Research Article

Farmers Preferred Information Sources for Agricultural Productivity in Hebei Province, China

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Abstract | Agricultural information sources play a pragmatic role in knowledge building among the farming community. Farmers use various traditional and modern information sources such as extension field staff, fellow farmers, private sector, electronic media, print media, and information communication technologies (ICTs) gadgets to get the latest information necessary for agricultural productivity. This study aimed to explore the patterns of farmers to access and receive information from different sources. A well-structured and expert reviewed interview schedule was used to collect data from farmers from Huailai county. A total of 122 interviews were conducted for the collection of data. Data were recorded using EpiData software program and a logistic regression model was applied using the computer-based statistical program "STATA". The findings indicate that media (electronic media and print media) was the key information source for the farmers and 40.16% of farmers accessed media particularly for agricultural information whereas 34.43% used agricultural extension field staff (government) to acquire agricultural information. The government of China should start some educational interventions for farmers to improve their educational level so that the farming community could utilize multiple information sources for crop productivity.

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Introduction

Farmers across the world are vulnerable to serious issues especially food insecurity. These issues urged developed and developing nations to devise innovative and organized ways of outsourcing agricultural information to the farmers to improve their livelihoods (Ballantyne, 2009; Lokanathan and Kapugama, 2012). Agricultural information delivery is considered the most critical component of agricultural productivity. Various extension institutions are engaged in disseminating the latest information related to agriculture using diverse methodologies (Farooq *et al*., 2007). The farming community faces difficulties in accessing agricultural information. To overcome such difficulties there is a need to flourish farmers-oriented extension services (Adhiguru *et al*., 2009; Lokanathan and Kapugama, 2012).

In the last few decades, Information and Communication Technologies (ICTs) have emerged as an advanced approach to transfer agricultural information

among farming communities by using various technological tools including mobile, computer, internet, and mass media, etc. (Feng *et al.*, 2005; Rhoades *et al.*, 2008; Rice and Kitche, 2015). There are diverse disparities in gaining agricultural information due to various localities; ICTs usage, ethnicity, beliefs, and prestige induced the distribution and delivery of agricultural information for agricultural development in most of the developing world (Oladele, 2006; Lwoga *et al.*, 2010; Fafchamps and Minten, 2012).

In China, the agriculture sector is feeding more than 1.38 trillion inhabitants of most emerging economies of the world. Globally it has been accepted that agriculture has ensured food availability and accessibility in the most populous country like China. Advancement in China's ATE system comprises five phases from its origin during the 1920s. The basic agricultural extension system emerged in the 1950s. Middle-level extension institutions developed during the 1960s and a national agricultural extension system was developed during the 1980s. A participatory extension system emerged during the Cultural Revolution. Finally, it was structured into a five-level technology extension system including; National, Provincial, Prefecture, County, and township levels (Esharenana *et al.*, 2003; Qijie and Chuanhong, 2008).

All the above said institutions are the hub for knowledge and information related to agricultural development (Hu *et al.*, 2006). These institutes have been modernized by implementing some policies and interventions by the Government to improve the existing structure of these farmers' based organizations (Song *et al.*, 2014; Qin and Zhang, 2016). Moreover, infrastructure has also contributed to the efficient provision of information and knowledge to the farming community for crop protection and production towards sustainable agricultural and environmental development. Availability of this service facilitates farmers to get easy access to various inputs for improved production at the farm level; this has a significant impact on the household income of the farming community as well as to reduce poverty. In the present research, it was investigated how farmers utilize different information sources for agricultural productivity in the Hebei province of China?

Materials and Methods

Sampling and data collection

A multi-stage random sampling technique was used for this study, in the first stage, one province from China was selected, which was Hebei province, then in the next stage, one county was selected which was Huailai County. In the final stage, six villages from the selected county were selected for data collection from respondent household heads. Overall, 122 respondent farmers were chosen from six villages; Yanjiafang, Anyingpu, Dongshuiquan, Paoercun, Shimenwan and Zhanjiaying. For data collection, a well-structured, expert-reviewed interview schedule was designed as a research instrument to conduct face-to-face interviews with respondent farmers.

Selection of model and analysis

Logistic regression was applied for the analysis of data, while data collected was based on the response of rural farming community regarding their sources of agricultural information, available for the farming community, which was considered like a dichotomy statement. According to this statement 1 refers that farmers are utilizing agriculture information sources, while 0 indicates non-utilization. Following particular equation was utilized for estimation of results:

The public sector as the agricultural information source for the farming community.

$$Ks_i = F(Ui) = f(\alpha + \beta X_i + \mu) = \frac{1}{1+eU_i} = \frac{1}{1+e^{-(\alpha+\beta X_i)}}$$

Where Ks_i is likelihood of information source from the public sector, accessible for the farming community,*f* denotes utility of collective standard logistic regression (Wooldridge, 2009), whereas, ß denotes factor which needs to analyze, likewise X_i is the mutable calculation vector. Fundamental modeling for the variable is used to generate a logistic model (Kostakis, 2014). It was anticipated that Ui is a non-observed factor, which needs to calculate using the below equation:

$$Log\frac{Ks_i}{1-Ks_i} = Ui = \alpha + \beta X_i + \mu$$

By considering μ as independent of X_i and it is also proportionally assumed as zero, suppose that μ is independent of X_i and is proportionally distributed to 0, similarly to calculate likelihood reaction for U*i* following equation is used:

$$Ks_i = \alpha + \beta_1 age + \beta_2 edu + \beta_3 edu\_high + \beta_4 off\_farm + \beta_5 n\_crops + \beta_6 n\_vl$$

Ks_i is a dichotomous factor, which indicates the farming community's accessible information sources from the public sector. By considering other agriculture information sources like friend neighbor relative, the private sector, media including both electronic and print media contain similar variables like the public sector.

Some variables used in this study are given in Table 1 with their explanation.

Table 1: *Variables used and their explanation.*

Variable	Explanation
Public_info	Government as sources of information for the respondent farmers
FNR_info	Friend/neighbor/ relative as a source of information for the respondent farmers
Company_info	Private company/ dealer as sources of information for the respondent farmers
Public-pvt_info	Public and private sector as sources of information for the respondent farmers
Media_info	Media (electronic and print) as sources of information for the respondent farmers
age	Age of the farmer considered as respondent for the study
Edu	Years of schooling education of the respondent farmer
edu_high	Higher education level among family members of the respondent farmer
off_farm	Off-farm activities of the respondent farmer
n_crops	Number of crops being grown by the respondent farmer
n_vl	Number of villages considered for the present study

Results and Discussion

Farmers' accessible sources for agricultural information are categorized in: Agricultural extension staff (government) which is normally carried out under the umbrella of agricultural extension system; neighbor-friend-relative; private sector, which includes different private companies and dealers providing agricultural inputs to farmers as major activity and agricultural information as secondary activity; media (print and electronic) is also providing agricultural information under the forum of government organizations as well as private organizations; self-experience of the farmer as a source of information. According to the finding of the study, only 40% of farmers have accessibility to various agricultural information sources (Adhiguru *et al.*, 2009).

Table 2 indicates available agriculture information sources for the farming community. In China, 34.43% of farmers get agricultural information from agricultural extension staff and 2.46% from neighbor-friend-relative, 4.92% from the private sector, 40.16% of farmers get agricultural information from media including print and electronic media and only 0.82% of farmers consider their own experience as a major agriculture information basis though, 17.21% of the farming community did not respond to give their opinion regarding agricultural information sources. About 74.59% of farmers consider agricultural extension staff and media as chief sources for agricultural information. Contrary to this Opara (2008) stated that almost 88% of the farmers consider extension workers as a major source of agricultural information.

Table 2: *Agriculture information sources for rural farmers.*

Sources	Frequency	Percentage
Agricultural extension staff	42	34.43
Neighbor-friend-relative	03	02.46
Company/ dealer	06	04.92
Media (print and electronic)	49	40.16
Self	01	0.82
No opinion	21	17.21
Total	122	100

Public sector (extension field staff) as an information source

Public sector extension field staff performs an imperative function to transfer agricultural information from research institutions to the rural farming community.

According to the logistic model's results presented in Table 3, if there is one unit increase in the educational level of a farmer then odds of farmers' information sources will rise by a factor of 1.01, likewise, one unit increase in higher education of farming community may boost up the availability of agricultural information by 1 factor. Whereas that accessibility rises 1.005 times by the one unit increase in the age of farmer. Likewise raising farmer's off-farm work by 1 unit, availability of agriculture information for the farming community from the public sector (agricultural extension staff) will rise by a factor of 0.268 only. Contrarily, by increasing the diversification of crops by rural communities by one unit, it will raise the government department (agricultural extension staff) as the knowledge source for the farming community

by a factor of 0.88, similarly by one unit increase in livestock will raise the availability of agricultural information from the government for the farming community by 0.996 factor.

Table 3: *Public sector as an agricultural information source.*

Public_info	Odds ratio	Z value	P>|Z|
Edu	1.017	0.21	0.830
high_edu	1.000	0.00	0.996
Age	1.005	0.20	0.839
off_farm	0.268	-2.56	0.010
n_crops	0.880	-0.56	0.557
n_lv	0.995	-0.65	0.516
_cons	0.646	-0.24	0.813
Total observations = 122			
LR chi^2 = 8.65			
Prob> chi^2 = 0.194			
Pseudo R^2 = 0.055			

Table 4: *Friend-Neighbor-Relative (private) as agricultural information source.*

FNR_info	Odds ratio	Z value	P>|Z|
Edu	1.569	1.14	0.253
edu_high	0.762	-0.76	0.445
Age	0.912	-1.12	0.262
off_farm	1.081	0.06	0.951
n_crops	0.959	-0.06	0.956
n_lv	01 omitted		
_cons	1.152	0.03	0.977
Total observations = 106			
LR chi^2 = 2.91			
Prob> chi^2 = 0.713			
Pseudo R^2 = 0.107			

Neighbor-friend-relative as an information source

Logistic model's results presented in Table 4 indicates that raising the educational level of the farmer by one unit will result in an increase of availability of agricultural information for farmers' from neighbor-friend-relative by a factor of 1.568, similarly, one unit increase in the level of farmer's higher education will increase the availability of agricultural information for farmers by a factor of 0.76 only. However, this availability will rise by a factor of 0.912 by increasing one unit in the age of the farmer. It is worth mentioning that by raising one unit in off-farm work of farmer it will make acceleration in the availability of information from neighbor friend relative for the farmer by a factor of 1.08, Similarly, if the diversified crops are increased by one unit it will raise friend neighbor relative being an agriculture information source for a rural community with 0.959 factorial increase.

Private sector (company/dealer) as an information source

Logistic regression's results presented in Table 5, indicates that by increasing one unit in educational level of farmer, it will increase the availability of agricultural information for the farming community from the private sector (company/ dealer) by a factor of 0.931, alike if farmer's higher education is raised by one unit then it will result in availability of private sector as information source by a factor of 1.02. Whereas, the availability of the private sector increases by a factor of 0.947 if the age of a farmer is increased by one unit. One unit increase in the off-farm work of farmers will result in an increase in the availability of agricultural information from the company/ dealer by a factor of 1.20. One unit increase in crops will make the private sector accessible for the farming community by a factor of 1.176. Comparably, a one-unit increase in livestock will also raise 0.999 factorial, availability of information by the private sector for farmers.

Table 5: *Company/dealer as an agricultural information source.*

Company_info	Odds ratio	Z value	P>|Z|
Edu	0.931	-0.48	0.632
edu_high	1.022	0.14	0.887
Age	0.947	-0.99	0.323
off_farm	1.200	0.20	0.844
n_crops	1.176	0.35	0.723
n_lv	0.999	-0.04	0.969
_cons	0.780	-0.07	0.943
Total observations = 122			
LR chi^2 = 1.43			
Prob> chi^2 = 0.964			
Pseudo R^2 = 0.030			

The public-private sector as information sources

Accordingly the results of the logistic regression model presented in Table 6, by raising 1 unit in the higher education level of farmers will raise the availability of agricultural information from the public-private sector for the farmer by a factor of 1.00 for each, likewise, this availability will rise by a factor of 0.994 if the age of the farmer is increased by one unit. Whereas, one

unit increase in off-farm work of rural farmers will increase availability by a factor of 0.313 times. Also, increasing crops number will result in a 0.909 factorial increase in the availability of agriculture information from the public-private sector, similarly, one unit rise in livestock will also increase the availability of agriculture information for a rural farmer by a factor of 0.995 times.

Table 6: *Public-private sectors as an agricultural information source.*

Public-pvt_info	Odds ratio	Z value	P>|Z|
Edu	1.000	0.00	0.998
edu_high	1.005	0.07	0.946
Age	0.994	-0.23	0.819
off_farm	0.313	-2.46	0.014
n_crops	0.910	-0.45	0.652
n_lv	0.995	-0.68	0.497
_cons	1.439	0.21	0.837
Total observations = 122			
LR chi^2 = 7.31			
Prob> chi^2 = 0.2927			
Pseudo R^2 = 0.0447			

Table 7: *Media (print and electronic) as an agricultural information source.*

Media_info	Odds ratio	Z value	P>|Z|
Edu	1.009	0.12	0.901
edu_high	0.982	-0.25	0.802
Age	1.022	0.86	0.391
off_farm	2.651	2.27	0.023
n_crops	1.128	0.58	0.563
n_lv	1.003	0.51	0.611
_cons	0.130	-1.14	0.253
Total observations = 122			
LR chi^2 = 6.63			
Prob> chi^2 = 0.3562			
Pseudo R^2 = 0.0403			

Media (print and electronic) as information sources

Results presented in Table 7 based on the logistic regression model, indicate 1 unit raising the educational level of the farmer may improve agricultural information from media be available for the farming community by a factor of 1.21, likewise one unit increase in the higher education level of the farmer will boost up the availability of agricultural information from media by 1.23 factor. Although this availability will increases by a factor of 1.004 by adding up the age of the farmer by one unit. If a farmer's off-farm work is raised by one unit then it will increase the availability of media as a source of agricultural information by a factor of 0.876 times. Similarly, one unit increase in crops number will also increase by a factor of 1.60 for media as the available source of agricultural information for farmers. Alike if a farmer's livestock is raised by one unit then it will also increase the availability of agricultural information from media by a factor of 0.991 times.

Conclusions and Recommendations

The major sources of information for the farmers were media (print and electronic) and agricultural extension field staff in the research area. Improving the educational level of farmers may result in better access to information sources. Similarly, cultivating more crops and livestock rearing could help farmers to access multiple information sources particularly from the public sector to gain agricultural knowledge for productivity. More educated farmers better access information from neighbor-friend-relative (NFR) in a productive way to improve crop productivity. Off-farm work has also positive consequences on accessing agricultural information through the private sector by the farmers. Similarly, diversified cropping also increases the accessibility of the private sector as one of the sources of information. In the same way, increasing higher education and the number of crops grown will result in improvement in the accessibility of public-private sector sources of information for farmers. While increasing educational levels of the farming community will also improve the accessibility of farmers to utilize media (print and electronic) as an information source for agricultural knowledge and crop productivity. Growing different crops by farmers will significantly increase the accessibility of media (print and electronic) as a source of information.

Based on conclusions below are few recommendations for improving the accessibility of different sources of information among farmers for agricultural productivity:

- The government should initiate educational interventions for farmers to improve their educational level for crop productivity.
- The government should start campaigns to raise awareness among farmers to cultivate more crops and rearing livestock.
- Public and private sector institutions should uti-

lize multiple sources to disseminate agricultural information for agricultural productivity.
- Advisory services providers should utilize media (print and electronic) as it is the perceived best source of information for farmers regarding agricultural information.

Novelty Statement

Access to agricultural information at the door steps of farming community is vital for improving agricultural productivity in majority of the countries especially where economic development largely depends upon agriculture. This article investigated how farmers utilize different information sources for agricultural productivity in the Hebei province of China.

Author's Contribution

Muhammad Yaseen: Conceived the major idea of research as principal author.
Xu Shiwei: Supervised the research and finalized the manuscript.
Yu Wen: Data analysis and helped in preparing research instrument.
Muhammad Luqman: Prepared initial draft of manuscript.
Raheel Saqib: Reviewed the literature, prepared research instrument.
Muhammad Ameen: Helped in data collection and data analysis
Sadia Hassan: Field data collection and analysis.
Tahir Munir Butt: English editing of manuscript.

Conflict of interest
The authors have declared no conflict of interest.

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