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Characterization of the wheat production practices in the irrigated Dryland lands of Egypt

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Characterization of the wheat production practices in irrigated lands of Egypt

Authors

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1. Introduction

In Egypt, wheat (*Triticum aestivum*) plays a pivotal role in the country's agricultural and economic landscape. It is the major component of the national diet and an essential contributor to food security. Its cultivation in the country has a rich history dating back to ancient times. The Nile Delta has always been an ideal location for wheat cultivation. Historically, Egypt was known as the "Breadbasket of the Roman Empire", highlighting its crucial role in sustaining its population and neighbouring regions. In the country, compared to all crops, it is grown in the largest area (1.33 million ha) and the country produces 9.1 million tons of wheat (average productivity of 6.81 t ha^{-1}) (Source: Economic Affairs Sector, Ministry of Agriculture and Land Reclamation, 2023). Compared to all crops, its cultivation area is increasing in the country. However, it is meeting 50% of the demand from the international market to fill the gap between production and consumption (5.86 million t, one of the top 10th largest importers), where the import value of wheat and wheat products was 2.49 billion USD in 2021 (FAOSTAT, 2023).

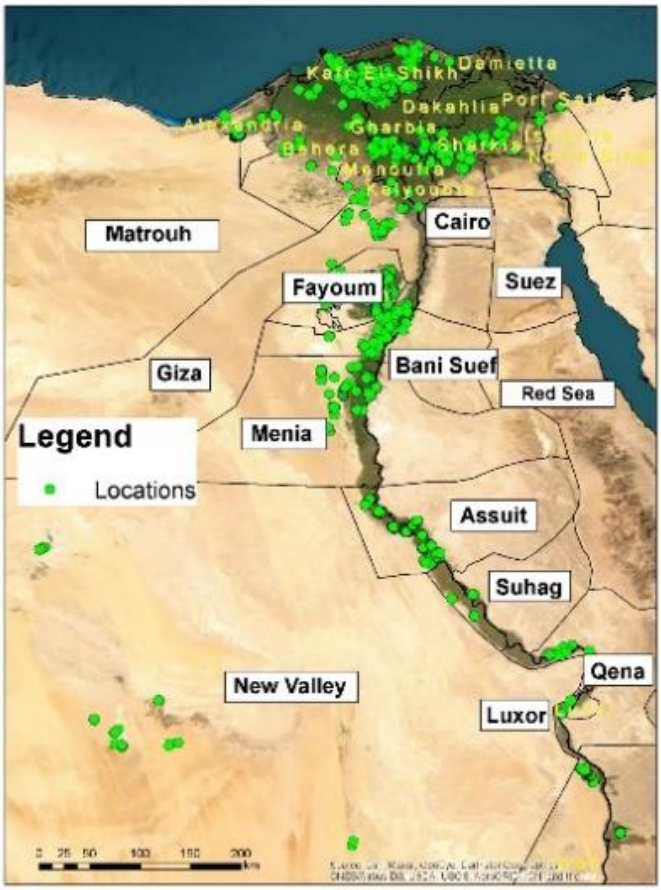

Figure 1. Major wheat growing areas in Egypt

In recent years (2018-2021), Egypt has shown prominence in reducing imports, where it imported 9.53 million tons wheat in 2021/2022 while it decreased by 17.5% (7.86 million tons) in 2022/2023 (Source: Agriculture Economic Research Institute (AERC). However, to reduce imports sustainably, the country might need to adopt both approaches, i.e., area expansion in New Land and sustainably closing the yield gap in the Old Land. Adopting science-led demand-driven and sustainable (economic, environmental, and social) farming practices, including improved crop varieties and efficient agronomic management practices, is the key for the sustainable intensification of wheat production in both new and old lands. By implementing below climate-smart wheat production technology tailored to Egypt›s conditions, farmers can enhance their yields, contribute to the country›s demand, and support its agricultural growth.

To understand the existing production practice in wheat cultivation in irrigated wheat system in Egypt, ICARDA has implemented under F2R CWANA, a CGIAR regional initiative and Excellence in Agronomy (EiA) Egypt use case. The study includes major wheat growing areas covering both old lands and wheat in 2022 wheat growing season.

2. Methodology

2.1 Farmers production practice survey

To understand the existing production practice in wheat cultivation in irrigated dryland system in Egypt, ICARDA has implemented production practice survey in major wheat growing areas covering both old lands and new lands for 2021/22 wheat growing season from 2200 farmer's field.

"Old lands" are the agricultural lands cultivated inside the Nile Valley and the Delta region. It is characterized by clay or silty clay soils, high intensified agriculture system (can be cultivated with 2 or three crops per year), smaller farm holding. "New lands" are the agricultural lands reclaimed and cultivated outside the Nile Valley and the Delta region. It is characterized by sandy soils and more frequent salinity problems, a lower intensified agriculture system compared to old lands, more interest in horticulture and high cash crops, and land holding is medium to larger size**.**

3. Summary

In Egypt, major wheat is grown under old land and wheat area is expanding also in new area. in the study year, the average grain yield of wheat under farmers' current management was 6.4+1.3 t ha^{-1} in old and 4.3+1.7 t ha^{-1} in the new land areas. Yield variability was higher in Newland with coefficient of variation (CV) of 40% which is double of what is in the old lands (Table 3). The mean fertilizer application rate for nitrogen (N) and phosphorus (P_2O_5) were 252 kg ha^{-1} (CV- 21%) and 29 kg ha^{-1} (CV-107%), respectively in the old lands and 213 kg ha^{-1} N (CV-32%), 28 kg ha^{-1} P_2O_5 (CV-92%) in the Newland. The average FYM application rate is comparatively higher in Newland (3.2 t ha^{-1}) than in Oldland (2.7 t ha^{-1}). The average number of irrigations during wheat season was significantly higher in Newland, where the average frequency of irrigation was 11 times in new land compared to 6 times in old lands. The average seed rate used is 143 kg seed/ha in old lands and 150 kg seeds in Newland (Table 1).

Table 1. Characterization over all for new land and old land

Cultivation site	Grain yield (t/ha)	N level (kg/ha)	P level (kg/ha)	Seed rate (kg/ha)	FYM (t/ha)	Frequency of irrigation (No.)
Old land	6.4+1.3	252+54	29+27	143+13	2.7+4.8	6+3
New land	4.3+1.7	213+69	28+26	150+25	3.2+	11

Regional

In Newland the study covered seven different governorates. In the study year, Port Said, Kafr El Sheikh, ElMinya had comparatively higher average grain yield, while Aswan and El-Behera are the lowest average grain yield (3.5 and 3.2 t ha^{-1}, respectively). Frequency of irrigation ranged from 5-18 times during wheat growing season. Farmers in Aswan applied maximum average number irrigation (18 times) and lowest in Alexandira followed by Sharkia and Port said (6 times). The average fertilizer application rate is low in Aswan, where farmers applied 173 kg N and only 3.0 kg P fertilizer, while the average application rate of FYM was highest (6.1 t ha^{-1}). In old land the study covered 21 governorates. Sohag (7.7 t ha^{-1}) followed by El Minya (7.1 t ha^{-1}), Luxor (7 tha^{-1}) Beheira (6.8 t ha^{-1}), and Bani Suef (6.7 t ha^{-1}) were the top five high average yield governate under farmers

management. Fayoum (5.4 t ha^{-1}) and Marsa Matrouh (5.5 t ha^{-1}) had low average yield under farmers management.

Table 2. Characterization of wheat production (yield, economics, input used) under farmers managed fields in different governorates in Old and New Lands production system in Egypt. Values shown in the table are mean ± SD.

Governorate	Grain yield (t/ha)	N rate (kg/ha)	P_2O_5 rate (kg/ha	K_2O rate (kg/ha)	Seed rate (kg/ha	FYM (t/ha)	No. of irrigation
Luxor	7.0±0.6	267+12	77+7	0.0	143	8.5	8
Alexandria	6.3±0.1	201+37	42+0	0.0	171	0.0	4
Aswan	6.6±1.4	351+19	82+8	0.0	149	4.5	10
Asyout	6.6±0.7	246+33	7+13	4.7	142	1.0	8
Bani Suef	6.7±0.8	254+34	45+26	0.0	148	7.4	5
Beheira	6.8±0.7	256+26	49+25	0.0	154	0.0	4
Dakhlia	6.5±1.0	286+45	52+28	0.0	156	0.0	5
Damietta	6.5±0.2	228+19	90+10	0.0	171	0.0	4
El Minya	7.1±1.5	208+61	26+27	0.0	154	7.2	6
Fayoum	5.4±1.8	331+14	10+12	0.0	148	0.0	7
Gharbia	6.6±1.0	234+20	30+15	0.0	171	0.0	4
Giza	6.4±1.2	208+58	34+30	0.0	146	5.6	6
Ismalya	6.0±0.6	250+56	64+19	0.0	162	0.0	6
Kafr El-Sheikh	6.4±1.0	248+30	36+26	2.2	154	0.8	5
Kalyobia	7.4±0.0	191+0	8+0	0.0	171	0.0	6
Marsa Matrouh	5.5±1.2	215+62	19+13	9.7	154	4.4	8
Menofia	6.6±1.3	252+44	35+24	0.0	164	3.7	5
New valley	6.3±1.2	173+5	11+6	0.0	143	18.6	18
Qalyubia	6.5±1.1	237+20	19+4	0.0	170	0.0	4
Qena	6.7±0.5	196+94	0+0	0.0	143	3.7	8
Sharkia	6.4±1.3	244+39	39+25	0.2	159	0.8	5

Sohag	7.7±0.3	330+22	34+11	55.9	143	6.1	6
Average	6.4±1.3	252±54	29±27		143+13	2.7±4.8	6±3

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