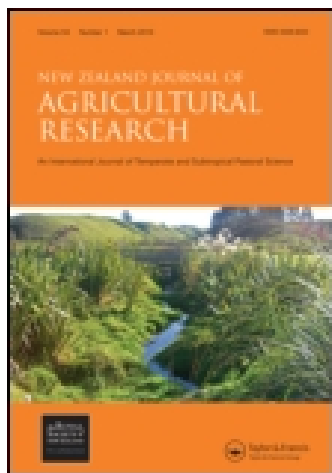


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## A study of the AMID (Agricultural Machinery Information Dissemination) scheme in China

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**Abstract** Agricultural Machinery Information Dissemination (AMID) is very important for the development of agricultural machinery services and thus China's future agricultural supply. An analysis of the current scheme demonstrates that improving the AMID scheme in rural China is necessary. This paper examines the motivation for improving the AMID scheme with the "Expectation Model". Shanxi's experiences demonstrate that the motivation for improving the AMID scheme by market is small. The AMID schemes to enhance the motivation are proposed in this paper for further experimentation in rural China.

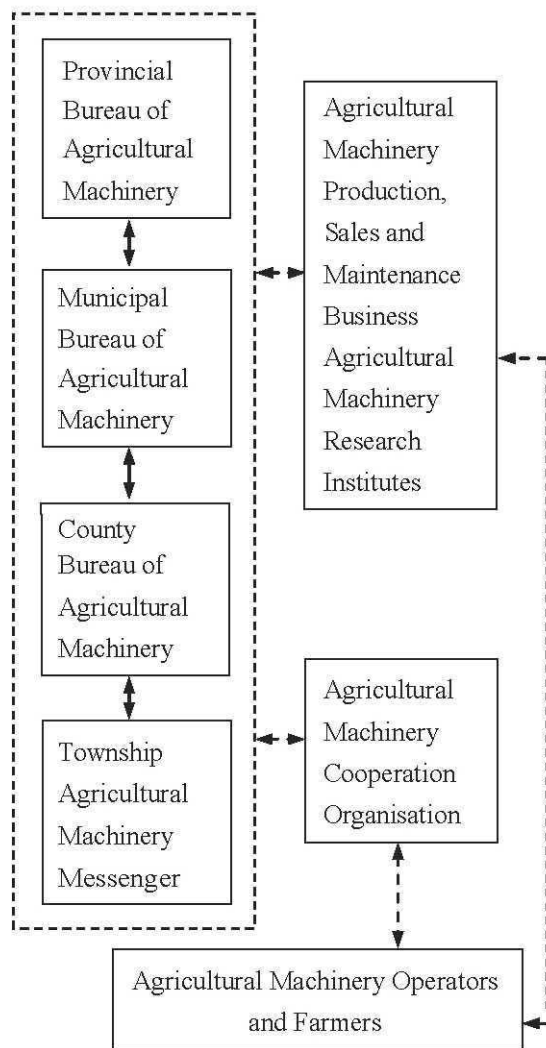
**Keywords** agricultural machinery information dissemination; China; scheme

### INTRODUCTION

In China, agricultural machinery operators are the main service providers for mechanised farming. These operators use the agricultural machinery that they own and also rent their machinery out to other farmers for additional income. This is the only way that many farmers can access agricultural machinery. In the operating process, agricultural machinery operators rely on policy information (the policy made by the Government about agricultural machinery), demand information (the information about the farmers who need agricultural machinery service), sales information (the information about the sellers of agricultural machinery) and technical information (new techniques for using agricultural machinery) in order to provide this valuable service to farmers. Agricultural machinery information consists of all the above information.

The availability of Agricultural Machinery Information Dissemination (AMID) schemes has been an important component in the provision of agricultural machinery services to agricultural machinery operators and farmers. An AMID scheme generally consists of an agricultural machinery information provider, an information dissemination path and information receivers. The improvement of the AMID schemes aim to enhance the efficiency and adequacy of agricultural machinery information.

As farm machinery services are quasi-public goods (Chen 2005), the government in China plays an important role in the AMID process. According to the developed national scheme, government, public institutions, enterprises, agricultural cooperative organisations (Harris & Fulton 2000) and individuals are all the main farm machinery information providers. Networks, newspapers, audio-visual and other media can be used in the dissemination of farm machinery information (Li 2005). Some researchers have offered various suggestions for developing information dissemination schemes in rural places (Caudel 1996; Womack 2002; Arnold 2004; Seneviratne 2004).



**Fig. 1** Existing information dissemination scheme. The dotted line shows the relationship between other providers and agricultural machinery operators.

Given the fact that agricultural machinery information services are so important to China's future agricultural supply, examining the adequacy of the current AMID scheme and the need for improvement are of great importance to China's agricultural development. Using the "expectation model", this paper investigates the motivation for improving the AMID scheme in rural China. We then use Shanxi's experience as a case. Finally, this paper offers proposals for improvement of AMID in rural China.

## THE MODEL

### Current information dissemination scheme

In China, the Government is the main provider of agricultural machinery information. The other information service providers (such as agricultural machinery production and sales enterprises, agricultural research institutes and agricultural machinery cooperation organisations) play only a supporting role in the process of agricultural machinery information dissemination (Fig. 1).

However, currently in China the poor facilities of the Government's local agricultural machinery management departments, especially those at the county level, make it difficult for the Government to achieve network management and other modern means of management. Also, the township agricultural machinery station's function is gradually weakening because of the streamlining of government agencies, so the agricultural machinery information provided by the Government can not be effectively delivered to information users.

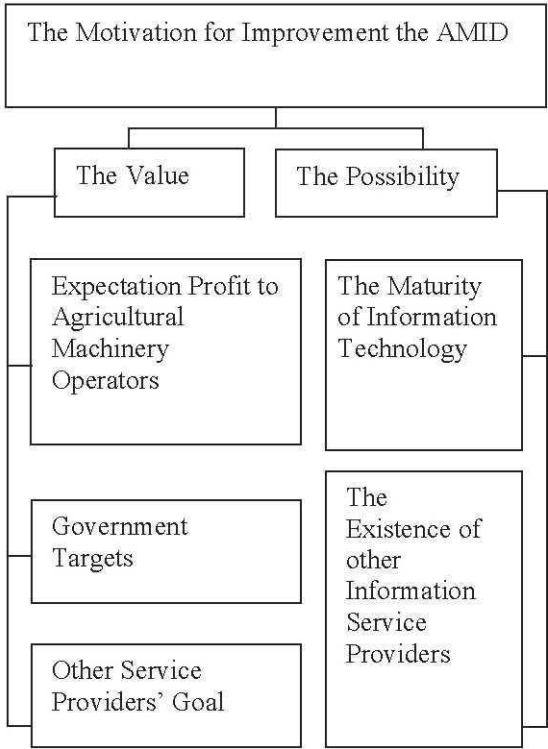
In this scheme, agricultural machinery sellers only sell agricultural machinery to the operators with little further information about the maintenance and new machinery. If the agricultural machinery operators want to know the farmers who need farming service, especially the trans-regional demand information, they can only find the farmers personally. In addition, the agricultural machinery operators find it difficult to communicate with the scientific research institutions owning the technical information.

In conclusion, the existing scheme does not provide effective and efficient information to agricultural machinery operators, and improvements to the current AMID scheme are called for.

### Expectation model

Although improvement of the AMID scheme is needed, it is necessary to study the motivation for the improvement. If all of the agricultural machinery operators, the Government and the other information providers believe that they will benefit from the increase of effective information, then the improvement of the AMID scheme will be achieved naturally, namely by market behaviour. However, if one of them believes that they will not benefit from the increase of effective information, then the Government itself has to design new AMID schemes to increase the effective information (Chen 2005).

Based on Vroom's "expectation model" (Robbins 1996), we can analyse the motivation for improvement in the AMID scheme: the motivation for



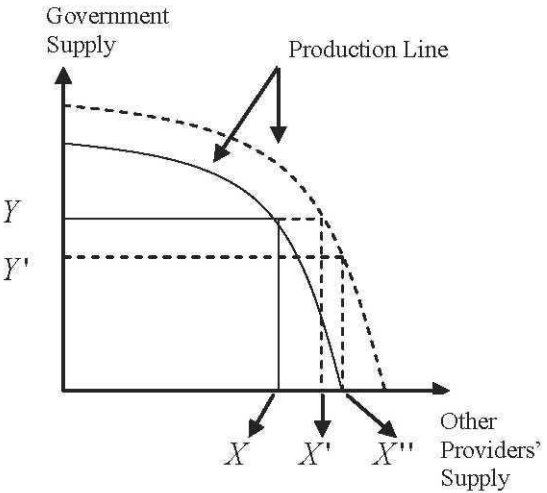
**Fig. 2** Expectation model. AMID, Agricultural machinery information dissemination.

improvement = the value of improvement  $\times$  the possibility of improvement. The value of improvement is the expected value and profit that can be received by improving the AMID scheme. The possibility of improvement refers to the estimates and judgments of the possibility that improvement can be achieved. The “expectation model” is shown in Fig. 2.

The model formula can be expressed as:

$$M = V \times P = (w_1 A + w_2 G + w_3 O) \times (T \times N)$$
$$s.t. \begin{cases} A, G, O \in [-1, 1] \\ w_1, w_2, w_3 \in [0, 1] \\ w_1 + w_2 + w_3 = 1 \\ T, N \in [0, 1] \end{cases} \quad (1)$$

$M$  is the motivation for improvement;  $V$  is the value of improvement;  $P$  is the possibility of improvement. The value of improvement consists of expected profit (profit is the difference between



**Fig. 3** Production line of agricultural machinery information.

income and cost) to agricultural machinery operators ( $A$ ), government objectives ( $G$ ), goals of other information service providers ( $O$ ). And the possibility of improvement consists of the maturity of information technology  $T$  and the existence of other information service providers ( $N$ ).  $w_1$ ,  $w_2$  and  $w_3$  are the weights in the improvement value of profit to agricultural machinery operators, government objectives, and goals of other service providers, respectively.

In the model,  $V$  ranges from  $-1$  to  $1$ . When profit to agricultural machinery operators is expected to increase, or government objectives and goals of other information service providers can be achieved,  $V$  lies closer to  $1$ ; if profit to agricultural machinery operators decrease and government or other providers' conditions worsen, then  $V$  lies closer to  $-1$ . The value of  $P$  ranges from  $0$  to  $1$ . If desired conditions can be achieved, then the value is  $1$ , if they can not, then the value is  $0$ . Of course, smaller values of  $A$ ,  $G$  and  $O$  will lead to smaller values of  $M$ . If any of the variables  $T$  or  $N$  is  $0$ , then  $M$  will be  $0$ .

### Variable analysis

Now, we assume the economic system produces only one product, agricultural machinery information, and that it can be provided by the Government and/or the other information service providers. Also, we can assume that communication technology and the mass media could be used to disseminate agricultural machinery information. Agricultural machinery

operators must factor in the cost of information for providing their service. The production line of agricultural machinery information is shown in Fig. 3.

In Fig. 3, if the improvement of AMID scheme can lead to an increase of agricultural machinery operators' profit after paying the information cost, this in turn will lead to a higher demand for information, and thus the production line will move outward and the agricultural machinery information provided by other providers will also increase (Lin 2005). Assume that this does occur: then if government information supply is static ( $Y$ ), the supply by other providers will increase from  $X$  to  $X'$ ; if government reduces information supply from  $Y$  to  $Y'$ , the increase of other providers' supplies will be greater (from  $X$  to  $X''$ ).

Based on the above analysis, we see that only when agricultural machinery operators' profit and demand for information increase, the supply capacity for agricultural machinery information will also increase. This benefits both the other service providers and government, because the profitability of other service providers will increase by providing most of the information and the Government can achieve its objective (increasing the supply efficiency of agricultural machinery information) at a lower cost. However, current AMID schemes lead to a static production line of information in China. So, only when the AMID scheme is improved, the production line will move outward.

Application of expectation model to Shanxi province

According to the research on 491 agricultural machinery operators in Shanxi province in 2005, agricultural machinery operators' demands for information increase with income. However, their demand is a little low (Table 1; the highest is 19.6%) because they can not afford the cost of information completely and their expectation for profit is low,

so let  $a = 0.2$  (near 19.6%). Therefore, other information providers cannot initially receive higher profits; they do not have strong motivation to provide more information. So let  $O = 0.2$ . The Government needs to encourage and support the other providers by designing new AMID schemes. Then, government objectives to increase information can be achieved. However, the Government has to provide subsidies to support other providers with higher cost. So let  $G = 0$ . Information technical elements are ripe for improvement in Shanxi, so let  $T = 1$ . For agricultural machinery operators' important positions in the whole AMID model, let,  $w_1 = 0.5$ ,  $w_2 = 0.25$  and  $w_3 = 0.25$ . Inserting these variables into the expectation model, we get:

$$M = (w_1 \times A + w_2 \times G + w_3 \times O) \times T \times N$$

$$s.t. \begin{cases} A = 0.2, G = 0, O = 0.2 \\ w_1 = 0.5, w_2 = 0.25, w_3 = 0.25, \\ T, N = 1 \end{cases} \quad (2)$$

$$M = 0.15$$

The result demonstrates that motivation for improvement is so small that the AMID scheme cannot be improved naturally by market behaviour.

Proposals for improving the AMID scheme

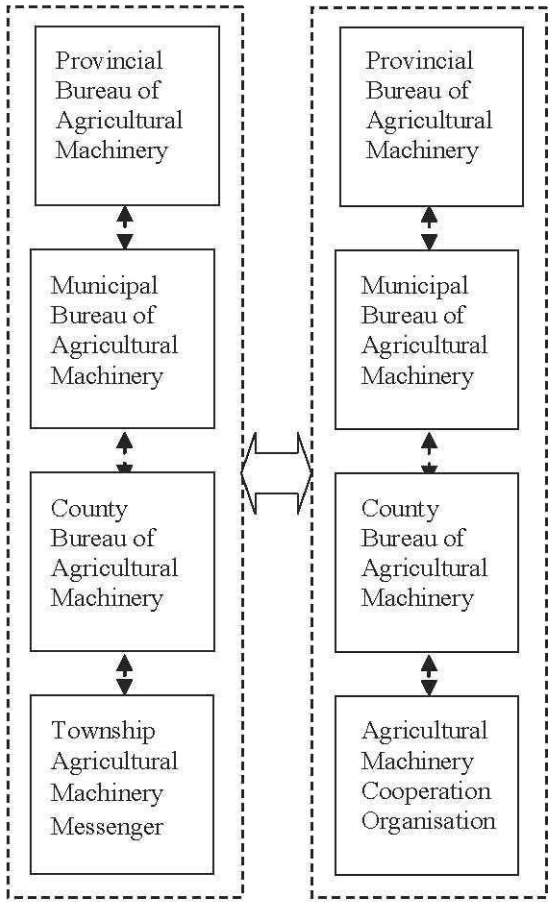
Based on the above analysis, we found that the improvement of the AMID scheme is needed in China and the improvement can be achieved by government action. So, agricultural machinery cooperative organisations, agricultural machinery operators, agricultural machinery research institutions and agricultural machinery sellers should be introduced and encouraged by the Government to improve the information dissemination scheme. Then, four new schemes which can encourage other providers are designed as follows:

*Cooperative scheme: government + agricultural machinery cooperation organisation + agricultural machinery operators*

In this scheme, agricultural machinery management departments should give agricultural machinery cooperation organisations certification to ensure their legalisation. The Government and these organisations should develop a long-term plan for cooperation. Then, agricultural machinery cooperative organisations can replace the role of the township agricultural machinery station and maintain contact with the county-level Bureaus of Agriculture Machinery. These organisations can receive policy

Table 1 Ratio of agricultural machinery operators (AMO) that demand for information in different income levels.

Income level (yuan)	0–28 000	28 000–47 000	47 000–65 000
AMO (%)	12.9	18.9	19.6

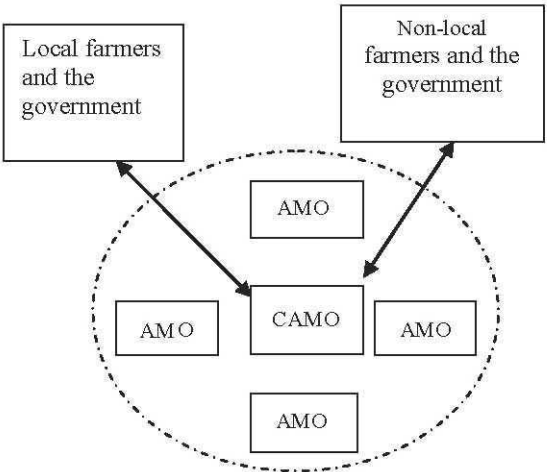


**Fig. 4** Change of agricultural machinery information dissemination (AMID) scheme.

information, technical guidance and trans-regional operations information from the Government. Then, they can disseminate this information to agricultural machinery operators who participate in these organizations (Fig. 4). Through this method, the agricultural machinery information received by agricultural machinery operators will be increased.

*Agricultural machinery operators (AMO) home scheme*

In addition to the above-mentioned scheme, we can make the agricultural machinery operators the core of information dissemination. This scheme can be called the “agricultural machinery operators home scheme (AMO)” (Fig. 5). The Government selects



**Fig. 5** Agricultural machinery operators (AMO) home model. CAMO, Core agricultural machinery operator.

several major, high-quality agricultural machinery operators (core agricultural machinery operators (CAMOs), and maintains direct links with them. The Government provides policy, machines, trans-regional operations information, and supplies market demand information to these CAMOs who then spread this information more widely to agricultural machinery operators and farmers in their areas; the CAMOs can also gather and provide information about demand to the Government. The Government and these CAMOs should develop a long-term plan for cooperation. The Agricultural Machinery Bureau can organise CAMOs to meet regularly and record the matters discussed. If permitted, the Agricultural Machinery Bureau can have these agricultural machinery majors equipped with computers, help them to use online information, and give subsidies for their network costs.

*Promotion scheme: government + research institutes + (promotion base) + agricultural machinery operators + farmers*

This scheme is used to disseminate technical information. Scientific research units, agricultural machinery operators and farmers should sign an agreement for cooperation, or scientific research units can sign agreements with the technology promotion base that the Government has already invested in. Scientific research units demonstrate new agricultural machinery and give technical guidance



to agricultural machinery operators or to the technology promotion base. Service fees are paid for by the Government and agricultural machinery operators. The advantages of this scheme are that the technical information can be disseminated directly and the promotion base can operate effectively.

*Sales service-oriented scheme: agricultural machinery sales enterprise + government + agricultural machinery operators + farmers*

In the entire information chain, agricultural machinery sellers are intermediaries between agricultural machinery manufacturers and agricultural machinery operators. The Government can select some agricultural machinery sellers with a good reputation and give these sellers special certifications. Agricultural machinery can be bought with subsidies from the Government only if it is bought from these sellers. Then the income of these sellers will be increased, so they can establish files and detailed records of purchases, maintenance and use information of agricultural machinery. Such information can be sent back to the agricultural machinery manufacturing enterprises to promote improved technical capability and quality based on the demand of agricultural machinery operators. Agricultural machinery sellers can also establish standard marketing service networks and publicise product information regularly, helping agricultural machinery operators to understand the latest information on technology, price and quality. Such a market-oriented information service must be built on a well-developed farm machinery sales service system, on the basis of a precondition for increasingly standardised management of agricultural machinery and increasing competition in the agricultural machinery market.

## CONCLUSION

From the analysis of the current AMID scheme, we found that improvement of the AMID scheme is needed. On the basis of the "expectation model", it can be concluded that the motivation for improvement is small. The main reason is the agricultural machinery operators can not afford the information cost, so the other providers can not benefit by providing more effective information. So, the Government needs to cooperate with other organisations to provide agricultural machinery information.

The cooperative scheme, the agricultural machinery operator home scheme, promotion scheme and sales service-oriented scheme are suitable schemes for AMID.

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