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Review

Afghanistan wheat seed scenario: Status and imperatives

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Wheat is Afghanistan's staple food item; however country's food production has been hovering between 2.6 and 5.2 million tons during last decade making imports necessary to feed its 35 million strong populations as of today. Like any other crop production system seed is critical to wheat production also. Availability of new high yielding and disease resistant varieties is not a constraint as the country has released over 35 new varieties since 2000. Organizations engaged in seed production have not been able to produce enough seed coupled with a still evolving system failed to deliver enough of affordable seed to farming community. Things however seem to be improving now as new laws now allow truthfully labeled seed and certified seed production targets aim a 10% seed replacement rate in near future.

Key words: Afghanistan, wheat cultivars, *Triticum aestivum*, certified seed

INTRODUCTION

Afghanistan's wheat production has ranged from 2.6 to 5.2 million tonnes (Figure 1) during last decade (FAO, 2016). However, the Afghan population has been growing steadily and added about 9 million during last decade to grow to about 35 million presently. Afghanistan depends on neighboring countries like Pakistan, Kazakhstan and Iran etc., to meet its wheat needs. The country has been importing varying quantities of wheat annually spending huge foreign currency (CSO, 2016). Ministry of Agriculture, Irrigation and Livestock (MAIL) has estimated that Afghanistan would need about seven million ton wheat by 2022 to achieve self-sufficiency (Waziri et al., 2013). The prospects of achieving two million ton jump in wheat production looks gloomy under present scenario where only 45% of wheat acreage is irrigated (MAIL, 2014), which is the major source of wheat production in the country. A multipronged strategy utilizing more widespread use of improved seed and fertilizer, better crop management and an effective research and extension system is needed to achieve self-sufficiency in wheat production (Waziri et al., 2013).

Seed production scenario in Afghanistan

Seed plays a crucial role in any crop production process. The yield potential seed houses determines the limits that crop management can realize. New cultivars have been shown to contribute up to 52% gain in yields in wheat (Zhang et al., 2013). A study in Afghanistan estimated that use of improved wheat varieties alone could contribute up to 33% incremental yield under irrigated conditions, whereas the use of quality seed could enhance yield further by 28% (Kugbei, 2011). The wheat seed production in Afghanistan has not been able to meet the expectations of farmers and the nation as a whole (Figure 2). The Afghan wheat seed market is estimated to be around 73,000 metric tons which is equivalent to about US$ 25 million (Kugbei, 2006). Agricultural Research Institute of Afghanistan (ARIA) with another government entity *viz*., Improved Seed Enterprise (ISE), and several seed companies operating in various parts of country collectively referred to as Private Seed Enterprises (PSE) are responsible for producing different classes of seeds. This system produced about 23911 tons of certified seed (CS) during 2010-11 seasons but touched a low of around 6295 tons during 2014-15 (Figure 3) (personal communication). An artificial market fueled by uncertain and inconsistent foreign aid supported subsidy has supposedly been the main reason for this underperformance. MAIL has now taken several steps including allowing ISE to produce CS and allowing the provision of Truth Fully labeled (TL) seeds to provide a boost to the growth of a realistic demand driven seed

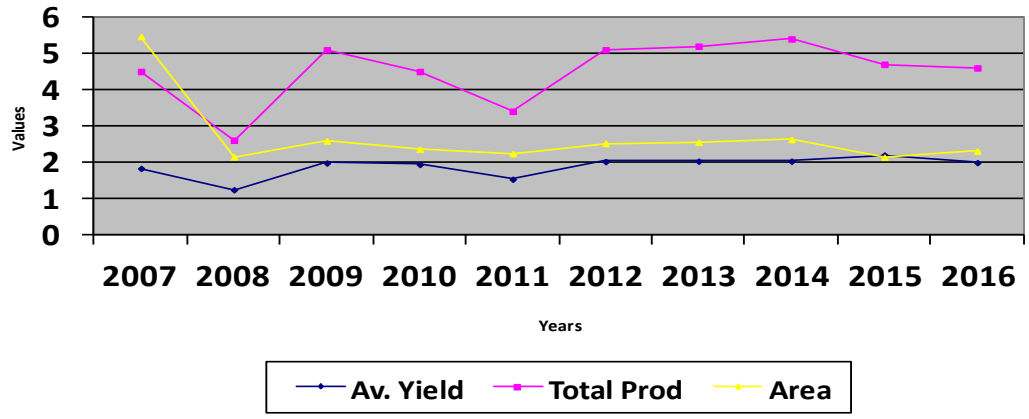

Figure 1: Wheat Area (million hectares), Production (million tonnes) and average yield (tonnes per hectare) for Afghanistan for last decade

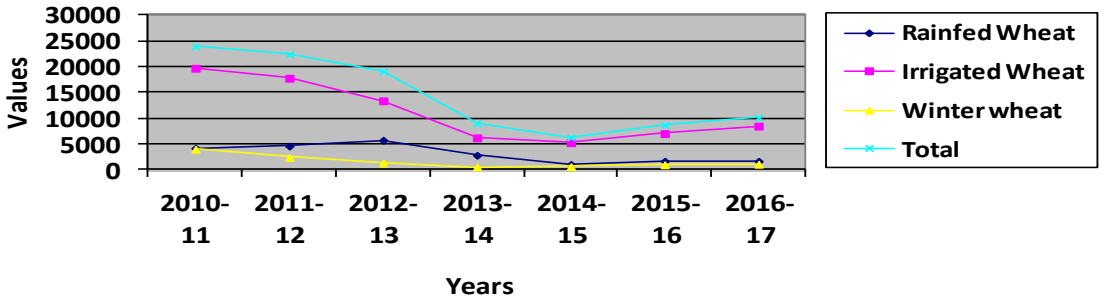

Figure 2: Wheat certified seed production in Afghanistan(tonnes)

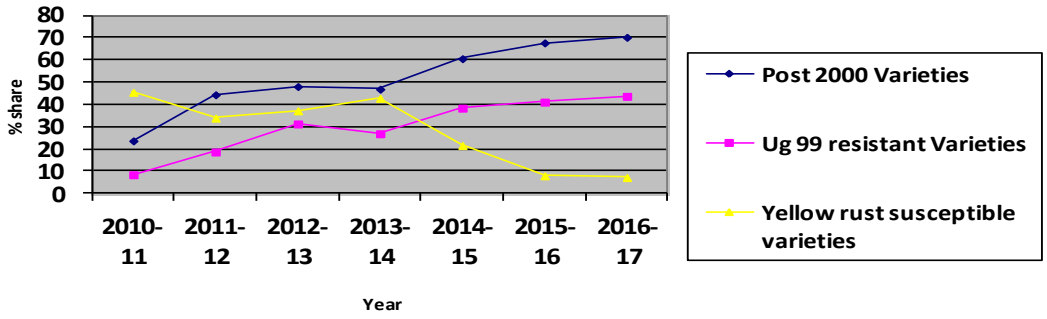

Figure 3: % share of different types of varieties in total CS produced

industry in the country. The steps are showing results and the production target has risen to 15000 tons for 2017-18 season and is planned to produce 30000 MT for 2018-19.

Constraints to growth of wheat certified seed production and suggested interventions

Research and Development

Research and innovation is crucial to accelerate agricultural growth and crop production. Though ARIA, the National Agricultural Research System of Afghanistan has no home grown breeding research but with support from CGIAR centers like International Maize and Wheat Improvement Centre (CIMMYT) and International Centre for Agricultural Research in Dry Areas (ICARDA), the country has been able to develop new high yielding and disease resistant varieties(Kendal and Sener, 2016). Availability of new improved high yielding and disease resistant (Ghanizada et al., 2013) varieties is therefore not a constraint to achieve

Table 1. Wheat varieties released in Afghanistan since 2000

No.	Seed Source/ Origin	YEAR	Cultivar
1.	CIMMYT	2002	Solh -02
2.	CIMMYT	2007	DARULAMAN-07
3.	CIMMYT	2008	DRUKHSHAN-08
4.	CIMMYT	2008	SHISHAMBAGH-08
5.	CIMMYT	2009	MUQAWIM -09
6.	CIMMYT	2009	KOSHAN -09
7.	CIMMYT	2009	BAGHLAN -09
8.	CIMMYT	2010	Chonte #1
9.	CIMMYT	2013	Lalmi 04
10.	CIMMYT	2013	Kabul 13
11.	CIMMYT	2013	Bamyan-013
12.	CIMMYT	2013	36th IDYN #41
13.	CIMMYT	2013	36th IDYN #47
14.	CIMMYT	2013	Balkh Dehdadi-013
15.	CIMMYT/ICARDA	2013	Sheshambagh-013
16.	CIMMYT/ICARDA	2013	Poza-e-shan-013
17.	CIMMYT	2013	Herat Lalmi-013
18.	CIMMYT/ICARDA	2013	Zarin-013
19.	CIMMYT	2015	Wahdat-15
20.	CIMMYT	2015	Afghan-15
21.	CIMMYT	2015	Wafer-15
22.	CIMMYT	2015	Lalmi-15
23.	CIMMYT	2015	Bahar-15
24.	CIMMYT	2015	Elhaam-15
25.	CIMMYT	2017	Lalmi 17
26.	CIMMYT	2017	Durum #3
27.	CIMMYT	2017	Diama 17
28.	CIMMYT	2017	Shamal 17
29.	ICARDA	2000	LALMI-2
30.	ICARDA	2000	LALMI-3
31.	ICARDA	2013	Sheeshambagh-13
32.	ICARDA	2013	Herat Lalmi
33.	French	2009	AUTAN
34.	French	2009	MHO304
35.	French	2009	EXOTIC
36.	French	2009	SOISSONS
37.	French	2009	ANDALOU
38.	French	2009	GUADALOPE
39.	French	2013	Bakhtar 13
40.	French	2013	Milad 13

production gains. The country has released about 38 new wheat varieties since 2000 (Table 1). These new varieties have also been increasingly included in the seed production system (Figure 3). The share of yellow rust susceptible varieties has come down steadily and now stands at about 7% only (personal communication). Similarly, system has been responsive and share of Ug99 resistant variety has gone to 43%. However, transferring this improved genetic potential to farmers i.e., making available enough quantities of seeds on time and at affordable price has been an issue. Providing new varieties and other critical inputs to farmers has been estimated to provide up to 33% gain in wheat yields (Tavva et al., 2017). There seems to be more of systems' issues than external ones causing failure of organizations to produce enough quantities of affordable quality seeds to farmers. Seed banks (Khatri-Chhetri and Agarwal, 2017) are also suggested to tide over seasonal fluctuations in seed production especially in regions depending on rainfall for successful crop production. There is immense scope for private investments in research and development in crop improvement and seed sector in Afghanistan as is happening in the neighboring countries in the region (Pray and Nagarajan, 2012). Almost all companies depend on public bred varieties for their economic viability. Though country is going ahead to bring in required plant variety protection regime to protect the interests of private investors. The plant variety protection act has now been adopted.

Organizations engaged in seed production

ARIA, the country's agricultural research system is

responsible for producing breeder seed. ISE has for long been responsible for producing foundation seed (FS), however recently has also been entrusted with producing CS to bring competition in the field. PSE companies have traditionally been responsible for producing CS, however recently 14 top ranked PSE companies have been allowed to produce both Certified and Foundation seed. Strengthening of seed system to offer farmers more new varieties and discourage the use of less productive, susceptible varieties requires proper planning. Inadequate planning seems to be one of the reasons for this. The present system of setting production targets is a top down approach in which farmers' views or actual demand is at best ignored. There is need to involve farmers, farmer organizations, development agencies and local agriculture department officials to gauge actual demand and then pass it on to seed producing agencies. The demand assessed each year in fact has to look into the future at least three years in advance so that breeder seed targets are set accordingly. Availability of breeder seed in next year would dictate targets for FS and similarly FS availability will determine CS targets in third year. This bottom approach will lead to estimate actual demand and would thus ensure consumption of CS produced.

Pricing

The high price of seeds is another barrier to the use of new, more nutrient use efficient varieties. Absence of a realistic market and determination of prices by ministry leads to artificial prices. Allowing independent companies to produce self-branded seeds like TL seeds would lead to realistic market dictated prices and would fuel their consumption. Government needs to encourage research and seed production in other agriculturally important crops also so that resources of seed producing companies are optimally utilized and their operating cost is reduced. Other suggested ways to address this problem include educating farmers about the optimum seed rate of sowing (for example, through the use of the 2012 wheat fact sheet published by CIMMYT and MAIL), and increasing wheat farmers' seed replacement rate from present less than 10% to at least 25%.

Extension Services

Strengthening of the national extension services to demonstrate and disseminate potential of new seeds to farmers is necessary to achieve gains in wheat production. Afghanistan is in dire need of restructuring not only its national agricultural research system but also extension services, input supply chain, marketing infrastructure, credit availability and some kind of post harvest price protection system. Presence of effective extension services and their utilization by farmers has been shown to be effective in increasing crop productivity (Aurangzeb, 2006). Farmer field demonstration of new technologies is one such tool that allows farmers to experience benefits of technology. It has been revealed (Painkra et al., 2012) that farmers in demonstration areas harvested higher yields compared to where there were no demonstrations. However, it is crucial that organizations involved in extension activities be provided all necessary equipment and support to meet farmers' requirements. ISE and also PSE need to aggressively reach out to farmers to disseminate new varieties. A systematic approach to address these issues will definitely enable Afghanistan be wheat sufficient by 2022.

Conflict of interests

The authors declare that they have no conflicting interests

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