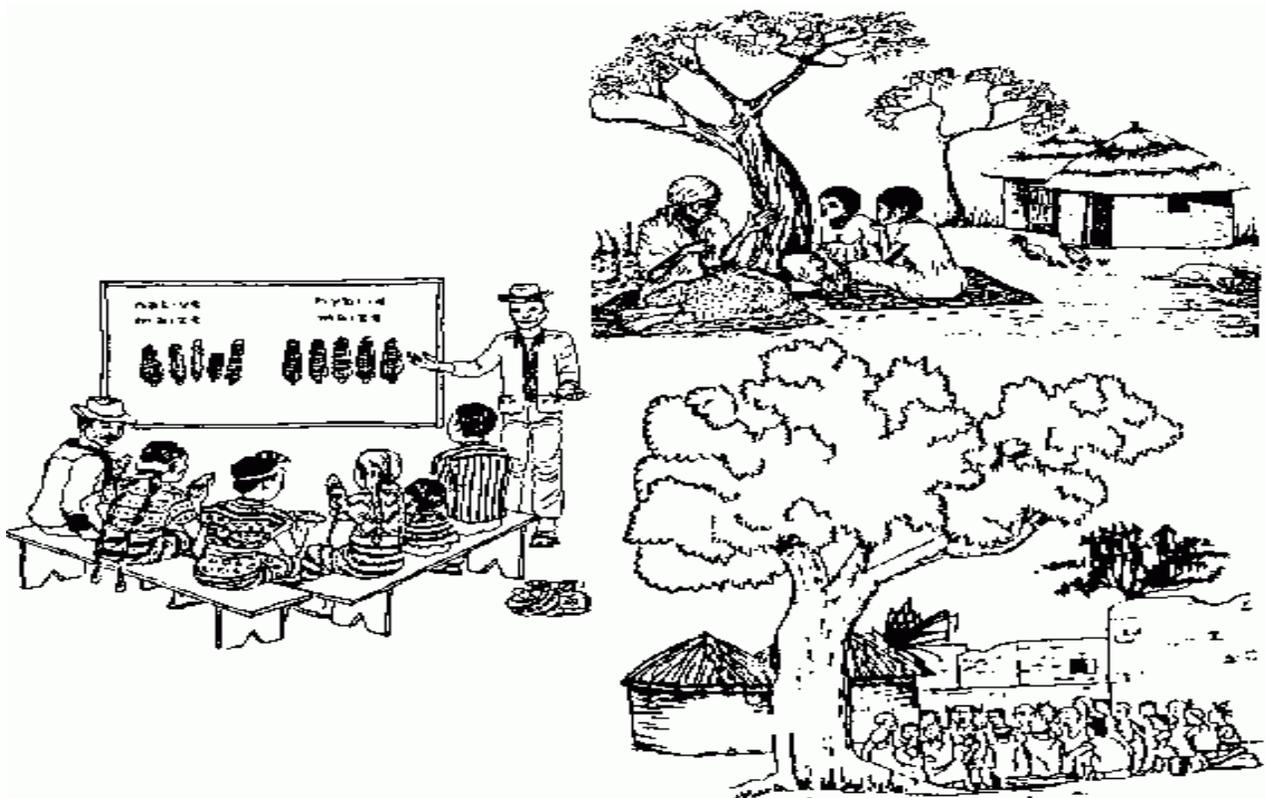


INTRODUCTION OF NEW MODES OF AGRICULTURE TECHNOLOGY DISSEMINATION

RESEARCH STUDY



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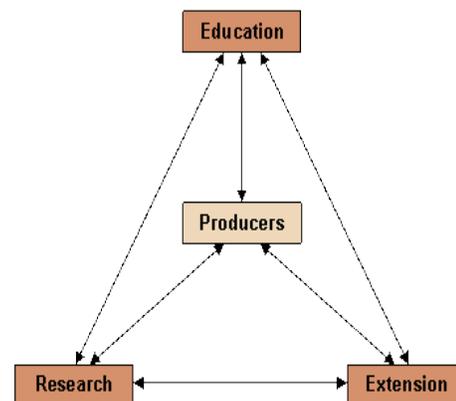
Contents

Chapter No.	Title	Page No.
01	INTRODUCTION	01
02	HISTORICAL BACKGROUND	02
03	CURRENT EXTENSION APPROACHES/METHODS	03
04	NATIONAL AGRICULTURAL RESEARCH SYSTEM	04
05	CHALLENGES AND PROBLEMS	05
06	ROLE OF PRINT MEDIA	07
07	ROLE OF ELECTRONIC MEDIA	07
	7.1 Radio Programs	08
	7.2 TV Programs	08
	7.3 Video Cassettes and Compactable Disks (CDs)	09
	7.4 Websites	09
	7.5 Agri. Help Line	10
08	ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN EXTENSION:	11
	8.1. Market information	11
	8.2. Weather Information	11
	8.3. Technology and Technical Knowhow	12
09	AGRICULTURAL INFORMATION DISSEMINATION MODELS	12
10	ANDROID APPLICATIONS (APPS) FOR FARMERS	14
	10.1. Agri. Assistant	14
	10.2. Khushal Zamindar	14
	10.3. Ba-Khabar Kissan	14
	10.4. Agriculture Corner's Mobile App	15
	10.5. Agri Smart	15
	10.6. E-Kissan Pakistan	15
	10.7. Khushal Aangan	15
	10.8. Zarai Baithak	16
11	MECHANISMS OF AGRICULTURAL INFORMATION SERVICE SYSTEMS IN CHINA	16
	11.1. Government Led	16
	11.2. Market Driven	16
	11.3. Community Support	17
12	ROLE OF ZARAI TARAQIATI BANK LIMITED (ZTBL)	17
	12.1. Farmers Training Centers	17
	12.2. Agri Technology Website	17
	12.3. ZTBL's Farmers Portal	18
	12.4. Call Center	18
	12.5. Publications/Print Media	19
13.	REFERENCES	20

1. INTRODUCTION

Pakistan is an agro-based country, which contributes 18.5% to GDP and creates opportunities of employment for 38.5% of the country's total labor force (Pakistan Economic Survey, 2018-19). Majority (60%) of our country's population resides in countryside, which directly depends for their livelihood on this sector. Despite this massive contribution, per acre crop yield in the country is less than rest of the world's average and potential obtained by developed countries. A notable gap is still occurring between yield obtained by local progressive farmers and small farmers in the country. Reasons behind the gap are constrained performance of the agri. sector and very few established institutional linkages to disseminate modern technology among the farming community. This gap can be filled considerably if latest agriculture technologies communicated to the farmers through efficient extension channels.

Dissemination of agriculture technology is based on three pillars of a triangle which is known as Agriculture Knowledge Triangle (shown in figure) in world wide. This triangular system links farmers, agriculture research institutions and extension officers to promote learning to generate, share and use of agriculture related technology, knowledge and information. This system also integrates farmers, agricultural educators, researchers and extension workers, enabling them to harness knowledge and information from various sources to improve farming and livelihoods. FAO and the World Bank refer this system as Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD).



Effectiveness of an extension method and linkage depends upon selection of right method at right time (Kerkhof, 1990). Various extension approaches have been found effective in varied situations at different levels in adoption process. Among these methods Group and Individual Contact methods are some of the extension methods through which messages concerning latest agricultural technologies can be reached to farmers. Various extension agencies are disseminating new technologies using different means including Mass, Individual and Group Contact methods. All these methods have their own strengths and weaknesses. Muhammad et al. (1990) found that demonstrations, meetings, farm and home visits are more effective among teaching methods than others. Office calls, radio, TV, movies and signboards proved effective to some extent. Moreover, the relative effectiveness of teaching methods/ media, result demonstrations are more effective at the top among other methods. Muhammad and Garforth (1995) publicized that exposure of farmers to information is most likely to be an important factor that influence their adoption behavior. So, the larger exposure will certainly enhance their awareness regarding the latest recommendations, which lead the farmers to put these recommendations into practice in a precise way.

Keeping the importance of agriculture sector in view, present study has been planned to examine the following:

- Effectiveness of various models for dissemination/communication of agricultural information to the farming community.
- Challenges and Problems in Agri. Extension System of the country
- Identification of new modes of Agri. Extension in the country

2. HISTORICAL BACKGROUND

Agricultural institutions in subcontinent were established on scientific lines by the British colonial government with the introduction of massive canal network during the beginning of 20th century. Many of the existing agriculture departments and institutions, related to the irrigated agriculture in Pakistan are legacy of the colonial raj (Gill, 1996). Secretary of Agriculture was the in-charge of agriculture, animal husbandry, forestry and fisheries wing. Major institutional component of these agriculture wings were Regional Directorates of Agriculture at Lahore (Punjab), Peshawar (Khyber Pakhtunkhaw) and Hyderabad (Sindh) and Bureau of Agricultural Information (established in 1962) situated at Lahore. However, only in Balochistan the department of Agriculture Extension was established in 1984.

Overall objectives of these Regional Directorates were to improve area under cultivation, managing seed and fertilizer stores, supply of agricultural inputs, plant protection and training of the staff etc. The Extension Wing was part of the Regional Directorates. Each Regional Director was assisted by Deputy Directors (at division level), who, in turn were supported by Extra Assistant Directors and other supporting staff. Animal Husbandry wing was responsible for the livestock development (disease control, animal breeding and nutrition etc.).

Since independence of Pakistan in 1947, agricultural extension services are part of the overall rural development strategies (Abbas et al., 2009). Different extension and rural development programmes have been launched in the country to uplift the rural areas. Some of the significant programmes include: Village Cooperative Movement (VCM), Village Agriculture and Industrial Development Programme (Village-AID), Basic Democracy System (BDS), Integrated Rural Development Programme (IRDP) and Training and Visit (T&V) programme. Most of the researchers are agreed that none of these programmes were successful in long run and were abandoned one after the other.

In 2001, the military government led by General Pervez Musharraf introduced **Devolution of Power Plan** in Pakistan, which was designed to decentralize the administrative authority at local government and empower local elected representatives with more authority and responsibility at the grass root level (NRB, 2005). The Devolution of Power Plan brought administrative changes in the almost all public sector departments including Agricultural Extension Department (Saeed et al., 2006). Under this system, districts were given more autonomy regarding planning and execution of development projects along with transfer of extension activities at district level. Keeping in view the revolution in the telecom sector, some projects regarding dissemination of improved research based

agricultural technology were launched by the telecom companies. Furthermore, Eighteenth (18th) amendment to the constitution of Pakistan was passed by the parliament in 2010, brought devolution in various federal ministries as seventeen ministries including that of food & agriculture, health and education were abolished and the responsibility was transferred to the provinces in 2011 (Dawn, 2013). A new Ministry of National Food Security and Research (MNFSR) was created at the federal level in replacement of Ministry of Food and Agriculture.

3. CURRENT EXTENSION APPROACHES/METHODS

Pakistan's current agriculture extension policy focuses on the main export crops such as cotton, sugarcane and cereal crops including rice & wheat. The current extension approach in the country is more or less modified version of Training & Visit (T & V) approach. The farmers' training methodology is being followed in the Punjab Province by the extension field staff in current decentralized system called "Agricultural Hub Programme" and it is almost similar to that of T&V system. The methodology of "Agricultural Hub Program" is given as under;

- A progressive and socially accepted farmer (termed as Hub Farmer) is identified by the Field Assistant at Union Council (UC) level (more or less one from each village of the UC) and the farm of selected grower serves as a demonstration center for other farmers. The extension field staff visits this selected farmer at least once a week on a fixed day and arrange farmers' meeting to introduce and disseminate approved agricultural technologies.
- The identified Hub Farmer, recommended by the Deputy District Officer Agriculture (DDOA) (extension) is advised for registration with the seed corporation to multiply their crop's seeds for further use in the respective village. Extension official randomly visit the selected demonstrations centers for monitoring of the progress at district and tehsil level. Other farmers are also invited at the centers and record of the same is maintained.
- Major difference between Agriculture Hub Program and T&V Approach is that previously the extension activities were centrally managed by the Director General Agriculture (Ext & AR), whereas presently extension is decentralized and managed at the district level by District Officer Agriculture (DOA) who is answerable to Executive District Officer Agriculture (EDO). In the previous T&V system, the extension field staff followed a strict fortnightly schedule to provide the information to the Contact Farmers (CFs) who were supposed to pass the information to other farmers. But now the role of Contact Farmers has been abolished and Agriculture Officers conduct training sessions on different stages of production cycle of crops and fruits with the help of Hub Farmers. Another, difference is that under T&V the Field Assistants were front line extension workers but now Agricultural Officers are the frontline extension workers.
- **The Farmer Field School (FFS) Approach** is a group based learning approach where facilitator/trainer trains a group of farmers by practical training and discussion. FFS was introduced in Pakistan in 2004 as alternate of T&V System. This approach is based on field studies and principles of growing a healthy crop, preventing predators; regularly observing the crop and helping farmers to become experts at their farms. This approach has been

utilized in Punjab, Sindh and Khyber Pakhtunkhwa (KP) to improve crop productivity. In Punjab, mango, citrus and vegetable growers are being trained through Farmer Field School (FFS) approach under Fruit and Vegetable Development Project. In Sindh FFS was introduced for deeper understanding of the important interactions of agro-ecosystems as well as on sustainable farming, with the particular emphasis on reduction of chemical pesticide.

4. NATIONAL AGRICULTURAL RESEARCH SYSTEM (NARS)

A well-coordinated and competent research system is inevitable for effectiveness of extension system of any country. Pakistan's National Agricultural Research System (NARS) is comprised of several federal and provincial research centers/institutes, agricultural universities and regional adaptive research farms.

At federal level Pakistan Agricultural Research Council (PARC) is the apex national organization working in close collaboration with other federal and provincial institutions in the country to provide science based solutions to agriculture through its statutory functions. PARC has four technical divisions viz. Plant Sciences, Animal Sciences, Social Sciences and Natural Resources. National Agriculture Research Center (NARC) (works under PARC) Islamabad undertakes/coordinates agricultural research, organizes training and disseminates agricultural technologies through its network of technology transfer institutes located throughout the country (Khan, 2006).

Other noteworthy federal research organizations working under Pakistan Atomic Energy Commission (PAEC) include Nuclear Institute for Agriculture and Biology (NIAB) Faisalabad, National Institute for Biotechnology and Genetic Engineering (NIBGE) Faisalabad, Nuclear institute of Food and Agriculture (NIFA), Peshawar and Nuclear Institute for Agriculture (NIA) Tando Jam, Sindh.

At provincial level in Punjab Province, Ayub Agricultural Research Institute (AARI), Faisalabad is the largest agricultural research organization which conducts research in all disciplines of agricultural science. Several agricultural research institutes are also working under the umbrella of AARI in different zones of the Punjab. In Sindh, Agricultural Research Institute (ARI) Tandojam is the prime research institute of Sindh province. In addition, Sindh Horticulture Research Institute Mirpur Khas, Rice Research Institute Dokri, Wheat Research Institute Sakrand, Quaid-e-Awam Agriculture Research Institute Larkana and Crop Diseases Research Institute, Karachi are notable research institutes in the province.

Similarly, various Research Institutes like Agriculture Research Institute, Tarnab Peshawar, National Tea & High Value Crops Research Institute, Mansehra, Mountain Agriculture Research Center Gilgit, Balochistan Agriculture Research and Development Center, Quetta and Horticulture Research Institute Khuzdar and many more in KP, Balochistan and Gilgit Baltistan respectively are

servicing farming communities by conducting research and transferring the technology for progress and development of agriculture sector in the provinces. Furthermore, these research institutes are supported by a network of agricultural research stations and sub-stations.

There are 23 universities in Pakistan including Azad Kashmir which are promoting education in agriculture by inducting doctorate, masters and bachelor level degrees in various major subjects like agronomy, horticulture, plant protection, forestry, poultry and fisheries. Major and notable universities are University of Agriculture Faisalabad (UAF), Agriculture University Peshawar and PMAS Arid Agriculture University Rawalpindi (AAUR), Sindh Agriculture University (SAU), Tando Jam, Veterinary University in Lahore and Balochistan Agriculture College, Quetta. There are several agricultural colleges in different locations and similarly some general universities also have full-fledged agriculture faculties or departments.

5. CHALLENGES AND PROBLEMS

a. Targeting the right clientele

Targeting the right and relevant clientele is the key to success of any extension approach. Evidences indicate that in Pakistan both public and private sectors seldom target small and resource poor farmers. For instance Davidson (2001) observed that the Government's extension department is biased towards comparatively more-educated farmers and private sector extension is more inclined towards large and resource-rich farmers rather than the small farmers because main objective of private companies is to maximize profit. The approach of public extension service is to target some selected farmers (hub or contact farmers) and majority of smallholders are "non-contact farmers" which means that they have no formal interaction with the agricultural extension personnel.

b. Lack of linkages

Burton et al., (2012) reported that agriculture extension services in Pakistan are outdated and agricultural universities are operating in relative isolation from research and extension institutions. However, their activities are beneficial for the farmers, and are not being reached at farmers' doorstep. Besides, Gill and Mushtaq (1998) also elaborated that Extension Wing of Agriculture Department and farmers at their farm has their own network to carry out similar extension activities (e.g. establishing demonstration plots and are organizing farmers field days), independently, without mutual coordination.

Same problem has also been found in NARS where agricultural universities, federal & provincial research & development organizations and extension departments are all working within their own (self-created) empires and have no precise functional linkages. Some universities are autonomous in nature and perform their roles (education and research) with very little liaison and coordination with related public and private sector organizations (Khan, 2006).

Formal linkages within the provincial wings of Department of Agriculture exist officially, but are not effective (Shah, 2003). Even within the Department of Agriculture, there is very little coordination

between the Extension and Adaptive Research wing, and Directorate of Agriculture Information and district governments (Siraj, 2011). Therefore, there is an urgent need to institutionalize the linkages between agriculture extension, agricultural universities, research, and farmers to strengthen AKIS.

c. Partial decentralization

Decentralized extension system was implemented in Pakistan in 2001 as explained earlier, but the evidences suggest that the decentralized extension system has not shown any considerable change in the efficiency of extension service in Pakistan. Most of the researchers who examined extension services after decentralization reported that public extension service of Pakistan still remains inefficient, top-down, autocratic, large landholders' oriented and ignoring the gender equality issue.

d. Climate change and natural disasters

Climate change and associated natural disasters are the emerging challenges, which are being faced by the agriculture sector throughout the world. Lack of capability and capacity for supporting smallholders in coping with the changing climate, declining natural resources and increase in rate natural disasters are major failure of extension workers. Flash floods have become regular feature in the irrigated areas of South Punjab and Sindh during the last many years. These floods cause huge damage to arable land and other assets of farmers during moon-soon, but any concrete and systematic planning is still to be seen from the Agriculture Department to cope with the catastrophic impact of flood.

e. Intrinsic weaknesses

Agriculture Officer (AO) who is front line extension agent works at the Markaz Level and he has to look after on an average 30-40 villages. Even in some districts there are more than 60 villages under the domain of an AO. It is almost not possible for the AO to pay detail visit to every village during each cropping season. In addition, multifarious tasks are given to the extension officials, which are sometime irrelevant to their profession.

f. Rare chances of promotion

Career development path for extension workers is unattractive with very slow promotion, minimal benefits and lack of rewards (Burton, 2012). Absence of efficient monitoring and evaluation system at the lower tier of extension set-up is another intrinsic weakness hindering the effectiveness of public extension system in Pakistan.

g. Incompetency of extension worker

Mostly extension workers possess general knowledge about scientific problems, lack of specialized knowledge, sufficient trainings of extension workers in different aspects of agriculture including plant and animal health, soil analysis etc. Minimum required qualification of AOs is B.Sc. (Hons.) degree in Agricultural Sciences and they possess generalized knowledge (Burton et al., 2012).

h. Less Emphasis on Horticultural Crops

Horticultural crops (fruits, vegetables, flowers, medicinal plants) are now gaining more and more attention of agricultural extension service around the globe because of the high profit margin. However in Pakistan, main focus of extension services is still towards traditional crops and there is meager emphasis on horticultural crops.

6. ROLE OF PRINT MEDIA

Print media includes words, pictures and diagram to convey precise and clear information on a mass scale. It can effectively be used if their form and content are tailored to the needs and interest of the targeted audience. It also offers, options and facilitates to all stakeholders in decision making process, encouraging in the adaptation of technology in local situation and give information on the economic and financial implications of any recommended technologies. Farmers may use printed material for long period as permanent reminder and can use again and again.

Printing helps in preserving technologies in the shape of books/booklets, magazines, newspapers and brochures. According to a study conducted in central Punjab, majority of the sugarcane growers preferred to read pamphlets, magazines and newspapers for getting the information regarding sugarcane production technologies. These were regarded as the most suitable forms of print media for adoption of sugarcane production technologies (Abbas et al., 2003a). Farm publications have been proved as effective means for dissemination of information, especially to introduce new technologies.

The Directorate of Agri. information Punjab regularly publishes booklets, pamphlets, folders, posters, brochures, flyers etc. for technical guidance and education of farmers/stakeholders in adequate quantity round the year. Books on different agricultural topics, written by the experts are also published for agricultural professionals, University teachers, students and progressive growers. An Urdu magazine “Zirat Nama” is regularly published by Directorate of Agricultural Information, Punjab on fortnightly basis to motivate and educate growers for adoption of innovative farm technologies.

Agriculture Department Sindh is facilitating farmers through their printed booklets and leaflets on various crops and farming technologies among the growers on seasonal basis e.g. monthly publication of Zarai Magazine. Similarly, Agriculture Department KP is disseminating Agri. Information through printed material like crop, fruits and vegetables production technologies and Zirat Nama Magazine.

7. ROLE OF ELECTRONIC MEDIA

Electronic media also plays an important role to inform farmers in the situation of urgency and emergency. Farmers may get the appropriate advices of experts via this type of media to cope with the emerging problems like disease or pest control, flood and changing weather. In this way, farmers can get hold of their future planning in a better way.

The electronic devices used for communication can be regarded as electronic media. Important electronic media pertinent to agriculture include following:

- | | | |
|-----------------|---------------|--------------------------|
| 1. Radio | 2. Television | 3. Audio/Video Cassettes |
| 4. Telephone | 5. Internet | 6. Agri. help line |
| 7. Mobile phone | 8. CDs/DVDs | |

7.1. Radio Programs

Various following agricultural radio programs in Punjab and Sindh have been reported as disseminator of the agri. information to the farmers in the country

- | | |
|------------------------|----------------------------|
| 1. Thul Singhar | 6. Jithey Teray Hal Wagday |
| 2. Wahi Rahi | 7. Utum Khaiti |
| 3. Silsla Abad Gar | 8. Wasnay Rehan Gran |
| 4. Kahit kahit haryali | 9. Dharti Bakht Bahar |
| 5. Sajri Rut | 10. Sandhal Darti |

In addition, the short, comprehensive and concise messages regarding crops and livestock are also being delivered to the farming community.

7.2. TV Programs

TV Programs are solution oriented and their main target is to provide experts opinion and to solve farmers' problems to increase crop production. Practical demonstration on new technologies can be transferred through these programs. Farmers can receive information of agriculture loan schemes through these programs. In Pakistan, following TV channels are telecasting Agri. Programs and Short Agricultural Messages:

TV Channel	Programme title	Type of broadcasting	Frequency
Apna Channel	Apna Kissan Apni Zarat	Discussion Programs	Daily
Punjab TV	Khaet Punjab dey	Discussion Programs	Daily
Channel 5	Kissan time	Discussion Programs	4 Prog./week
PTV	Haryali	Discussion Programs	Weekly
Aaj TV	Zarkhez	Discussion Programs	Weekly
ATV	Sarsabz Pakistan	Discussion Programs	Weekly
PTV National	Zirat Nama	Introductory	
Mehran TV	Zarai Dunya	Discussion Program	

Table1. Agriculture TV Channels and their Programs

In Sindh, Sindh TV, KTN and Mehran TV are notable channels which are telecasting agri. related programs and short messages. Moreover, various agencies like pesticide, fertilizer, seed companies and farm machinery dealers are not only achieving the goal of promoting their products but also providing agri. information on specific products to farmers. Therefore, Television (TV) is considered to be one of the effective media as a source of agricultural information for the farmers.

7.3. Video Cassettes and Compatible Disks (CDs)

The Directorate of Agri. Information Govt. of the Punjab, Sindh and KP are providing Agri. information on various aspects of Agriculture by the facility of audio/video cassettes and CDs on no profit and loss basis. The Directorate of Punjab also produces video documentaries on various agricultural topics for telecast through TV channels. These documentaries are usually played on the occasions of agricultural exhibitions, fairs, farmer days and training programmes. These documentaries are being provided to farmers / stakeholders in the form of DVD's on no profit and loss basis.

7.4. Websites

Various web sites are available in Pakistan; equipped with agricultural information. There are some websites having the agri. information in Urdu language like www.pakissan.com and official website of Department of Agriculture, Govt. of the Punjab www.agripunjab.gov.pk. More similar websites and their features are given in table 2.

Sr. No.	Web Portal	Link	Major Features
1.	Agriculture Information Bank	http://agrinfobank.com.pk	<ul style="list-style-type: none">• Knowledge on Organic Farming• Crop Planning• Articles on Livestock & Poultry• Soil Management• Farmers Training• E-Marketing• Research Article
2.	Pakistan Agriculture Research Council (PARC) Website	http://www.parc.gov.pk	<ul style="list-style-type: none">• Provide science based solutions.• Crop production technologies• Information on Kitchen Gardening• Important links of Agriculture Research Institute• Documentaries
3.	AMIS (Agriculture Marketing Information System)	http://www.amis.pk/	<ul style="list-style-type: none">• Import & Exports situation• Crops Area & Production• Food Processing• Weather updates• Agriculture News• Agriculture Statistics• Android Application
4.	Meri Zameen	http://agriportal.lmkt.com/	<ul style="list-style-type: none">• Field Crops• List of Agri. value added products producers• Market Prices of Agri. Commodities• Pesticides composition• Fertilizer applications• Market Places

			<ul style="list-style-type: none"> • Android app
5.	Pakissan.com	https://www.pakissan.com/	<ul style="list-style-type: none"> • Research Articles on Agri. technologies • Agri. News • Weather updates • Farmers Advisories • Production technologies of crop plants • Data on diseases, insect pests and crop varieties
6.	Agri Hunt	https://agrihunt.com/	<ul style="list-style-type: none"> • Knowledge Bank on all subsectors of Agriculture • Agriculture News • E- Library • Research Articles on Agriculture
7.	Agriculture.pk	http://www.agriculture.pk/	<ul style="list-style-type: none"> • latest and timely information about different crops • Production technology of crops, • Videos on agri. related issues • Machinery update • Mandi Rates of Agri. commodities • Knowledge Bank
8.	Kissan Dost	http://www.kissandost.pk/	<ul style="list-style-type: none"> • Provides information through user friendly web interfaces, SMS and Farmer Facilitation Centre. • Toll free numbers • Crop plans
9.	Pakistan Agriculture Research	http://par.com.pk/	<ul style="list-style-type: none"> • It provides Agriculture News • Current fertilizer prices • Weather situation • Field Crops data

7.5. Agri. Help Line

These are telephone numbers that are available for answering the queries of farmers. Directorate of Agricultural Information, Punjab and Khyber Pakhtunkhaw are facilitating farmers by providing them with toll free help lines (0800-15000 & 0800-29000 and 0348-1117070 respectively for acquiring information pertinent to their urgent and emergent issues. Likewise Livestock and Dairy Development (L&DD) Department Punjab has also extended similar facility of help line (0800-78686) for providing livestock related information to the farmers.

Cellular Mobile Network companies also made it easier for farmers to keep in touch with the latest information in various spheres of agriculture like weather updates, crops, and market rates etc through a unique “Kissan service”. Farmers can feel comfort to get the desired agri. information

whenever needed. The service has been available on Mobilink as “Kissan Service” and on Telenor as “Tele Kissan”.

8. ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN EXTENSION

Over the last few years pace of cell phone’s consumption has been increased at a rapid rate and telecommunication & IT sector has reported itself as fastest growing industry. According to Pakistan Telecommunication Authority (PTA), there are 161 million cell phones users in the country. In addition to this, access of agriculture information has become more feasible after induction of 3G & 4G technologies in the country. Hence, effective utilization of ICT’s has become an important tool to disseminate agricultural information to the farming community.

Why there is need for ICTs in Agriculture?

In Pakistan there are more than 100 Agricultural Research Stations, which are working under Federal and Provincial Governments. Unfortunately most part of latest agriculture information cannot reach to the end users and vanishes within these stations.

Only one department “Agriculture Extension” is responsible for transferring the Agriculture information to the farming community and acts as a bridge between research institutes & farmers. This Department is performing an excellent job by providing information to the farming community even to remote areas with their own resources. According to a research study, only one agriculture officer deals with approximately 410 Farm families in Punjab and 390 farm families in KP respectively. Telecom sector can also acts as a bridge between researchers and farmers and may help them in creating linkages among them for Agriculture development in the country.

Three sets of information needs and services for information delivery have been widely emphasized where ICT can play a crucial role in improving agriculture efficiency; leading to increased productivity and profitability. These are elaborated as below:

8.1. Market information

Farmers need the information about real time wholesale output prices, input prices; market trends, market alerts for sales timing etc. When real-time commodity prices in the local and regional markets would be available to farmers and traders, they would be better able to make informed decisions on choice of crops, adjust harvesting & sales timings and optimize production decisions and profits (Siddiq 2015). Similarly, timely information about the input prices such as fertilizers, seeds, pesticides and farm implements/ machinery can help farmers in optimal use of inputs and minimizing costs.

8.2. Weather Information

Real time weather information and forecast is an important part in farmers’ decision making process, throughout the crop management cycle. Farmers need timely and accurate weather information for planning cropping patterns, selection of cultivars, land preparation, planting & sowing dates,

application of irrigation, fertilizers & pesticides, and harvesting/post-harvest decisions. The need for timely and location specific weather forecast has been increased especially in light of climate change and variability which cause extreme events (droughts, floods, high and low wind, cold and heat waves etc.). Timely weather forecast and early warnings about extreme weather events can help farmers to take timely protection measures (Hussain 2010, 2012, 2014).

8.3. Technology and Technical Knowhow

Site-specific crop management, Precision Agriculture ¹(PA), and satellite farming are some of the novel agricultural strategies based on variations within or in-between the fields. The theme of PA is to develop a decision support system for whole farms to search for maximizing returns from farm inputs while minimizing resource consumption and safeguarding the environments. The role of satellite navigation involving modern techniques, such as Global Positioning Systems² (GPS) and Geographic Information Systems ³(GIS), provides promising support for PA that can be regarded as an important component of the modern revolution in agriculture.

9. AGRICULTURAL INFORMATION DISSEMINATION MODELS

Major models which are being used in our country for providing Agriculture information services to the farmers are web portals, mobile applications on android phone, SMS and voice messages on simple phones, videos and video conferencing with the experts. Agriculture experts are the key component in the whole process of disseminating information to the farmers.



1. Voice Messages:

Voice messaging is an instant communication technology in which messages are transmitted via voice media. It stores voice messages in a voice mail, which can be accessed via a smart device or even a landline phone. Through this technology farmers can send their problems or ask any information from agriculture experts and get their feedback by using their cellular phones.

2. Mobile based internet service:

Due to low penetration rate of computers in rural households and high usage of mobile phones in the country. This model has been developed by taking the advantages of mobile internet

¹ Is an approach to farm management that uses information technology (IT) to ensure that the crops and soil receive exactly what they need for optimum health and productivity.

² GPS-based applications in precision farming are being used for farm planning, field mapping, soil sampling, tractor guidance, crop scouting, variable rate applications, and yield mapping.

³ A geographic information system is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data.

technologies. Users can be connected via handheld devices anywhere at any time. Agriculture information is disseminated to farmers on the move or located in any agriculture production sites. The mobile information service is ubiquitous, portable and geographically identifiable. Mobile phones are found as the most widely accessed tool among the farmers for communication and for accessing agriculture-related information particularly for the marketing of produce. Researchers also reported that mobile phones are the most used ICT tool and highly accessible by the farmers.

3. Interactive Video Conferencing

Video conferencing service model is the use of the internet to achieve real time video and voice communication. The most notable features of this model lie in a visual and face to face interaction, multiple service approaches including one to one service to provide real time remote technical advice and many more services. Farmers and agriculture experts can have online one to one interaction. Videos on various topics i.e. production technologies, use of agriculture machinery, application of fertilizer and insecticide and other cultural practices are being transferred to farming community.

4. Web Portals

Web portal is a platform hosting a collection of relevant websites. A web portal is a specially designed website that brings information from diverse sources, like emails, online forums and search engines, together in a uniform way.

5. SMS (short message service)

SMS is a text messaging service component of most telephone, internet, and mobile-device systems. It uses standardized communication protocols to enable mobile devices to exchange short text messages.

6. Self Support Online Community

This is a membership based system involving all stakeholders. Members share their experiences and exchange information through active service platforms. A group of farmers may register themselves in the service system with authenticated personal information. In this online community service model, members of the community include farmers, government officers, agri. technical professionals, industry associations and agri. enterprises. They can use online chat on their computer or mobile phone.

7. Groups and Official Pages on Social media

Various android applications have features of group conversation like where users can share knowledge and information in shape of videos, audio and voice messages and text messages. A 'Whatsapp', imo, face book messenger and Twitter etc have feature of group, where farmers and scientists can interact with each other. Similarly Face Book and YouTube have a feature of official page where farmers can watch videos, pictures on production technologies of crops and solution of their problems. In addition, farmers can directly contact with agriculture expert for their queries.

10. ANDROID APPLICATIONS (APPS) FOR FARMERS

10.1. Agri. Assistant

An android application of Agri. Assistant was launched by the LMKT with the collaboration of Punjab Agriculture Department on August, 2017. This mobile application has enabled farming community about monitoring of soil conditions in conjunction with weather forecasts to help farmers' plan for the planting and harvesting season. It is the first application of its kind in Pakistan to offer farm marking on a digitalized map for real-time collection of soil samples. The application also enabled District Officer of Agriculture (DOA's) to locate their assigned areas and mark farm boundaries specific to each farmer on the field maps.



10.2. Khushal Zamindar

Khushal Zamindar is a digital platform, which was launched on October 16, 2018 after an agreement made between Telenor Pakistan and Winrock International, a leading provider of social, agriculture and environmental solutions. Khushaal Zamindar provides access to real-time weather conditions, tips for effective harvesting and live audio advisory services to farmers through mobile phones. Farmers of Sindh and Punjab regions including Thatta, Mirpur Khas, Hyderabad/Matiari, Umerkot, Tando Allah Yar and Khairpur in Sindh; Shiekhpura, Multan, Muzaffargarh, Khanewal, Bahawalpur and Lodhran in Punjab are enjoying this services.



10.3. Ba-Khabar Kissan

It is a free of cost service with SMS, IVR, and mobile app features for farmers, providing them with latest market rates, weather forecast, agricultural advisory, best practice tips, animal husbandry section to buy products and news related to agriculture and government schemes. There is also a free helpline for access to Agri-experts for any crop or livestock related issues, mainly in rural Punjab and Khyber Pakhtunkhaw. Currently “Ba Khabar Kissan” has about 1.5 Million subscribers with 19 Million SMSs/month being sent out, over 420,000 IVRs/month being carried out and 15,000 calls/month being made to the subscribers (PTA Annual Report, 2018).



10.4. Agriculture Corner's Mobile App

Agriculture Corner (Agricorner.com) is a social networking platform for Pakistani farmers, who allows them to directly interact with other farmers, extension workers, scientists and allied professionals/ institutes, irrespective of their geographic location. Agriculture Corner provides farmers an instant access to following services;

- Market prices
- Weather forecasts
- Farm advisory
- News around the globe etc
- Information on livestock and dairy



10.5. Agri Smart

In order to help agriculture extension workers for effective agricultural developments, Punjab Public Management Reform Program (PPMRP) introduced an application for agricultural interventions named Agri. Smart. This application covers full scope of the Agriculture Department Extension Wing. It enables agriculture extension workers to obtain information related to farming and agriculture. Moreover,



the database of the reported activities is also used to plan more effective agricultural interventions.

10.6. E-Kissan Pakistan

It's an app for helping farmers to grow their crops with latest technology. It contains weather information, recent or hourly basis for whole of the week. User/farmer can add their crops in this app by which necessary information regarding their crops like tips of the day will be provided. Farmers can also check prices of different fertilizers and pesticides.



10.7. Khushal Aangan

Telenor Pakistan in partnership with Punjab Livestock and Dairy Development Board (PLDDB) launched a dedicated free of cost IVR service for female farmers in Punjab called 'Khushaal Aangan' on December 05, 2017. The aim of this service is to empower Pakistan's female farmers and to educate them on agriculture, livestock rearing, family health and much more. Female farmers simply need to dial 727251 to subscribe to the service and get information regarding livestock rearing, family health, nutrition, hygiene and sanitation.

10.8. Zarai Baithak

It is an online interactive agricultural information portal where farmers can also access through a number of information centers established in selected villages and equipped with operators. This portal was developed by the Institute of Agri Extension & Rural Development, University of Agriculture, Faisalabad, with support of the University's Endowment Funds Secretariat and United States Department of Agriculture (USDA) on 2010-11. Department of Agriculture (Punjab) is also a partner of this initiative.



11. MECHANISMS OF AGRICULTURAL INFORMATION SERVICE SYSTEMS IN CHINA

There are different ways in developing, deploying and managing agricultural information services in China. The service mechanisms can be categorized into three types which have following advantages and disadvantage:

1. Government-led
2. Market driven
3. Community self-support

11.1. Government Led.

In this mechanism beneficiaries are farming community. This model is based on the fact that government support & services are free of charge and fully funded by the government. The government-led mechanism depends on the government system structure and normally follows a top-down approach. The initiatives are developed from MOA and promoted through the management systems from agricultural departments in provincial cities, agriculture bureau or agricultural promotion centers in counties. They are finally implemented in agricultural stations in villages. The advantages of this hierarchical implementation system are effective control and coordination of resources. This mechanism has also advantages of supporting policies, regulations and adequate human & financial resources. However, disadvantages are the government oriented organizations may be lack of effective incentives. The services provided are not always originated from farmers' requirements. As a result, farmers may not be highly motivated to use the services.

11.2. Market driven

The market driven mechanism refers to the development and provision of information services to individual farmers by commercial enterprises. Farmers pay for the access and usage of information, so information service providers can make profit from their investment. Currently the mechanism of using the market driven approach to develop commercial agricultural information service systems in China is still in the preliminary stage because the rural information market is not sufficiently matured due to the risk involved. The market driven mechanism is suitable for regions where farmers have high financial capability, know their information needs, and are motivated to pay for the valuable

information. The major advantage of this mechanism is that it is demanded driven and can be a win-win situation for both information enterprises and farmers.

11.3. Community support

The community support mechanism is that information services are organized by local communities. They finance the information provision through their own funds. Typical communities are farmers' co-operative organization, professional agricultural technology associations, industry associations, etc. The members get benefits, from the information provided by the community. Because the government policy encourages the development of community self-support approach, it is becoming a popular and important model for rural agricultural information dissemination. The community self-support mechanism must follow certain policies and regulations that are set up by the government. This mechanism is more suitable for well-developed regions where farmers may have certain investment capability as well as information analyzing and processing capabilities.

12. ROLE OF ZARAI TARAQIATI BANK LIMITED (ZTBL)

Zarai Taraqati Bank Limited is the only Agri. financial institution which is uplifting agriculture sector of the country through provision of credit facilities and dissemination of latest agriculture information to the farming communities. As a Corporate Social Responsibility (CSR) activity, the Bank is continuously introducing latest agriculture information and creating awareness among farmers about latest Agriculture technologies to enhance their farm productivity. In order to disseminate innovative agriculture practices and production technology packages of various crops, technical knowledge and professional skills to the farmers to increase their productivity and income, the Bank has been launching following initiatives:

12.1. Farmers Training Centers

The Bank has established 50 Farmers Training Centers (FTCs) each covering agro-ecological zone across the country, where various agri. related activities are being carried out by the Mobile Technical Officers (MTOs)/Mobile Credit Officers (MCOs). These activities are soil/water tasting, biogas, artificial insemination, animal vaccination, de-worming, use of hybrid/improved seeds, balanced use of fertilizer and demonstration of plots. Through these activities, training of 60-100 farmers through 8 field days was carried out wherein 215 demo plots were established, 8 solar energy tube wells, 1 biogas units, plastic tunnels, drip and sprinkler irrigation and use of Hybrid seeds were arranged in 2018. In addition to this, various other agriculture tech expos and livestock, dairy, poultry, Kissan Convention Exhibition 2018 were held at Lahore, Layyah, Peshawar and Larkana etc.

12.2. Agri Technology Website

A web site of "Technology for Agriculture" available on www.atd.ztbl.com.pk was launched on November 03, 2015 to disseminate latest Agriculture information to the farmers. Farmers can obtain information by using this website in following parameters:

- Production technologies of different major field crops, vegetable and fruits.

- Brochures on crop
- List of Progressive Farmers
- Case studies
- Weather forecast
- Monthly Agri. Outlook
- Agri. News
- Monthly Agri. Business Supplement

12.3. ZTBL's Farmers Portal

The Bank has Farmers' Portal (unique in terms of itself) which is available on ZTBL website at <https://www.ztbl.com.pk/farmers-portal/> link, where farmers can get information on following features on free of cost basis.

- Weather Updates
- Soil information & diagnostics
- Plant tips
- Pest and insecticide information/tips
- Fertilizer Information
- Livestock and aquaculture (fishery) information
- Disease and remedy information/tips

These features are to be uploaded on seasonal basis and refreshed on weekly basis. However, farmers can access this facility and listen pre-recorded agriculture information through IVR (Inter Voice Recognition) as well as SMS (Short Message Service) at any time.

12.4. Call Center

In order to provide information related to Agriculture, Banking operations and other queries generated by external customers and internal customers, farmers may call on the help line No 051-111-30-30-30. This helpline is supporting the complete value chain of agro economy. The information is disseminated by this service can be divided into several major areas like:

- Production and Cultivation Techniques
- Diseases and Insect Information
- Plant Nutrients and Water Usage
- Educations and Health Information

Farmers may also contact directly to the Agriculture Specialists for solution of their problems/queries through this call center. Farmers may subscribe this service by simply dialing the ZTBL call center and request for activation or simply enter your Mobile Number on the Service Subscription Text box on the link given above.

12.5. Publications/Print Media

The Bank has two monthly publication namely Agri. Business Supplement and Agriculture outlook.

a. Monthly Agri. business supplement

It is a compendium of research articles on various topics related agriculture, food security, poultry, dairy and livestock development etc for information and motivation of stakeholder. For motivation of farmers to adopt latest technologies and to enhance their income level, this supplement/magazine also comprises of a success story of a progressive farmer. Moreover to keep up to date farming community regarding ongoing crops, fruits and vegetables Zarai Sifarshat in Urdu language are also included as a part of the publication.

b. Monthly Agriculture Outlook

This report or publication contains current crop situation, weather advisory, water situation, area & production of crops, import & export situation and Zarai Sifarshat in Urdu language. These Zarai Sifarshat are displayed on each branch of the Bank for guidance of farming community.

c. Packages on Crop Production technologies/Brochures

The Bank has also prepared leaflets and brochures on production technologies of fruits, vegetables and field crops, which are available in printed form and on official website of agri. technology website of the Bank.

List of Publications both in English, Urdu and Local Languages

Production Technologies of Fruits

1. Fig (in Urdu & English)
2. Grapes (in Urdu & Sindhi)
3. Guava (in Urdu)
4. Lemon (in Urdu)
5. Olive (in Urdu)
6. Pomegranate (in Urdu)
7. Strawberry (in Urdu)
8. Peach (in Urdu)
9. Production of squash from fruits at home level (in Urdu)
10. Falsa (in Urdu)
11. Olive (in Urdu)
12. Date (in Urdu)
13. Citrus Fruits ((in Urdu & English)

Production Technologies of Vegetables

1. Chillies (in Urdu)
2. Pease (in Urdu)
3. Pease (in Urdu)
4. Pot Culture (in Urdu)
5. Potato (in Urdu)
6. Tomato (in Urdu)
7. Tunnel Farming (in Urdu)
8. Bitter Gourd (in Urdu)
9. Brinjal (in Urdu)
10. Potato (in Urdu)
11. Kitchen Gardening (in Urdu)
12. Potatoes disease and their control (new) (in Urdu)
13. Coriander (in Urdu)
14. Carrot (in Urdu)

Production Technologies of Crops

1. Wheat weeds & its control
2. Rice (in English & Sindh)
3. Sugarcane
4. Mung Bean (in English & Sindhi)
5. Ground Nut (Sindhi)
6. Gram (in English & Sindhi)
7. Sunflower (in Urdu & Sindhi)
8. Canola (in Urdu)
9. Maize (in Urdu)
10. Garlic (in Urdu)
11. Cotton (in Urdu)
12. Lentil (in English & Sindhi)

Livestock /Dairy Development

1. Apiculture (in Urdu)
2. Care of Animals during Raining Season (in Urdu)
3. Fish Farming (in Urdu)
4. Poultry Farming at Home Level (in Urdu)
5. Cattle Farming in Pakistan (in Urdu)
6. Fattening of Calf (in Urdu)
7. Quail Farming (in Urdu)
8. Ostrich Farming (in Urdu)

Medicinal Crops

1. Isapghol (in Urdu)
2. Moringa (in Urdu)
3. Kalonji (in Urdu)

Fodder Crops

1. Mott Grass (in Urdu & Sindhi)
2. Green Fodder (in Urdu)

Agriculture Machinery

1. Agriculture Machinery Catalog (in Urdu)
2. Ridger (in Urdu)
3. Chilling Unit (in Urdu)
4. Air Blast Sprayer (in Urdu)
5. Milking Machine (in Urdu)
6. Silage Baler cum Wrapper (in Urdu)
7. Seed Sowing Machine (in Urdu)
8. Reversible M.B. Plough (in Urdu)

Others

1. Rat Control in Crop (in Urdu)
2. Safe Preservation of Grains (in Urdu)
3. Rules of Maintaining Soil Fertility (in Urdu)
4. Insecticides Catalog (in Urdu)
5. Agriculture Equipments (in Urdu)
6. Mushroom Production Technology (in Urdu)
7. Climate change and its impact on Pakistan Agriculture (in Urdu)
8. Green Banking (leaflet)
9. Pest Scouting (in Urdu) Referred

13. REFERENCES

- Shahzad, B. and Salman A.2010 Agricultural Extension Services in Pakistan: Challenges, Constraints and Ways forward. Enabling agricultural policies for benefiting smallholders in dairy, citrus and mango industries of Pakistan – Project No. ADP/2010/091

- Abdullah, Li Cui Xia, Jia Li, Sidra G. Yasir M, Mazhar N. Ishaq and Shah S. 2014. Effectiveness Comparison Between the Farmers Field School and the Training & Visit Approaches of Agricultural Extension in Two Districts of Pakistan. American-Eurasian J. Agric. & Environ. Sci., 14 (1): 33-39, 2014 ISSN 1818-6769 Muhammad
- Khatam., A, Sher M. Badar N. S, Muhammad Z. Y. H, Ijaz A, Muhammad Z. K and Aijaz K.2013. Communication of Agricultural Information through Group Contact Methods in Pakistan. Pakistan J. Agri. Res. Vol.26 Issue 3
- Baig.M.B. and Aldosari. F. 2013. Agricultural Extension in Asia: Constraints and Options for Improvement. J. Anim. Plant Sci. 23(2):2013.619
- Mumtaz A B, and Gopal B. T. 2019.Review of the agricultural extension modes and services with the focus to Balochistan, Pakistan. Journal of the Saudi Society of Agricultural Sciences 18 (2019) 188–194
- Farooq. A, Muhammad I and Nisar A. S. and Robina K.2010. Agricultural Extension Agents and Challenges For Sustainable Development (A Case Study of Peshawar Valley) Sarhad J. Agric. Vol 26, No.3, 2010 419
- Zhang Y. Lei W and Yanqiag D.2016. Agricultural information dissemination using ICTs: A review and analysis of information dissemination models in China. Available at www.sciencedirect.com
- Fakhar, I., Awais. A, B. N. Siddique and Khalid. M. C. 2018., Role of ICT's in Agricultural Development: A Case Study from Jazz Ba-Khabar Kissan Service The International Journal of Humanities & Social Studies (ISSN 2321 - 9203) Vol 6 Issue 5 (275-280)
- Slavoljub M., .2014.The Role and Potential of Information Technology in Agricultural Improvement Economics of Agriculture 2/2014 UDC: 004.738.5:631 Review Article
- <http://www.agricorner.com/agriculture-corner-launches-mobile-app-for-farmers/>
- <http://agrinfobank.com.pk/10-best-agriculture-website-for-farmers-in-pakistan/>
- <https://www.lmkt.com/lmkt-to-launch-agri-assistant-mobile-application-for-improving-farmer-welfare-in-punjab/>
- https://play.google.com/store/apps/details?id=pk.gov.pitb.agrismart&hl=en_US
- <http://www.pakissan.com/english/news/newsDetail.php?newsid=26722>

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