the first problem is the trafficability of agricultural machinery. It is a common and serious problem in tropical or subtropical areas. I would like to request Dr. Sano to make some comments.

Sano : I believe the development of specific machinery for the soft soil is not toward the right way to solve the problem. The right way is toward land improvement. Especially we have been making the improvements advocated by Dr. Nakagawa the day before yesterday. I think land improvement has the following merits: first, the cheap machine can work efficiently; second, productivity can be increased, not only in labor productivity but also in land productivity; third, machines can produce more working hours in a year. I would like to tell you about some experiences on land machinery used in soft soil. We started the development of the machinery in 1964 at the Hachiro-gata (Hachiro Lake) reclamation project area. Toward the development and the improvement of farm machinery adaptable to very soft ground, there are two stages. One is the stage toward the practical use of construction machinery and the other is the stage toward the development of farm machinery. In the first stage we developed or improved various types of machinery as follows. (1) The mud buggy or the marsh buggy and (2) the marsh dragline and the marsh clamshell which are all amphibious. They can travel and work on the ground where men cannot walk. Bearing capacity of the ground is about 0.5 kg per cm². Contact pressure of marsh buggy is 0.06 kg per cm² and that of marsh dragline is 0.09 kg per cm². We also developed (3) the super swamp bulldozer and the super-super swamp bulldozer. The swamp bulldozer is typical Japanese type equipment. Its contact pressure is about 0.25 kg per cm² but it cannot travel further in Hachiro-gata ground. So we developed the super swamp bulldozer and the super-super swamp bulldozer. The super swamp bulldozer's contact pressure is 0.13 kg per cm². In the case of these equipments the bearing capacity of the ground is about 1.0 to 2.0 kg per cm² for cone index. We also have (4) rotary type equipments. They are rotary trencher and the rotary ditcher.

Zachariah : I would like merely to make a few observations with respect to trafficability. Even though we are attempting to improve the boggancy of the machines and also, as suggested, even if we improve the factor of the soil to improve the boggancy we would still have certain problems. The cost of reclamation would be high. I feel that we should still adapt

some of the old, traditional forms of pulling implements for tillage purposes and also power driven implements, like power-driven ploughs, power-driven harrows, almost employing the same principle as the Rotavator. This would enable even heavier machines to work on lighter soil. The second design aspect which all designers will have to keep in mind would be to adapt the same that is used under fine conditions for more difficult conditions by slightly over-designing the transmission system. We have experienced this difficulty with respect to combine harvesters. The combine harvesters, which are used and designed for wheat, can also be used for rice by changing the cylinder and the crank case. But when it comes to loose soil, we found that in the transmissions and the rear axles, the failures are quite high. And therefore the whole design approach to improve the rear transmission system should be adapted. This is not due to the difficult soil condition. Very little work is also being done on the traction component. Perhaps the best that we know of is the cage wheel for the power tiller. Most of the European designed tractors have cage wheels which only admit the soil partially, but does not improve the boggancy of the tractor. Whereas the approach by power-tiller cage wheel adopted in Japan seems to be very good. I would only point out that further work should be done on the traction component for improving boggancy and this is the aspect on which further work should be carried out.

Mutalib : I just have a short comment to make, because the main point is that land improvement should be the approach. This is of course the ideal and we hope someday we will be able to do that. But I think that for the other countries besides Japan, it will be at least twenty years before we can afford to go to this approach. Therefore I think for the rest of us we have got to settle for design improvement. Of course, as has been mentioned here, there are now all sorts of buggies—super-super buggies and triple-super buggies. But the problem is cost. So I think it would be a good thing if the designers could keep it in mind that what we want now is a simple and cheap machine. I think that the machine that can defeat trafficability is already there. What we want now is a cheap one.

Chairman : I would like to add a little bit to both the comments. My feeling is that post design efforts have gone into increasing the surface contact, surface area, but relatively less attention has been paid to lightening the machine itself. I think much more attention is required by designers in looking at that aspect rather than creating a heavy machine and then finding bigger area to support it. That was just a little comment. I think we ought to move along to the second subject: the second is the problem of drying of high-moisture grain, storage and quality of grain. I would request Mr. Morino to make a brief comment on it.

Drying and milling of grain

Morino : I can speak only generally and I quite agree with Mr. Tani's report of yesterday. The harvested paddy should be dried up to the 18% of moisture content as soon as possible so as to be stored temporarily and then dried evenly up to 14%. Moreover the paddy dryer should be cheap and easy to handle. And I suggest that the flat floor type dryer be most profitable to farmers at the present.

- Chairman :** The third point is the problems of rice milling machinery. What comments would you like us to make, Dr. Matsuda, professor of Kyoto University?
- Matsuda :** In Japan, dried paddy is husked by farmers themselves or in the so called rice centers which are managed by agricultural cooperatives. The Government purchases the brown rice, stores it and wholesales it to rice mills. There are two types of rice mills in Japan. One is large scale mills which are not so popular but recently increasing in number in big cities. Their milling capacity is 50 to 90 tons of brown rice per day, and requires 25 to 120 ps. Their milling machines have combination equipments of an emery roll type and a pressure type with a blower. The other is small pressure type machines with a blower and requires 2 to 5 ps. Farmers also have their own milling machine of the same type of 0.5 to 1.0 ps for the purpose of milling the rice for their own consumption. The milling machine of one pass system is getting popular among farmers.
- Boonit :** About milling, I think this is a problem for Southeast Asia, too. Usually the loss is about 35%, but under the process of milling, the loss is not so much. But during the ripening time of a certain rice, the loss is great. So if perhaps we could find some project to concentrate on ripening more than on milling it would be more economical, because indica type is more easily broken.

Economic evaluation of farm mechanization

- Chairman :** I think we will move up to the next subject. This was suitability of Japanese-made farm machinery for the conditions of South-East Asian countries. It is suggested by Mr. Zachariah and some other people.
- Zachariah :** The only additional point I have is that most of the machines made here are made for the home market. If some effort could be made to economize on design, I mean, otherwise, to remove all the frills on the equipment, the other countries could use and maintain them much more easily.
- Chairman :** Shall we move up to the economic problems? This is the second major heading. The first problem is comparison of Japanese combines with ordinary combines. Mr. Kudo, please.
- Kudo :** Since the day before yesterday, we have discussed the economic efficiency of machines, especially the operating cost of the harvesting machine. First of all, I want to answer the question from Mr. Mutalib. The operating cost is about ¥17,000 per hectare or about ¥800 per hour with hand harvester for rice harvesting under the power tiller pattern, about ¥19,000 or ¥1,000 with 3 row binder under the medium size tractor pattern, and about ¥15,000 or ¥480 with a small size combine under the large size tractor pattern. Yesterday, Dr. Ezaki said that the operating cost of the small combine is about half or one third of that of the large conventional combine. It is about ¥43,000 per hectare under the large size tractor pattern in the case operated in 25 hectares of paddy field.
- Then, I would like to speak of the economic obsolescence on the old type machine. Several years ago, I have made a survey of the replacement of the power tiller at 350 rice farms in Shonai Area which is one of the most mechanized in Japan. The main reasons of replacement of the power tiller are as follows:
- 1) Increasing of labor efficiency by the new type power tiller or medium

size tractor

2) Increasing of repair cost on the old type power tiller

3) Economic obsolescence of the old type power tiller

Agricultural technique is developing so rapidly in Japan that the economic obsolescence is increasing with its change. The selling price of the old power tiller from the farmer is going down sharply with its age.

Of course, I don't think that all of machines introduced into farms are used economically in Japan, but some of them are over invested. I guess, about 20% of power tillers are used uneconomically now, even if its even-break point is about 1.5 hectare.

Zachariah :

For improving the utilization of the combine, I feel that even though quite a good amount of work has been done in Japan, there are also several conditions where crops other than rice are grown. So if the same combine with minor modification can also handle wheat and some other cereal crops, its annual usage will increase considerably. The second approach is to have an attachment for the power tiller, so that the cost of transmission and other power units can be reduced. These are two specific approaches which some work will have to be concentrated upon. The next subject is the economic evaluation aspect of land utilization.

Chairman :

Suzuki :

It is generally said that one purpose of farm mechanization is the labor-saving on farm work. This is particularly true of advanced countries where farm workers can easily get their jobs from non-agricultural sectors. Farm labor saved by the mechanization transfers to non-agricultural sectors in which their employments are found. In those countries, the size of farm is relatively large and the economy of scale has been achieved. In other words, the substitution of machinery for labor has been advanced. Whereas, in developing countries, even if farm labor was saved by the mechanization, there could not be found employment enough for industrial sectors. This means that farm labor has not been replaced yet by machinery because of its cost.

In fact, it can be said that the farming in most developing countries does not yet afford the intensive use of labor and capital. In the case of small-hold agriculture, farmers want to maximize their farm income by using their family labor intensively. We must notice that maximizing income is not necessarily consistent with mechanizing farming. Figures 1 and 2 show some relationships of farm mechanization to farm income. Suppose that a large machine is introduced into a farm, assuming other things, for instance, land use or cropping pattern and so on being equal.

- 1) Before farm mechanization, the farmer's revenue is shown by the amount of area which is a rectangle OABC. After mechanization, his revenue is supposed to be the amount of area which is a rectangle O' A' B' C'.
- 2) Each rectangle is expressed by the capacity of labor (O A and O' A') and the efficiency of labor (A B and A' B'). Here, MPC and APC mean marginal product curve and average product curve, respectively.
- 3) Given the conditions, it would not be always certified that O' A' B' C' would be larger than O A B C without the change of cropping pattern and so forth. It would be rather usual that O A B C would be larger than O' A' B' C', because the output per man would increase but the input of man-days would decrease after farm mechanization.
- 4) Effective farm mechanization, therefore, depends on the amount of

capacity and the efficiency of labor before and after mechanization. When there would not be any opportunities of getting off-farm jobs, farmers' income tends to decrease after farm mechanization. Therefore, it is important to know how to mechanize farming, that is, the procedures of the mechanization. So, in order to mechanize farming it must be considered to increase the capacity of labor as well as the efficiency of labor through the development of multiple cropping, the enlargement of farm size and so on. (See Figure 3).

Chairman : I would like to move to the next topic which is economic evaluation aspects of labor.

Umeki : I would like to emphasize the fact that there are two types of labor shortage on farms. The first type of labor shortage occurs in the course of intensification of farming. With the introduction of intensive crops or intensive enterprises, seasonal or daily distribution of labor may change and labor shortage is unavoidable in the peak season. The second type of labor shortage arises from the movement of farm people to other industries. Under the circumstance where land is scarce and labor is abundant, much attention will be paid to raise land productivity. In the reverse case, farmers will pay much attention to save labor.

Political and socio-economic problems of farm mechanization

Chairman : We will move to the next topics which are the political problems of rice and socio-economic problems of farm mechanization. Now, there are a number of problems listed here. One is the effect of rice prices on farm mechanization by Mr. Kamiya. Mr. Kamiya also has another topic on the aspects of irrigation and drainage.

Kamiya : I want to make comments on economic condition with special reference to the agricultural policies in Japan. I think there are two fundamental conditions, under which farm mechanization has developed in Japan; one of them is rapid growth of national economy, especially of the non-farm sectors. The remarkable rural exodus in recent years has brought about the annual decreasing rate of 2% or more in agricultural labor force. Needless to say, the growth of national economy provides the farmers with the cheaper agricultural equipments of non-farm origin. Rapid decline in actual labor force has forced farmers to introduce the labor saving devices. According to my calculation, in the last decade, the rate of cost of fixed capital has risen from 19% to 25%, while the rate of cost of labor in the gross value of agricultural product has fallen from 45% to 23%. This is the general condition.

I want to mention another favorable condition, that is, the agricultural support policy. One of the important agricultural support policies is the price support measure for rice. Under the Food Control Law, the producers' price of rice is fixed every year on the basis of the cost and income compensation formula which permits farmers to receive a fair return compared with workers of other sectors. The price measure is not limited to the rice, but covers main crops and other products, such as, barley, wheat, sugar beets, soy beans, rape seeds, milk, cocoon and so on. Roughly saying, the gross product of the main crops under protection accounts for about two thirds of the total gross product, in Japan. Other public measures include agricultural structural improvement program now under way and various government financing schemes, such as, loan

from Agricultural Financing Corporation and from Agricultural Modernization Fund Scheme and so on. These programs have a good influence on agricultural farm mechanization. I only mention the budget appropriation for farm mechanization tripled in the last ten years, exactly to say, up to 1968 in absolute terms. These conditions are very favorable to the progress of the farm mechanization, I think.

Now we are facing the difficulty of overproduction of rice. As you know, the producers' price of rice is fixed at almost the same level since 1968. I think this plan will be maintained for some period in future. Because very recently the Agricultural Policy Deliberation Council published the interim report on agricultural price saying that the benefit gained by the improved productivity should be shared by both producers and consumers. So I think these conditions will be continued for the time being, but these fixed prices are naturally going to have some adverse effects on farm economy. But I think the gain from improved productivity will compensate or offset these adverse effects. Furthermore, the research work on farm mechanization is expected to be developed. I think this research work will help farmers to adopt more efficient mechanization and more efficient labor saving devices.

Chairman:

The next topic is again related to political problems of rice and socio-economic problems of farm mechanization from the aspect of the structure of agricultural society.

Hirashima :

I would like to make three comments which have not yet been pointed out. First, social scientists find very high correlation between diffusion of new technology and investment in infrastructure, mainly in irrigation and flood control, and also high correlation between diffusion of new technology and land tenure system. If the present land tenure system and the level of infrastructure investment remain the same, an introduction of new technology would widen the income gap among regions as well as among individuals.

Second, investment in infrastructure that requires a tremendous amount of capital is a precondition for a rapid diffusion of farm mechanization. It is often asserted that the Japanese agriculture after Meiji Restoration has been developing mainly through the introduction of high yielding variety of rice and the heavy application of fertilizer. But this argument is verified only on a large irrigation base, the basic form of which was constructed before the end of Tokugawa (prior to Meiji) period. These does not seem to be a cheap strategy for agricultural development.

Third, as long as farm mechanization is limited to a portion of the production process, namely, partial mechanization, positive effects such as productivity increase, reclamation, etc. tend to be more than negative effects. However, if mechanization is going on expanding toward total mechanization, negative effects, especially labor displacement effect would become explicit. Absorptive capacity of the displaced agricultural labor force in the non-agricultural sector depends on the type and the pace of the development of the non-agricultural sector. In the present situation, I highly doubt that the kind of labor that would be transferred as a result of the spread of farm mechanization may not be well accepted by the non-agricultural sector. In considering a delicate political situation in the developing countries, only 10% of farm population may be enough to bring out a serious socio-political problems.

Chairman : Dr. Southworth has suggested some points here. I'm trying to read it here.

When the countries first begin farm mechanization, they need machines that are: (1) simple and easy to operate and to maintain because people have no knowledge of machinery; (2) cheap because they have little capital and interest rates on capital are very high; (3) versatile because they can not afford capital investment in a machine that will be used only a few days or weeks in a year. Then the tendency of engineering development is toward sophisticated, complicated machines that are highly efficient in performing a specialized task under specific condition, or that have some very delicate or precise adjustment to meet efficient labor requirement of different conditions. Such machines require much know-how to be used successfully. Inexperienced operators can not take advantage of their efficiency and besides their intricacies make them expensive. His question is: how this conflict between engineering efficiency and ignorance and poverty can be reconciled. I think it is a very interesting question.

Mutalib : I think the matter of reconciliation between the efficient machine and the simple machine is not difficult because a machine need not be very complicated to be efficient. I think the simpler the machine is the more efficient it is. I think this is what we have been talking of these last few days. We are asking for more efficient machines and simpler machines. I think it is a mistake to think that a machine is only efficient if it is complicated, has electronic eyes, and so on. I mean, it is easier to design a complicated machine than to design a simple one.

How to reduce the price of machinery

Chairman : I would like to add very much to that. It is far more challenging to design a simple machine than a complicated one. I would like to raise a point which was questioned by myself and I think it was discussed earlier in the meeting concerning marketing cost of Japanese equipments in the developing countries. I have briefly written down the steps the equipment has to go through to reach the farmers. First from a manufacturer it usually goes to a Japanese export house which is specializing in exporting. Then it is often found that a Japanese company located in the developing country acts as an import house. Then finally there is a local sole distributor who handles the overall sales of the country and then he in turn has his dealers and those dealers have subdealers. Then you reach the final farmers. So you see, there is a whole series of nearly seven steps between manufacturers and the farmers. We think this is a problem which results in high cost because every step involves certain amount of raises in the price. Could something be done in this direction where export of Japanese equipments could be more economical and in time, this marketing cost could be reduced somehow.

Mutalib : I think the best thing is for each country or each region to start assembling the whole machine, maybe, in cooperation with more advanced countries such as Japan. Malaysia couldn't manufacture its own machines, but with cooperation from Japan, now assemble the machines. This will save a lot of the steps that Dr. Khan has just mentioned, and probably will reduce the cost.

Chairman : I like to also add here. My own feeling is that a manufacturer

could directly export to the sole distributor in the country and eliminate these two middle functions which are not really serving a very specific purpose for some reason or other. We see these steps present in the Philippines. Now if the manufacturers directly appoint the sole distributors, and that's the way the American companies operate generally or the European companies have been operating.

Truong : We have some experience in Vietnam. I think it's up to the local regulation. Since a year ago we don't allow the dealer (exactly to say the representative from the Company) to deal in Vietnam. This dealer must cooperate with a Vietnamese society to be a sole distributor in Vietnam. So we reduce one or two steps in this long way. We hope in this way we will reduce the cost of machines sold to the farmers.

Zachariah : I would think that Japan has not yet solved the problem of reducing the ultimate cost in a cooperative way. If it could be possible to cooperate with Japan in assembling simple equipment, it could be much more advantageous to both countries.

Chairman : I would like to add a little comment in the same direction. For example, the thresher produced in Japan is a very popular item here, but it is very difficult to be manufactured in another country. The problem is how much some of these machines can be simplified. But I think Mr. Zachariah's point is very important. Perhaps it should be considered by the various commercial companies that can adopt their products for such operations. If there is not any comment from Japanese side in connection with that problem, we are going to move into the third which is the problems of a general nature. I think, the first one that we are talking about has been mentioned by a number of people here. The setting-up of an international organization for South-East Asian countries on the development of farm machinery. The people mentioned are Dr. Yamada, Japan, and Mr. Boonit, Thailand, and, I think, myself and Mr. Zachariah. Quite a few of us have mentioned it.

Setting up of an international research institute and other international cooperation programs

Yamada : First of all, may I invite your attention to the Tropical Agriculture Research Center. I have prepared a brief note explaining the Tropical Agriculture Research Center, which was set up in June, this year with an aim of contributing something to the development of agricultural technology in tropical Asian countries in compliance with Japan's ever-increasing obligation to further cooperation with here neighboring countries. Perhaps you may find the same out in this note, circulated this morning, so that I don't want to spend much time in the detail of the activities of this Center. The objective is to promote international cooperation between our neighboring countries and Japan, and the scope of activity is as follows. So far the emphasis has been placed on research work on rice production, but the recent trend of development of agriculture in tropical Asian countries indicates crop diversification. The crop diversification is going on now in many countries in parallel to the improvement of infrastructure. Crop diversification is very important in the sense that through this process farm mechanization will be promoted and that animal industry will develop. The activities of the Center should respond to such a general trend of agricultural

development.

I think; there are three very serious problems confronting us. The first is the control of disease and insect pests. Under the traditional farming method, fear of disease and insect pests may not be so serious. But once a new variety was popularized and use of fertilizer became popular, then diseases and insects pests outbreak became a very serious problem. The second problem is how to maintain and increase soil fertility. Perhaps you know about this problem more than I, so I will indicate one example. When we clear up jungles and grow upland crops, and if we take the yield of the initial year as 100, the yield of the second year will be reduced to about a half, and the yield of the third year will be only one quarter of the initial year's yield, indicating how the destruction of organic substance and decrease in soil fertility are serious. The third problem is the promotion of farm mechanization. At the present time my Center has not yet any research facility abroad, so that we are sending research officers of different disciplines to many research institutions of our neighboring countries with permission of the government of respective countries. But I have my own personal view that I would like to establish some sort of research institute which deals with mainly these three subjects of research somewhere in the tropical Asian region. It is too premature to say anything about the type and location of such a research institute, but I hope that such a research institute will be established and could serve as one of the regional center for the development of farm machinery.

Chairman : I would like to say we are very encouraged to hear your comment that you have the intentions. We, of course, would be very much pleased to see such a development started on. We feel, at least, personally, I feel, Japan today is the only nation in the whole world which can make a major contribution in this area because of the development of equipment and the mechanization on a small scale of farming level. This is the only country which has most experienced and I have known many engineers here in industry and research organizations and feel that the expertise available here can not be matched anywhere even in America, Europe or any other country. So this is very interesting development. I think it will serve not only the developing countries but will have some benefit to the developed countries, too. We are seeing it in our program that some of the machines we intended to design for ourselves are now being manufactured for developed countries.

Zachariah : What has been mentioned is a great encouragement for most of the participants to this symposium. There are various problems that are faced by the developing countries. One of the early speakers mentioned the socio-economic problems, labor replacement, and most of us have been greatly induced by what has been done in this country, especially as Mr. Kamiya said of the mechanization of small farms by utilizing family labor and without causing much displacement of labor. Well, even though a beginning has been made, I think we are in the take-off stage. The farm mechanization institute that has been established certainly serves one of the right steps, but we are in the take-off stage. I would feel that something more is needed to give much more emphasis to the problems of the area. There are several international agencies which are invested in similar work, FAO, UNIDO, USA, Rockefeller

Foundation. And Japan being the country which has pioneered the small farm situation, I would feel that Japan could take a lead and initiate a program so that one of the centers could be set up in any of the countries in Asia. There are problems of training, development, and after-sales service. Now these problems will be able to be put together if there is one organization which can concentrate on all this and disseminate the information that would enable us to go in the right direction. Otherwise, as you heard from the different speakers who spoke here, we are doing something in one direction and the same work is being done somewhere else. As the resources are limited, we could put them all together and we could have a much more contribution and effective effort. Therefore I would suggest the symposium consider this a little more in detail.

Chairman: I would like to go along with Mr. Zachariah's comment. Perhaps farm mechanization is the subject which needs attention separately in itself, and is a wide enough subject for an institute for the mechanization of tropical agriculture. Not only rice, but I am talking also about dry land and wet land crops and so forth. If Japan can lead this type of setup, it would be major contribution.

Then, shall we move to the next topic which is improvement of cooperative work on farm machinery in many aspects, such as, development, training, research and so forth. This is a little different from setting up an institute.

Peng : During the last 2 and a half days distinguished delegates dealt with many problems in many aspects concerning farm machinery and mechanization. However, many problems could not be so organized. So many delegates hope that a kind of regional organization in Asia be established for the development of organization which may take many a year, a kind of workable project for cooperation on the development of farm machinery or training or other activity between the two countries or in regional basis where Japan is to be included.

Soedijanto : I think what you mentioned is that, maybe, this cooperation work on training and research has nothing to do with loose association, but I think undoubtedly that this personal association is developed in future and that one of the programs is to develop also the cooperation work dealing with agricultural machinery.

Group farming

Bulanadi : I enjoyed hearing because I am in the process of learning. I thought I would not make any comment any more before analyzing the situation of our rice area alone compared favorably with the rice area of Japan in the report of Dr. Kaburaki. I think his estimate was 3,400,000 hectares per planted rice. In the Philippines we have 3,200,000 hectares. But if you compare the machines you have and the machinery we have, there is a whale of difference. We had a very big problem that I could not solve myself. We need the machines. We usually learn how to use these machines and how to adjust them, but we have no money to pay for them. So that is our big problem. Now from the little experience that we have in the Philippines, I think that group farming is similar to what we call the farm machinery pool which we started away back in 1950 up to 1963. People who can afford the money to buy tractors hire them to their neighbors. While doing the odd jobs,

during the time when they are not busy, they do serve their neighbors as tractor dealers. I think they in Europe call it multifarm use. We know how to do that, but there are not enough people who want to invest their money in agricultural machinery. We always believe that the Philippine farmers are poor and that there is not much income from them. Now at this time, let me go back a little bit to the kind of design of equipment. We know how to use and adjust equipment to make them more useful for specific conditions: for example, the combine. If you use the rusp bar cylinder when you are threshing rice, you need 800 to 1,050 rpm. You can convert that combine to a harvester for long beans that we call Mongol by reducing the speed of the cylinder from 500 to 400 up to 600 rpm. So then we have very little problem with the mentality for use of those machines, but the problem is know-how to produce money to buy them.

Chairman : On group farming, I would like to request Mr. Mutalib to make some comment because there is a lot of experiment going on in the MUDA scheme and the other schemes.

Mutalib : I believe that group farming, farmers' association or whatever you call it, is the same meaning. I think this is the only way out for small farmers to effectively use machines. That is, if you want to use machines economically, I don't see how farmers with 1 or 2 hectares can do them individually. I think group farming is the only way. That is why we in Malaysia are interested in the larger machines, because we believe that group farming owning larger machines would be better than individual farmers owning one small machine of 3 or 4 horse power.

Zachariah : As a specific program, cooperative farming, which is what we call group farming, has been initiated. There is a tendency among the people to be individualistic in certain areas. In certain areas they would join together and form an input association, even going up to aerial spraying. What we are trying to concentrate on, now, based on experience as far as mechanization is concerned, is to provide machinery pools from where even the small farmer can have the machinery at a lower cost. Now that eliminates so many problems of training, operation, maintenance and other related aspects. We are also trying to concentrate upon the implement, low cost equipment and besides the expensive ones he can hire out. This is the general approach that we are trying to follow because of the individualistic nature of farmers.

Bulanadi : I did a little study on the economics of using the equipment: take for example, a Japanese tractor costing 8,000 pesos. If you use it for 90 days in a year, your cost of operation per day is 28 pesos. If you use 130 days, your cost of operation is 22 pesos per day. If you use 190 days, your cost of operation is 17 pesos per day. So multi-purpose farming or custom jobbing or cooperative farming is benefited by expanding the usefulness of the equipment in one year.

Chairman : I think I have a question here of training coordination and so on submitted by Mr. Zachariah, but it has been covered here. So I would take up another question here by Mr. Peng on cooperation between government and farm machinery manufacturers.

Cooperation between government and manufacturers

Peng : I want to emphasize that the farm machinery purchased from Japan in terms of government agencies has cost us high to our farm mechanization program in South-East Asia. So the manufacturers should be involved in such kind of cooperation activity, but I don't know in what kind of manner.

Zachariah : I would like to add what we find in a lot of research centers and government institutions that we have. In a developing economy naturally it is more necessary for the government to come forward, but once we make some progress in order to get the information from the research institutions, we find that there should be more and more collaboration between industry and government agencies. And, unless this is done, as our experience tells, we cannot put what is done in the research institution to actual use. Even we are trying to commercialize some of the scientific research institutions where the manufacturers come into touch with the universities and research institutions. The universities should work for these forms, so that as soon as research work and investigations are over, they are put into a practical form to be used by the consumers. I think the coordination between the research institutions and manufacturers is more important when the university has developed into some stage. Or when it is not yet developed much, the full responsibility comes from the government agency.

Supply of spare parts and other requests for manufacturers

Chairman : We move into the next point. This is the problem of spare parts due to frequent model changes.

Soedijanto : I think that we are almost from consuming countries using this equipment from Japan. Since almost every year manufacturers in Japan come out with new models and types, we would like to have some security that the supply of spare parts for older types and models can be secured for at least 6 or 7 years because our farmers can not afford to buy every time a new model or type that has been produced in Japan.

Chairman : In fact I would like to add something from my own personal experience. We have a certain make of tractors from Japan which we bought about 5 years ago and some parts got broken down. We couldn't get them because they were obsolete. So finally we had to have the old make somewhere else and we were able to locate one at the college nearby and we were able to cannibalize and get it going; but it does reflect, to some extent, the problem we are discussing. You see a Japanese machine not working for this kind of reason, which I don't see very nice. I think somehow this problem should be solved. Now it should be available for longer like many of the US companies which plan the part production at the early stage and store it and carry it over. They may not be producing it but they have sufficient stock to carry for a certain number of years. It seems that a company should try to follow the same system.

Zachariah : Apart from the manufacturers changing the designs, there is another problem that comes up. We were discussing earlier the different agencies involved in the marketing; one is the company to import. Now unfortunately in some countries that particular company no longer exists. They have been handling imports for 2 years; they sold the machine,

and they are no longer interested. I feel that if the Japanese manufacturer, as a matter of policy, would insist that every importer, so far as they are able, should provide a parts guarantee for minimum 8 years. I know, for instance, of a US manufacturer: they provide a parts guarantee for 10 years, in the case of power tillers. The right could be much less. If there is a parts guarantee by which the purchaser can be made sure that he can get the parts, that would be of very great service. Now also there are a few instances of the price disparity between the different models and the initial cost. Now at the time of import of machines, I am not speaking about Japanese machines necessarily, the prices are quite reasonable. As the time goes, the price spirals and spirals up, even though there is no general rise in the price/cost index of the manufacturer's products. And therefore there are two aspects. I would request the farm machinery manufacturers in this country to consider: to insist upon their foreign suppliers to provide a parts guarantee and for the manufacturer to ensure that this parts supply is made available.

Bululanadi : In our grant and aid projects, when we buy equipment or a group of equipment we require the dealer to be included, and in our budget we include the total cost of the machine, 10% of which is added in order to have spare parts maintained by the dealer. So the machine costs 1,000 pesos. We appropriate 100 pesos for the spare parts.

Boonit : We have the same problem, too. I now understand that most manufacturers intend for home market. But there are some cases where their manufacturers are used in locality and found not available. The manufacturers admit the defect and change the design. This model becomes obsolete, so that we cannot get the spare parts any more. We have one example of it. The Royal Irrigation Department at Kanchanaburi found that the cylinder of a machine was broken because of the loose valve set, and that the engine as well was sometimes broken down later. Therefore they sent it to the company for a new cylinder. Since then the company has changed the model to that of the American design engine. I am afraid that Japanese manufacturers don't have tested enough. They sometimes sent the spare parts which had defects. I think this is one point we should concentrate our discussion on.

Saito : There is a local distribution aspect, together with this problem. It is one thing to have an adequate supply of spare parts in the central depot. It is another for a farmer 200 or 300 km away to get a certain spare part when he is in the midst of field operation.

Chairman : I think Mr. Boonit's problems are in almost every country. The other side of the problem in the case is also that if you have too many dealers in too many places, none of them becomes idle. I think sales are not sufficient enough to make living very well. So I think in due course of the time, as more mechanization goes, this sort of problems will be less and less.

Zachariah : I would like to make one point on what you were saying to manufacturers. Along with the machine it is compulsory to import 10% spare parts as far as we are concerned, but it so happens that over a period of time out of the 10% only half is consumed. Of the particular conditions of use and maintenance, the stock warrants the full use of the shop and therefore a situation is created in which you don't use the parts that

are made available. If there could be a program of parts exchange and different countries have got different obsolete machines, let's put it that way; if there is a parts exchange program, the importing organization is enabled to exchange the surplus parts for new parts. That would enable the local companies to stock adequate parts.

Chairman : A very interesting comment. I believe that once a manufacturer starts dealing directly, they could handle many of these problems at a much better level than they do so they presently do with so many intermediate steps in between.

Trung : From my own experience I think that to solve the problem of shortage of spare parts, we have to ask the manufacturers to follow standardization. From Europe and America you know that some P.T.O. speeds are followed by all manufacturers. You know that the size of fittings are the same from Europe to America. In Japan even between two factories you have different sizes of bolts, nuts, tools, wheels, bearings, so that is the problem. I want to settle it today and I hope that the manufacturers of Japan will consider this problem to help up.

Boonit : I think it is because farm machinery of Japan has developed too fast. So when we change the model, they do not have the same. So when we get back that model, it has become obsolete.

Mutalib : What we found out in Malaysia is that spare parts are tied up with the population of the machines. If there are more machines in the fields, then you know that there will be enough spare parts. In the past we have about a dozen different tractors on the market and of course nobody keeps spare parts. So what happened over the years is that we found that one or two companies were really working hard to push their sales. So now the government induces them to manufacture in Malaysia. Now this has two effects. One is that when manufacturing in Malaysia they can not afford to change models every one or two years. That means this model is going to last at least seven or eight years. The other is that because only one or two companies are given this right they don't have much competition; and that because they know that they can sell spare parts they can afford to have more money spent on spare parts. In fact many companies in Malaysia are now making more money spent on spare parts than on tractors.

Bulanadi : I like to make one comment on the spare parts. I am thinking to restrict the brand of imported machinery. I don't know how to restrict the brand but I suppose the spare parts shall be easy to get, if the number of brand is restricted and the number of machine per brand increases in the market.

Chairman : I know that in a number of countries it is a problem for the local country to restrict. I think it is very hard for the Japanese Government to do anything in this area. I know of India, for example. They have restricted the early stages, and now they are producing their own. But in the early stage they have very severe restrictions on what makes come in. Pakistan has a similar restriction. I believe Ceylon has some kind of restriction. So I think this move is definitely a very nice move because it will create at least a sizeable market for one make of machines and not so much of the duplicity. I believe the Philippines also is thinking about this. The Philippines had a free kind of import policy previously, and so we had a whole lot of makes of machines, but they are realizing this

problem.

Lastly I have a request for Dr. Ong to make a little comment.

Closing

Ong :

As an observer I should keep quiet. The success of this symposium encourages me not to remain silent all the time. I should say a few words, first to express our thanks to the organizing committee of this symposium for inviting us, Professor Southworth and me to participate in this symposium. We both benefited a great deal for which we would like to express our thank to you. Secondly, I think as an engineer of long experience I have learnt a lot myself about the farm mechanization problems not only in Japan, but also in the whole of the tropical countries in Asia. At the round table discussion this afternoon, we have covered all aspects of farm mechanization. There are three points I learnt from it about the success of farm mechanization in Japan. They are big problems. I would like to point them out before the closing of this symposium. Thirdly, the market of farm machinery in Japan is located in rural areas. Farmers are buyers. In developing countries, the buyers are governments. So we have to know that the managerial ability of Japanese farmers is very high. They are not simple farmers but true businessmen. They know how to calculate the cost and the benefits by using the modern machines. So if the farm mechanization process would be popularized in the developing countries, the first things we have to upgrade is the managerial ability of the farmers whether it is for group farming or individual operation. And secondly the private sector in Japan contributed a lot to the development of farm mechanization schemes. In many countries in Asia, the project settlers' economy, particularly in every business industry, is not well developed, unless every business industry is developed. These industries will need more machinery and they will have to accumulate more capital to build and to establish farm machinery manufacturing factories in each country. And the third problem is the importance of the role of government. I hope we would not forget the first paper presented by Dr. Kaburaki that in 1951 Japan promulgated the Agricultural Law. The law codified many agricultural improvement sectors and supported the farm mechanization which was only one of the schemes. Then the basic purpose of this Agricultural Law is to lessen the gap of income disparity between rural sectors and urban sectors. If you read the papers presented by many participants, you will find that for land consolidation the cost of one acre of the regions is only about US \$ 22,000 and that for the first and second phases of group farming per household the cost is US \$ 3,333. Now the government channels money to all kinds of subsidies, so that farmers will be able to carry out this kind of farm mechanization schemes. So I think if we would like to launch the big farm mechanization schemes in Asian countries, we should not ignore the importance of the managerial ability of the individual farmers. We should not ignore the role of the private sector and the government should take the leading role to push and plan, prepare, and build schemes for the success of farm mechanization.

Chairman :

I think this brings us to the end of the concluding session. I would like to take the opportunity, here personally and also on behalf of the

foreign members who have come here, to thank the government of Japan and the members of the organizing committee of this symposium for the trouble they have taken of making all the arrangements for our visit. We believe it has been a good experience for many of us to see and discuss and exchange ideas with the co-professional workers here. And also we are all looking forward to the visit tomorrow to the Institute and later on the field to observe at first hand. I am sure many of us will remember this experience for a long time. We hope that we could continue to cooperate and exchange ideas, if not personally but by telephone and by mail, to keep in contact. Now for myself, I would like to say we have a regular 6 monthly report which we publish on our work and we would be very glad to exchange with any organization reports on a regular basis. Thank you again.