

# Characterization of the seed demand dynamism in wheat growing areas of Ethiopia

Bedada Begna<sup>1\*</sup>, Karta K. Kalsa<sup>1</sup>, Tesfaye Solomn<sup>1</sup>, Astawus Esatu<sup>1</sup>, Abebe Atilaw<sup>2</sup>  
Abera Gemechu<sup>3</sup>, Daniel Tilahun<sup>4</sup>, Sultan Usman<sup>5</sup> and Awel Zeberga<sup>6</sup>

1, Wheat Center of Excellence (WCoE), Kulumsa Agricultural Research Center (KARC), Assela, Ethiopia,

2, Ethiopian Institute of Agricultural Research (EIAR), Addis Ababa.

3, Debrezeit Agricultural Research Center (DZARC)

4, Amahara Agricultural Research Institute (ARARI)

5, Sinana Agricultural Research Center (SARC)

6, Areka Agricultural Research Center (AARC)

## Abstract

Availability and access to seed of improved varieties is a key factor contributing for enhancement of wheat production in Ethiopia. Even though farmers have become aware of advantages of seeds of improved varieties through the consolidated efforts of the research and extension systems, seed demand dynamism in the wheat seed system is noticeable in Ethiopia. Therefore, the present study was designed to characterize the seed demand dynamics in major wheat growing areas and to indicate the possible options that improve its access and utilization by the stallholder farmers. The study was conducted in three purposively selected regional states of Ethiopia and totally 756 wheat producer household heads were interviewed in simple random sampling method. Furthermore, Focus Group Discussions were held with the respective key informants to validate the data collected from the selected respondents. Results indicated that in the past five years 80% of the respondents used improved wheat seeds; however, the regular users were only 33.7%. Shortage of supply, high price, and untimely supply of quality improved wheat seeds were the factors that reduced its regular utilization. The farmers' demand for improved wheat seeds varied across the time because of the miss-match among variety preference, financial availability, change in rainfall trend and shortage of supply. Accordingly, out of 756, 43.3% respondents changed their demand for improved seeds in 2012. In order to enhance farmers' utilization of improved wheat seeds to improve wheat production and productivity; facilitating credit services, improving wheat research for variety development, and improving timely supply of improved wheat seeds are the points that need due consideration in wheat producing regions of Ethiopia.

**Keywords:** seed system, wheat, seed demand, Ethiopia

## 1. Introduction

In Ethiopia, sustainably enhancing wheat production and productivity is imperative to maintain food security and to feed the rapidly growing population and urbanization. Availability and access to seed of improved varieties is a key factor contributing for enhancement of wheat production in Ethiopia. Increasing quality and usage of improved seed (along with other best practices such as irrigation, fertilizer adoption, and mechanization) has the potential to dramatically increase Ethiopia's annual crop production (IFPRI, 2010).

Failure to use appropriate seed, while investing sufficiently on other inputs and management practices, usually yields against expectations. This can be observed in the improved seed coverage and national wheat productivity in Ethiopia. During the main rainy season of 2012/2013, of 1.63 million hectare of land covered with wheat, only 4.35% was sown with seeds from the formal sources (CSA, 2013) indicating that the vast majority of seeds used by small farmers in the country is obtained from the farmers' seed system. However, improvements have been observed in improved seed supply in recent years, Dawit Alemu and Spielman (2006) had summarized that only 20% of the demand for improved seed was covered in the main rainy season of 2005 demonstrating that nearly 3000 tons of improved wheat seed is required to satisfy the existing demand.

Experience has shown that the predicted demand for wheat seed usually does not conform to the demand at planting times. When farmers revise their expectations of rainfall, prices and other factors, they incline to shift their interests. This frequently causes significant coordination problems for seed suppliers. This is well evidenced by the present national scaling up initiative by the EIAR and seed sell reports by seed suppliers. Hence, clearly defining demand dynamism for wheat seed has a crucial importance. Therefore, the study was initiated to characterize the wheat seed demand dynamics and identify options for targeted supply of early generation of certified seed to the producers.

### 1.1. Conceptual and historical background of wheat production

With the rapid increase in population and urbanization, the demand for wheat production has been increasing. To meet up growing demand without importing wheat, area under wheat should be increased (Kamruzzaman and Mohammad, 2008). As stated in Mesay et al (2013) and Abeyo et al. (2012), Ethiopia is one of the largest grain

producing countries in Africa, although it is still a food insecure country and a net importer of grain, it is the second largest wheat producer in sub-Saharan Africa, after South Africa. For the crop year of 2012/2013, from the total land allocated for cereal crops, wheat stands in fourth by covering 13.25% of the total areas preceded by Tef, Maize and Sorghum (CSA, 2013).

The use local and low-yielding varieties, incidence of diseases and pests, poor agronomic practices and declining soil fertility have been identified as major constraints to low wheat production and productivity in Ethiopia (Chilot et al, 2012 and Mesay et al, 2013).

## **1.2. Review of seed systems concept in Ethiopia**

The Ethiopian seed system has been evolving in attempt to ensure the availability required type of seed in the required quantity and quality at affordable price. Seed system in Ethiopia represents the entire complex organizational, institutional, and individual operations associated with the development, multiplication, processing, storage, distribution, and marketing of seed in the country (Abebe and Lijalem, 2011). In line to this, EAIR/FRG II (2012) indicated the existence of multiple challenges in the system due to limited capacity and lack of role clarity of the different actors, the focus of the system on a very few crops and varieties, mismatch between supply and demand resulting in shortage and excess inventory, and degradation of seed quality because inappropriate production practices, storage and transport facilities. Farmers, particularly smallholder ones, are involved in multiple kinds of seed systems, which can guarantee them in obtaining the quantity and quality of seeds they need and to market their produce.

Seed systems in Ethiopia can be divided into two broad types: the formal system and the informal system (sometimes called local or farmers seed system). Both systems are operating simultaneously in the country and difficult to demarcate between the two. There is however, a fact that the formal system is the original source of improved seeds in the informal system. There is also a system referred to as integrated seed system. Other forms of seed systems operating in both systems also exist such as Community-Based Seed System (CBSS). Though not well developed, few commercial seed systems, as part of the formal system, are also operating in the country.

According to Bishaw et al. (2008), the Ethiopian formal seed system was introduced five decades ago with the activities of crop improvement research by the existing research and higher learning institutes; nevertheless, it has not developed as expected due to multiple reasons (Yonas, 2012) related to lack of organizational set up, inadequacy of on trained manpower and limited private participation. In the context of some countries like Ethiopia, the informal system is extremely important for seed security. The bulk of seed supply is provided through the informal system, implying its importance in national seed security. The informal seed system (either self-saved seed or farmer-to-farmer seed exchange) accounts for 90% of the seed used by smallholder farmers (Belay, 2004), while the share of improved seed is less than 10% (FAO-CDMDP, 2010). As stated in Abebe and Lijalem (2011) the key reasons why the majority of Ethiopian farmers show a tendency of depending on the informal system are- it is relatively cheaper and readily available in the farmer's villages at required time and it allows use of seeds after testing on primary adopter farmers.

## **2. Research methodology**

### **2.1. Sampling technique**

Multi-stage sampling procedures were employed to select the sample respondents. In the first stage, three regions (Oromia, Amahara and Southern Nation Nationality People (SNNP)) potentially producing wheat were purposively selected among regions in Ethiopia and the administrative zones in the selected regions were stratified into two groups based on wheat production potentials (major producers and relatively less producers). In the second stage, two to three zones were selected purposefully based on accessibility among the listed major wheat producing zones in each selected regions. Thirdly, a team of researchers selected districts based on the wheat production potential within administrative zones. In the final stage, household heads in the selected Peasant Associations (PAs) of the selected districts were listed and based on the limited resource and time at the disposal of the researchers, totally 756 farm households were selected randomly as per the district's wheat producers size determined in the prior stage.

### **2.2. Method of data collection**

The imperative data needed to be captured by the study were collected from both primary and secondary sources. The primary data were collected through household survey and focus group discussions (FGDs) held with farmers and concerned development stakeholders (key informants). A semi-structured questionnaire was used for the field interviews. In addition to the questionnaire survey, FGDs were made with randomly selected farmers and key informants including community leaders, development workers and representatives of governmental organizations. These informal techniques helped to acquire useful and detailed information, which would have been difficult to collect through the questionnaire survey. FGDs were guided by checklists prepared for the

purpose. Furthermore, intensive review of secondary literatures was made before the field survey as well after it so as to realize the results of the study with prior works.

### 2.3. Data analysis

The survey data have been coded, entered into SPSS software, cleaned and checked for consistency. Descriptive statistics such as mean, percentage, cross-tabulations and graphs were used to present the results. Mean difference tests have been used to estimate the significance of the key variables included in the study. Qualitative information collected from the FGD and key informants were used to describe the finding from wider community prospective to complement the survey data.

## 3. Results and Discussion

### 3.1. Farmers' knowledge and perception on improved wheat seeds

More than 96% of the respondents confirmed their accessed to information on seeds of improved wheat varieties; however, the information level or knowledge on the improved varieties varied among the respondents. Local extension service (80%), relatives/neighbors (16.8%), cooperative unions (10%), agriculture research centers (9.5%) and seed enterprises (2.8%) were the sources of information on improved wheat varieties in the study areas (Table 4). About 98% of the respondent perceived that seed of improved wheat varieties from formal sources provides better yield than local seeds. Respondent farmers witnessed the possibility of obtaining 1.5t/ha more yield on average when improved wheat varieties are used together with well agronomic managements over local varieties. The finding is in conformity with previous reports that the direct contribution of quality seed alone to the total production is estimated at 15-20% depending on the crop type, and it can further be raised up to 45% with efficient management of other inputs (Abebe et al., 2012). As mentioned in FGD, majority of the farmers had information on improved wheat seed from formal sources and have positive perception on its advantages. However, they lack direct access to seed of improved varieties from the formal sources (Abebe and Lijalem, 2012) because the formal sector has limited coverage (less than 10%) of the seed needs of the farmers for the dominant staple crops in Ethiopia (FAO-CDMDP, 2010) and it is highly centralized (Dawit Alemu, 2011).

Table 4. Percentage distribution of respondents by the sources of information on improved wheat varieties

Source of information on improved wheat varieties	Region			
	Oromia n=311	Amahara n=210	SNNP n=235	Combined N=756
Local extension contact	73.3	85.2	83.8	80.0
Agriculture Research centers	12.5	7.1	7.6	9.5
Seed enterprises	2.0	3.3	3.4	2.8
NGOs (non-government organizations)	4.5	5.2	6.8	5.4
Relatives & neighbors	22.2	9.1	16.6	16.8
Cooperatives/ unions	11.6	8.1	10.0	10.1

Note: Percentages do not add up to 100 because of multiple responses

### 3.2. Farmers' seed use and seed sources

The extent of farmers seed use is influenced by several factors such as availability, finance, pricing, timing and awareness. About 80% (including both regular and irregular users) of the respondents used seed of improved wheat varieties though the proportion of regular users was limited only to 33.7% in the past five years. Irregularities in seed use are attributed to shortage of supply (29%), lack of finance (24%), high seed price (22%), untimely supply (12%), lack of awareness on seed of improved varieties (12%), and lack of trust on quality of improved seed or suppliers (12%) (Table 5). In the past five years, the non-user respondents also could not use seed of improved wheat varieties due to lack of finance and awareness, untimely supply, lack of trust on improved seeds or suppliers and high price of related packages like fertilizer. The majority of the respondents (more than 90%) complained on the regular access to seed of improved wheat varieties which could be attributed to different factors like shortage combined with institutional factors related to transportation and distribution of seeds.

Table 5. Reasons that hindered utilization of seeds of improved wheat varieties in the past five years (percentage distributions)

Reasons raised by irregular users	Oromia (n=311)	Amahara (n=210)	SNNP (n=235)	Total (N=756)
Shortage of supply	28.0	33.3	27.6	29.4
Lack of finance	24.4	26.2	21.7	24.1
High price	22.0	22.0	22.5	22.1
Untimely supply	16.7	18.6	20.0	12.3
Lack of awareness/ interest	9.0	12.4	16.6	12.3
Lack of trust on (improved seeds and suppliers)	10.0	13.0	14.5	12.2

Farmers get seed from both formal and informal sources. Seed enterprises, research system, and cooperative unions are key players in the formal systems while the neighboring farmers, relatives, local markets and seed saving constitute the informal sector. Farmers accessed to wheat seed from different sources among which cooperatives or unions (34.4%), seed enterprises (21%) and neighboring farmers (18.4%) were the major sources in Ethiopia. The predominance of cooperative unions in seed supply is due to the centralized seed marketing and distribution scheme prevailing in the country (Dawit Alemu, 2011). The unions are the major gates where smallholder farmers have access to agricultural inputs in Ethiopia. In Oromia regional state, farmers mainly obtain improved wheat seed from cooperative/union (45%) and neighboring farmers (29%) (Table 6).

Table 6. Sources of improved wheat seed in major wheat producing regions of Ethiopia

Wheat seed source	Oromia	Amahara	SNNPP	Total
Seed enterprises	5.1	30.5	33.6	21.0
Research centers	4.0	2.0	5.5	3.8
NGOs	2.3	1.0	6.0	3.2
Cooperative unions	45.3	40.0	14.5	34.3
Neighboring farmers	28.6	8.6	15.2	18.4
Relatives	4.5	0.0	4.3	3.0
Local markets	4.0	9.0	4.8	5.2
Own saved see	2.3	0.0	5.2	2.5

### 3.3. Seed demand and its dynamism

The seed demand of wheat producers is correlated with the farmers' trust or perception and level of awareness on the seed of improved wheat varieties. In line with this, as stated above about 98% of respondents in the study area indicated their good perception on seeds of improved wheat varieties for better yield which further indicate the farmers' high demand for seed of improved wheat varieties. Even though the farmers have high demand for improved wheat seeds, their demand varied from time to time.

Farmers' original demand is collected by the development agents (DAs) at peasant association (*kebele*) level and presented to district agricultural office and the respective cooperative unions. The total demand for wheat seed from all districts is summarized at regional state BoA level and finally submitted to the MoA. Based on the available certified seed stock at the seed enterprises the Ministry of Agriculture makes appropriations to regions as per their demand gathered from the respective unions. The supply then flows down from Ministry to region and from region to cooperative unions which distribute seed again to farmers' primary cooperatives. In this long chain, when improved seeds arrive at farmers' village (primary cooperatives) a large number of farmers fail to take and use the seeds as per their original request. Similarly, among 756 respondents more than 42% changed their plan of seed request and this attributed for the loss of improved seeds in warehouses at different segments of seed supply chain. The reasons cited for the change of seed requested by farmers were change in trend of rainfall (19%), variety preference and lack of new variety (26.6%), lack of finance and other complementary packages (25.5%), and shortage and untimely supply (7.5%) (Table 7).

The existing wheat seed price is one important factor contributing for changing seed demand of farmers. However, evaluation of seed price varies among farmers depending on the farmer's level of awareness and experience on improved seed utilization. Farmers' evaluation of seed price during 2012 indicated that it was cheap for 5%, affordable for 31% and expensive for 51% of 756 respondents in wheat producing regions of the country.

Table 7. Percentage distribution of respondents based on reasons for changing seed demand

Reasons for changing seed demand	Orimia (n=311)	Amahara (n=210)	SNNP (n=235)	Total (N=756)
Change of trend of rainfall	3.8	24.8	33.6	18.9
Change of variety preference	11.1	34.8	39.2	26.6
Lack of finance	8.4	18.6	54.5	25.5
Shortage of supply & untimely supply	8.7	6.7	7.6	7.5

Time of improved wheat seed availability determines the farmers' level of improved seed utilization. The influence of timely availability of improved seeds is significant for enhancing the farmers' adoption of improved wheat seeds according to the key informants included in FGD. The survey result indicated that some farmers start to search and purchase improved wheat seed in December and January whereas majority of the respondents requested for improved seeds in March, April and May. Because of unavailability of improved seed early on time of request, majority of the respondents actually purchased in May and June (Fig 1). The untimely availability issue contributed for a significant number of farmers to use own saved wheat seed as stated by the farmers in FGD.

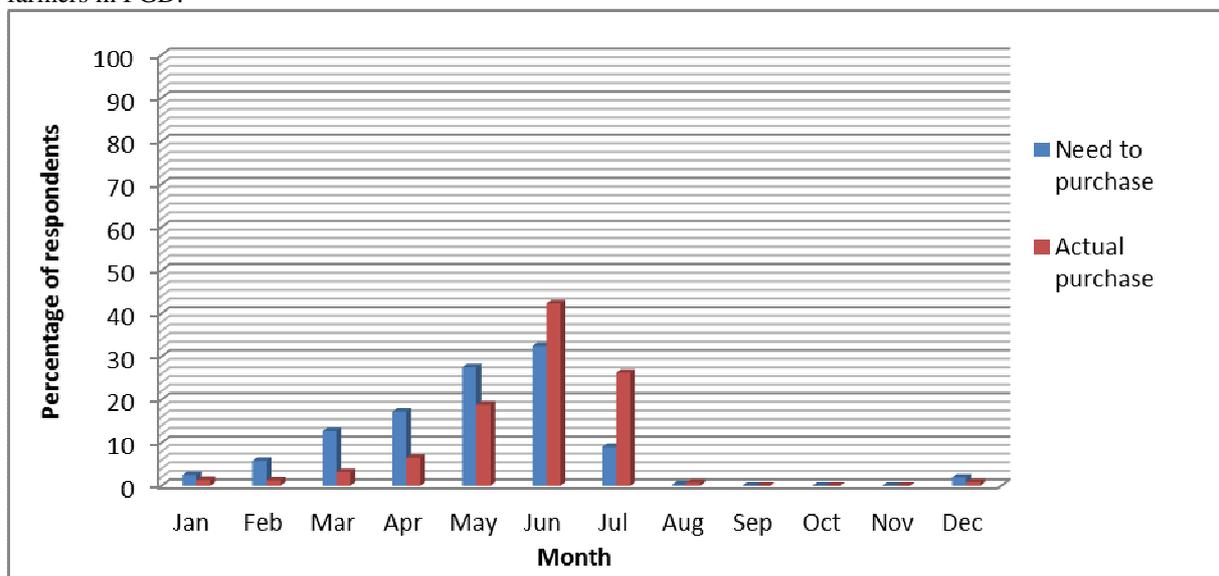


Figure 1. Time when farmers' want to buy improved wheat seed and actual bought

#### 4. Conclusion

Availability of good quality seed of improved varieties at required amount and time and in affordable prices is a milestone for developments to be recorded in wheat production. Failure to use appropriate seed, while investing sufficiently on other inputs and managements, usually yields below expectations. There is adequate information with farmers on advantages of seed of improved wheat varieties. The information about improved wheat technologies are mainly accessed to farmers by the help of agricultural extension system and information exchange with relatives/neighbors.

There is always mismatch between the original demand for seed of improved varieties from formal sources and the demand at planting times. When farmers revise their expectations of rainfall, prices and other factors combined with untimely supply of improved seeds, they incline to shift their requests. Furthermore, the mismatch between time of actual seed availability and farmers' seed request is the important factor attributed to seed demand dynamism among farmers. Farmers request for seed is high in March, April and May though the existing formal seed supply system is not ready in those months. Formal supply is high in June on contrary to the farmers' request.

Even though farmers have different perceptions on wheat seed quality, the major criteria that are used by the respondents to determine wheat seed quality were freedom from admixture, field emergence, freedom from disease (discoloration) and yielding potential. In this regard a significant number of respondent have complain on the quality of seeds supplied through formal system.

#### 5. Recommendations

Hence, to enhance the utilization of improved seed that contributes for boosting of wheat production and productivity the following points are recommended based on the study outputs.

- Improving linkages among seed producers and processors to enable timely supply of improved seeds to

farmers

- Farmers should have direct access to seed sources: seed sales should be allowed at any time of the year to farmers in their vicinities.
- Seed producers in the formal sector should reconsider their quality management system and there must be a strict procedure of seed certification that can safeguard the smallholder farmers from use of poor quality seeds.
- Facilitating credit services, strengthening wheat research and new variety development.

### Acknowledgement

This research was conducted with the support from East African Agricultural Productivity Project (EAAPP), Wheat Regional Center of Excellence. We kindly acknowledge the support. We would like to extend our gratitude to the smallholder farmers for devoting their time and sharing their experiences and observations during the interview.

### References

- Abebe Atilaw and Lijalem Korbu (2011). Recent Development in Seed Systems of Ethiopia. Debre Zeit Research Center, Ethiopian Institute of Agricultural Research, Addis Ababa, Ethiopia
- Abeyo B, H. Braun, R. Singh, K. Ammar, T. Payne, A. Badebo, F. Eticha, B.Girma and S.Gelalcha (2012). The performance of CIMMIT wheat germplasm in East Africa with special emphasis on Ethiopia. Wheat for food security in Africa. Science and policy dialogue, October 8-12, 2012.
- Chilot Yirga, Moti Jaleta, Bekele Shiferaw, Minale Kassie and Assfaw Negassa (2012). Analysis of adoption and diffusion of improved wheat varieties in Ethiopia. Wheat for food security in Africa. Science and policy dialogue, October 8-12, 2012.
- CSA. (2013). The Federal Democratic Republic of Ethiopia Central Statistical Agency (CSA) Agricultural sample survey 2012 / 2013 (2005e.c.). Volume I. Report on area and production of major crops.
- Belay Kassa and W. Manig (2004). Access to Rural Land in Eastern Ethiopia: Mismatch between Policy and Reality. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, Volume 105, No.2, 2004, pages 123–138.
- Dawit Alemu and David J. Spielman (2006). The Ethiopian Seed System: Regulations, Institutions and Stakeholders. Paper submitted for ESSP Policy Conference 2006 “Bridging, Balancing, and Scaling up: Advancing the Rural Growth Agenda in Ethiopia” 6-8 June 2006, Addis Ababa, Ethiopia
- EIAR/FRG (2012). Ensuring seed quality in Ethiopian seed system, Status and challenges. FRG II project: empowering Farmers’ innovation, Serious No.3.
- FAO-Crop Diversification and Marketing Development Project (2010). Seed Value Chain Analysis as a means for Sustainable Seed System: a case of farmers based seed production and marketing in ArsiZone, OromiaRegion. Assela, Ethiopia.
- GebreMariam, S., Amare, S., Baker, D., Solomon, A. (2010). Diagnostic study of live cattle and beef production and marketing: Constraints and opportunities for enhancing the system. Seattle, WA(USA): Bill & Melinda Gates Foundation and Addis Ababa, Ethiopia: Ethiopian Agricultural Transformation Agency.
- International Food Policy Research Institute (IFPRI) (2010). Seed system potential in Ethiopia constraints and opportunities for enhancing crop production. IFPRI sustainable solutions for ending hunger and poverty, Working paper I July 2010.
- Kamruzzaman M, Mohammad HI (2008). Technical efficiency of wheat growers in some selected sites of Dinajpur district of Bangladesh. *Bang. J. Agric. Res.* 33(3):363-373.
- Mesay Yami, Bedada Begna, Bedada Girma, Terefe Fita, Tesfaye Sollomon, Werkeye Tilahun, Firdisa Eticha, Ayele Badebo, Alemayehu Assefa, Dawit Habte, Worku Dembel, Zerihun Tadesse and Sollomon Gelalcha, Firew Kelem and Desta Gebre (2013). Enhancing adoption of rust tolerant wheat varieties: Experience of EAAPP in Ethiopia. Ethiopian Institute of Agricultural Research Institute (EIAR) Wheat Regional Center of Excellence (WRCoE)
- Mesay Y, Tesafaye S, Bedada B, Fekadu F, Tolesa A and Dawit A. (2013). Source of technical inefficiency of smallholder wheat farmers in selected waterlogged areas of Ethiopia: A translog production function approach.
- Yonas Sahlu (2012). The Ethiopian seed quality control system. Ensuring seed quality in Ethiopian seed system, Status and challenges. FGR II project: empowering Farmers’ innovation, Serious No.3. pp 9-15.
- Zewdie Bishaw, Yonas Sahlu and Belay Simane (2008). The status of the Ethiopian seed industry. In: Thijssen, M.H., Z. Bishaw, A. Bashir and W.S.de Boef, 2008 (eds.). *Farmers, seed and varieties: supporting informal seed supply in Ethiopia*. Wageningen International.348p.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:

<http://www.iiste.org>

### CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

**Prospective authors of journals can find the submission instruction on the following page:** <http://www.iiste.org/journals/> All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

### MORE RESOURCES

Book publication information: <http://www.iiste.org/book/>

Academic conference: <http://www.iiste.org/conference/upcoming-conferences-call-for-paper/>

### IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library, NewJour, Google Scholar

