

ANALYSIS ON AGRICULTURAL INFORMATION DEMAND — — Case of Jilin Province

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ABSTRACT: With the rapid development of agricultural informatization in the world, the demand of agricultural information has been a focus in the international agriculture and information fields. Based on the investigation, this paper presented the four characteristics of the demand of agricultural information in China, including regionality, seasonality, great potential demand and variation in kind and level. The factors influencing the demand of agricultural information were analyzed by the Optimized Least Square (OLS) method. The result shows that, of all factors influencing agricultural information demand, the most important one is economy, the second is facility of information pass, and knowledge and education of user, credit of agricultural information service system and production situation follow. Taking Jilin Province as an example, this article also elaborated the agricultural information demand and status, and deduced the regression model of agricultural information demand and verified it by the survey in rural Jilin.

KEY WORDS: agricultural information demand; agricultural information service system; Jilin Province

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1 INTRODUCTION

Just like the other resources, information is of the characteristics of scarcity. And agricultural information is to be in greater demand with the development of economy (CHEN, 1999). It is more urgent to enforce the applying of information to agriculture in many developing countries with agriculture-oriented economy. Furthermore, the transformation of traditional agriculture is to be undergone, relying on the perfect agricultural information service in combination with the modern and advanced information technology, which is more concerned topic in the world (SUN, 2004; SHEN, 2002; AN *et al.*, 2003; DULLE *et al.*, 2002; LEWIS and BARDON, 1998; ATTAULLAH and JOHNSON, 1991; SISC, 2000; LIANG *et al.*, 2003). Information demand is the source and impeller of information service to survive and develop. While the important steps to achieve the superior agricultural information service system (AISS) are as follows: 1) acquiring the agricultural information demand of enterprise and farmers, then to analyze its trend and find the imbalance between agricultural information supply and demand; 2) building and improving the AISS according to the trend and eliminating im-

balance; 3) exploiting agricultural information resources, and guiding users to effectively utilize information. In the market economy, users' demand of agricultural information has been always dominant in the AISS with the feature of information-oriented agriculture. Therefore, to meet users' information demand is aimed by many countries and regions in the construction of AISS (DURAM and LARSON, 2001; APRIL and HERSH, 1977; FRANK, 1987; ROBSON, 1984). Some developed agricultural countries, such as America, Japan, R.O.Korea, Philippine, follow this rule too, by setting assessment groups of agricultural information demand in the provinces or states qualified as market centers, to collect all kinds of agricultural information demand. Those groups are targeted at exploring the suitable information collection ways for agricultural market and taking the activities of information gathering, processing, analyzing and dispersing (WANG, 2001; YUAN and LIU, 1999; ZHANG, 2000; SHEN, 2002; XUE and FANG, 1998). For China with relative surplus in agricultural products, it is more prominent to bring agricultural information into play, centering as agricultural information demand (XUE and FANG, 1998; YU, 2004). So the main grain producing areas in

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China must take it as the foremost vital duty to follow the international agricultural trend, to speed up agriculture informatization according to information demand, by the means of modern techniques of electronic information, to improve the ability of utilizing agricultural information, and further to promote agriculture and country's quantum leaps. Many domestic scholars also studied agricultural informatization and its support technology in China (ZHAO, 2000; LIANG *et al.*, 2000; PAN, 1999; YANG *et al.*, 2004; ZHU, 2005; ZHANG *et al.*, 2004). And XIANG *et al.* (2003), TANG and PAN (2000), ZHU and LIU (2003), GAO *et al.* (2001) and CHEN *et al.* (2000) studied agricultural information demand with the emphases on the subjects of agricultural information demand, and the ways and types of acquiring agricultural information. This article, taking Jilin Province as a case, presented the characteristics and the factors influencing agricultural information demand by the face-to-face survey.

2 CHARACTERISTICS OF AGRICULTURAL INFORMATION DEMAND

2.1 Regionality

In the broad and variable agricultural lands of China, the agricultural production of each region must be done in the light of their local natural resources. As a result of its physical limitation, various specialties in production and operation are shown in different regions of China. The different ways and types of production, however, give birth to different demand of agricultural information in different regions, which endows agricultural information demand with evident regionality. There is great difference in agricultural information demand in Liaoning, Shandong, Zhejiang and Jiangsu provinces, and Langfang City (Table 1).

2.2 Seasonality

Different from other departments, agricultural production is confined to natural resources, especially in the planting area, and distinctive seasonality shines in the whole production. The information to guide agricultural production is temporalized accordingly, so it also has obvious seasonality. Taking planting as an example, confined to specific natural environment, the cultivating in spring is eager to weather information and seed information. But in summer, the important season in agricultural production, insect pest information is paid more attention to by farmers in both planting and breeding. Harvest, threshing, store and transport of grain are great proceedings in autumn, when the demand on weather information also dominates. The demand on market information is prominent in the time of agricultural products sales, and the price and standard of national subscription, and agricultural tax, etc., are turned into new focuses. In winter, escaping from agricultural production, farmers are going to seek new income sources, who care for employment information, and that preparing information for the production of next year, such as national policy of price support, tax, support type of crop and so on.

2.3 Great Potential Demand

From the survey, we can find the role of information in agricultural production is important, and farmers attached more and more importance to it. Moreover, as a great agricultural country, China has gigantic total agricultural products, whose production is subject to market. Subsequently, it is urgent for all farmers to attain accurate, scientific and objective information in macro and micro scales, reasonable price estimation, and timely warning of the case of products supply beyond demand. According to the law of Parkevech, the informa-

Table 1 Variation of agricultural information demand in different regions¹ (GAO *et al.*, 2001) (%)

Region	Policy	Technology	Sales	Education	Talent	Investment	Planting	Breeding
Liaoning	- ²	-	14.70	-	-	-	52.40	4.31
Langfang ³	-	-		64.20	46.70	27.60	80.90	30.90
Shandong	5.00	45.03	40.50	-	-	-	40.00	40.00
Jiangsu	-	-	-	-	-	-	61.22	22.20
Zhejiang	67.00	65.60	44.90	-	-	-	-	-
Mean	14.40	22.13	20.02	12.84	9.34	5.52	46.90	19.48

Notes: 1. All information types can be selected in 0-100% in all regions; 2. "-" means that the number is so small as to be omitted; 3. Except for Langfang City, other regions are provinces in this table.

tion demand increasing as GNP per capita beyond US \$1000, Chinese information demand will grow extensively, with the GNP per capita of US\$1272 in 2003 (National Bureau of Statistics of China, 2004). And owing to Matthew Effect, information demand acts on self-stimulation, which results that the more information

tion is accumulated, the more information is required. Thus, the agricultural information demand, served for rapid developing agriculture, has great potential ability to develop in China.

2.4 Variation in Kind and Level

The number of information demanders is larger and larger in recent years, and types of agricultural information demand are varied greatly in China. The farmer users, engaging in basic agricultural production, have such characters of scattered living and acting, low education and taking parts in several kinds of business at the same time, etc., that the agricultural information demands of them are various. But for the agrotechnician, mainly distributed in rural area, the agricultural information demanded is intact and timely agricultural technology, as well as the matched risk estimation and assessment and, market potential of technology, by which they can update their knowledge and to disspread agricultural technology on the condition of relative fewer crew. The users of government need more agricultural management information, and households with large-scale production concern more market information and technology information.

3 FACTORS INFLUENCING AGRICULTURAL INFORMATION DEMAND

3.1 Factors Influencing Agricultural Information Demand and Analysis Method

Viewing from users, agricultural information demand is affected by not only the common factors, involving users' roles in the society and, the whole social condition, but also users' special situation, timing and site. After classified abstractly, the factors influencing agricultural information demand are divided into 7 types, including information source, user type, production, knowledge and education of user, economy, credit of A ISS, and the facility of information pass, by which the theoretic model can be deduced:

$$D=f(S, U, P, K, E, C, F, N) \quad (1)$$

where D is demand of agricultural information; f , defined function; S , information source; U , user type; P , production; K , knowledge and education of user; E , economy; C , credit of A ISS; and F , the facility of information pass. This model means the basic demand N (such as information timeliness, information scientificity and authority etc.) must be met before the validity of D is accepted, besides, other 7 factors also must be considered.

factors of agricultural information demand (XU and ZHU, 2004; TANG and PAN, 2000), this article subclasses the factors influencing agricultural information demand:

- (1) Information source: national information center, provincial information center, urban information center and county information center, etc.;
- (2) User type: farmer household, agricultural enterprise, agrotechnician, researcher in academic institute, decision-maker in government, etc.;
- (3) Production: planting, breeding, fishery, agricultural products processing, etc.;
- (4) Knowledge and education of user: primary school, senior middle, junior middle school, etc.;
- (5) Economy: commodity rate, fixed asset, per capita net income and gross output value, etc.;
- (6) Credit of A ISS: need, no need;
- (7) Facility of information passes: substituted by utilizing rate.

3.2 Regression Analysis of Agricultural Information Demand

It is important to quantify the users' agricultural information demand form anaging A ISS, controlling and adjusting the information demand structure change. Here, we bring the basic quantified correlation among all the factors influencing agricultural information demand into light, through the quantifying theory of multi-factor, and have a correlation analysis between all those factors and the agricultural information demand.

Because this article aims to analyze farmers' agricultural information demand, the influence from user's type is ignored. And information source is excluded for it is too confused to get data. Other factors are separated into several variables according to the setting method. In the agricultural information demand analysis, information fee, paid by users to get agricultural information, is the representation of quantified agricultural information demand as dependent variables, and others are independent ones:

- (1) Information fee, i.e., expenditure on information in a household, involving the expense of purchasing information set, such as television, and adding other information passes, represented by Y ;

- (2) Credit of A ISS with two variables of need and no need, represented by virtual variable X , i.e.,

$$X = \begin{cases} 1 & \text{need;} \\ 0 & \text{no need;} \end{cases}$$

- (3) Production (P) with 5 variables of the incomes of grain output, commercial crop output, breeding, part-time employment and others, represented by $P_1, P_2, P_3,$

P_4, P_5 ;

(4) Economy (E) with 3 variables, commodity rate, per capita net income and gross output value, represented by E_1, E_2, E_3 ;

(5) Knowledge and education of user (K) with 2 variables, the education proportion of main labor force (man aged from 15 to 60, woman aged from 15 to 55) with junior middle school and above, and one below the junior middle school, represented by K_1, K_2 ;

(6) Facility of information passes replaced by utilization rate (F) = number of information passes utilized by the user/total number of information passes.

The regression model is supposed by the correlation analysis of factors mentioned above with the base of Visual Variable Theory in Econometrics.

$$Y = t_1E_1 + t_2E_2 + t_3E_3 + t_4K_1 + t_5K_2 + t_6P_1 + t_7P_2 + t_8P_3 + t_9P_4 + t_{10}P_5 + t_{11}F + t_{12}X \quad (2)$$

4 CASE OF JILIN PROVINCE

4.1 Study Area and Data

Jilin Province is located in Northeast China ($40^{\circ}52' - 46^{\circ}19'N$, $121^{\circ}38' - 131^{\circ}19'E$), with an area of $187\,400\text{ km}^2$, where Changbai Mountains lie in the southeast and alluvial valley of the Songnen Plain sits in the west, between them, transitional area of mountain and plain is there. Known as one of main commodity grain production base, one of national key natural forest, pasture center and one of commodity cattle and fine-wool sheep base, Jilin Province possesses abundant natural resources.

In this article, all data are derived from a survey on the demand of agricultural economic information in 2004 and the statistical yearbooks of Jilin Province and China in recent years. The study area includes nine cities and counties in Jilin Province such as Jiaohe City, Shulan City, Dunhua City, Gongzhuling City, Yushu City, Jiutai City, Qianqiu County, Fuyu County, Yongji County, and so on. The subjects are cadres at the basic level in counties, agrotechnicians and farmers. The survey mainly depended on questionnaires.

4.2 Agriculture Information Demand

4.2.1 Spatial disparity of agricultural information demand

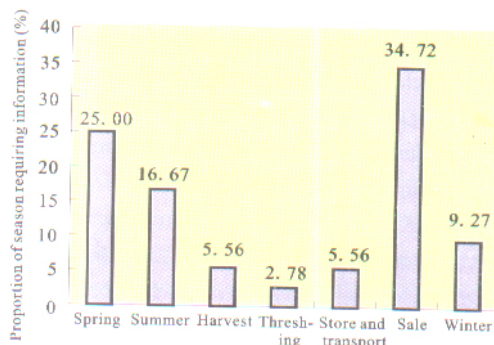
The numerous agricultural information users are distributed extensively in the rural areas with diverse environment in Jilin Province (JIANG and GU, 2003). They obtain distinctly natural resources, work in the varied production conditions, and involve in the different levels and ways of economy development, all of

which make agricultural information demand bear spatial disparity.

Firstly, the degree of demand on agricultural information is different in different areas of Jilin Province. Besides natural condition, the many kinds of agricultural industries and great population with uneven qualities all contribute to it. Comparatively, farmers of neighboring areas to Changchun and Jilin cities paid more attention to agricultural information, but those in the western pasture of Baicheng City, northwestern forest area of Baishan City and northeastern planting area of Liaoyuan City paid less. Secondly, the types of agricultural information are varied. The investigation indicates that farmers in the middle of Jilin Province, where planting is dominant, thanking for the flat landform and plentiful sunshine and rainfall, require planting information greatly, and agricultural producing and processing information, market information and policy information as well. While the planting in the western area, affected by poor rainfall and alkali-saline land, is inferior to breeding, which contributes to the focus on breeding information. The users of the forest area in the eastern area care for insect and pest information. In addition, industrial structure and information types have a great effect on the time of all kinds of agricultural information demand in different areas.

4.2.2 Temporal difference in agricultural information demand

Processing data with the view of season requiring agricultural information, it is revealed that the demand and intensity on information in sale season of agricultural production is the greatest. The easy and authoritative information is a catalyst to turn agricultural products into profits in the sale season, which are also returns for farmers' one-year efforts, so the demand on information in this season is superior, comparing with other seasons. That in spring season follows, when rich information



The autumn is divided into harvest, threshing, store and transport, and sale seasons

Fig.1 Seasons requiring information

Table 2 Indexes of agriculture information required in each season

	Spring	Summer	Autumn				Winter
			Harvest	Threshing	Store and transport	Sale	
Ecological environment	3.19	10.40	9.01	6.00	9.09	1.04	1.04
Weather	26.60	24.80	29.04	20.35	21.15	1.04	1.04
Plant disease and insect pest	4.26	30.21	3.33	3.31	3.42	5.20	6.24
Sci-technology	15.99	17.32	1.41	2.36	1.08	1.04	7.28
Market	19.15	9.34	21.05	29.29	24.06	44.79	13.54
Seed	25.53	1.03	1.39	6.13	8.54	1.04	3.12
Production materials	2.13	3.09	4.25	5.43	2.99	1.04	5.20
Policy and law	5.32	0.00	15.36	18.13	18.01	29.17	15.63
Experience	2.13	5.06	3.09	3.42	6.53	9.36	5.20
Employment	0.79	0	1.22	0	0	3.12	23.96
Others	1.00	0	0	0	1.27	1.04	4.16

will lead farmers to choose perfect mode and types of production (Fig. 1). And the types of required information are distinctive in different seasons (Table 2).

4.2.3 Farmers' recognition on agricultural information

In the investigation on agricultural information's effect on production, it is evident that farmers in Jilin Province have to acknowledge the great importance of information when it is used soundly though they paid less attention to it usually.

The analysis on recognition of farmers on the means of production, chiefly including information, fertilizer, agricultural machine, seed, and cultivated land, discovers that farmers attached the least importance on information (10.90%) (Fig. 2). This result shows that, in Jilin Province, a traditional agricultural province, farmers have kept the orthodox and closed way in production in deep roots, and possessed weak information perception due to poor transmission and diffusion though their economic ideas have enhanced recently, which limits their desires to turn information into effect in production.

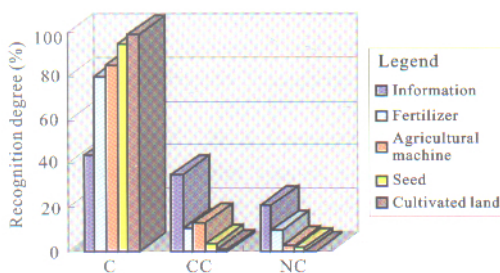


Fig. 2 Peasants' recognition to means of production

4.2.4 Type of agricultural information demand

The research on the type of agriculture information re-

quired, in connection with 8 basic agricultural information (natural resources, technology, agricultural materials, market, policy, experiences, rural socio-economy and employment), discloses that natural resources (28.98%) and market information (23.79%) are top two in the importance list, which displays a primary attribute of agricultural production; "agricultural production is the combination of natural production and economic production. Just because that natural resources information is needed more than others. And there are two reasons to rank market information as second: 1) The price elasticity of supply is low owing to long producing cycle of agricultural products and lagged reflection to market, which, to some extent, exposes farmers to the great market risk of agriculture business. However, accurate and timely market forecast information can guide farmers to introduce fine seeds, to reorganize production structure, and to supply the production with high quality, high technology and high market competitive capacity, in order to decrease risk. 2) By attaining and analyzing the first-hand market information, farmers can select a reliable purchaser to guarantee their own future benefits. According to statistics, the agricultural products price information required includes market price of agricultural products in familiar areas (41.18%), that in unfamiliar areas (41.18%), government ordering price (15.69%) and others (1.95%). Meantime, the top five of information demands on agricultural sci-technology are fine seed, high and advanced production technology, processing technology, new species, and breeding technology.

4.3 Model Verification

Base on the survey in 9 cities and counties of Jilin Province, the model in Equation (1) is verified, getting correlation coefficients of regression (Table 3).

Table 3 Correlativity and coefficients of regression

Independent variable	Coefficient	t-test	Correlativity	Independent variable	Coefficient	t-test	Correlativity
P_1	0.0083	10.858	0.2802	E_1	-7.9054	-0.898	-0.2781
P_2	0.0107	6.284	0.0976	E_2	-0.0003	-0.781	-0.2897
P_3	0.0092	12.002	0.0676	E_3	-0.0006	-0.776	-0.2775
P_4	0.0089	10.214	0.1542	E	-	-	-0.8453
P_5	0.0077	10.718	0.1713	K_1	-11.5923	-2.286	0.3832
P	-	-	0.7709	K_2	-0.8403	-2.345	0.3980
F	-21.0420	-2.746	0.7930	K	-	-	0.7812
X	-3.7182	-0.852	0.7756	C	28.3476	3.269	0.5542

The complex covariance $R=1.92530$, which proves that this model fitness is very good.

From the correlation between the independent variables and dependent variable attained from the regression analysis, we know the selected factors have high correlation with the agricultural information demand, of which, economy is the outstanding, followed by the facility of information passes, knowledge and education of user, credit of A ISS and production. The cause of the case is that, for farmers, economic benefit is the first criterion to verify the utilization of a kind of resources, then the more economic benefit, the more cost on the information, vice versa, the more information is used, the more benefits are got. Additionally, the more information passes are, the more information is attained, ruled by Matthew Effect, the more demands of information. And for users, the more knowledge and education they have, the more attention are paid, subsequently, more information is required.

5 CONCLUSIONS

From the research, we can conclude that agricultural information demand in China behaves distinctively regionality, seasonality and variation in kind and level. The pattern of agricultural production in China, inheriting traditional individual small-scale farming and self-sufficing farming, shapes the closed idea of farming, so that households care more experience than theory. Farmers are come to be the first demander with rapid pace after the contract responsibility system with remuneration linked to output was established, but their scattered distribution and inconvenient conveyance make the agricultural information difficult to be obtained. Furthermore, modern agricultural technology is critic to its users, who must equipped with more knowledge and skill, and good attitude and idea. But Chinese farmers are relative inferior to this. The little comparative benefit and poor income drive farmers to keep away from all risks earlier, consequently, they are afraid to try any

new things with risk. On the conditions of all above, the demand and utilization from farmers are crippled, as well as the purchase idea and ability. But this just implies that agricultural information demand has great potential to develop with the growth of agriculture in China. Another idea gained from this research is that economy is the dominant factor influencing agricultural information demand, and seconds to it are the facility of information passes, knowledge and education of user, credit of A ISS and production.

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