Islamic Republic of Afghanistan
Ministry of Agriculture, Irrigation and Livestock
Agricultural Research Institute of Afghanistan

Best Practices in Wheat Production

Zone-Specific Recommendations for:

NORTHERN REGION

Irrigated and Rainfed Systems

Research-Based Recommendations made possible through by collaborative research undertaken by these partners:

USAID FROM THE AMERICAN PEOPLE
GRAIN GRAIN RESEARCH AND INNOVATION
Global Center for Food Systems Innovation MICHIGAN STATE UNIVERSITY
CIMMYT International Maize and Wheat Improvement Center

“This guide is made possible by the support of the American people through the United States Agency for International Development (USAID). The contents are the sole responsibility of Global Center for Food Systems Innovation at Michigan State University, and do not necessarily reflect the views of USAID or the United States Government.”

Introduction

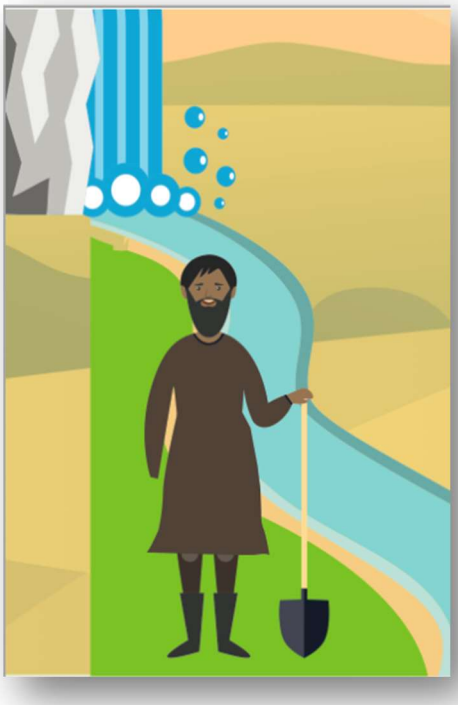
Wheat is strategically an important crop in Afghanistan because it is linked directly to food security and is a major source of nutrition and up to 60% of a family's caloric intake. Although wheat occupies 2.66 million hectares of land, the country does not currently produce enough wheat to meet the growing population's needs. On average, annual production is estimated at 5 million metric tons, and the requirement is at 7 million metric tons. Afghanistan imports approximately 2 million metric tons of wheat flour from neighboring countries to fill this annual production gap. Afghan wheat productivity is the lowest among the neighboring countries (2.0 metric tons per hectare vs. around 3 metric tons per hectare). There is tremendous potential to increase productivity of irrigated and rain-fed wheat in the Northern region by introducing improved agronomic practices and utilizing suitable technologies

This booklet provides research-based information on best management practices regarding the key aspects that contribute to increased productivity of wheat. This includes recommendations for proper sowing dates, nutrient management, weed management, and best stages and methods of irrigation.

This booklet is intended for use by agricultural extension staff in the Northern Zone. Recognizing the agro-ecological diversity of Afghanistan, this booklet is part of a series of four booklets, each covering a different agro-ecological zone. Ultimately, this guide aims to arm extension staff and farmers with the information necessary to increase wheat production and contribute to food security.

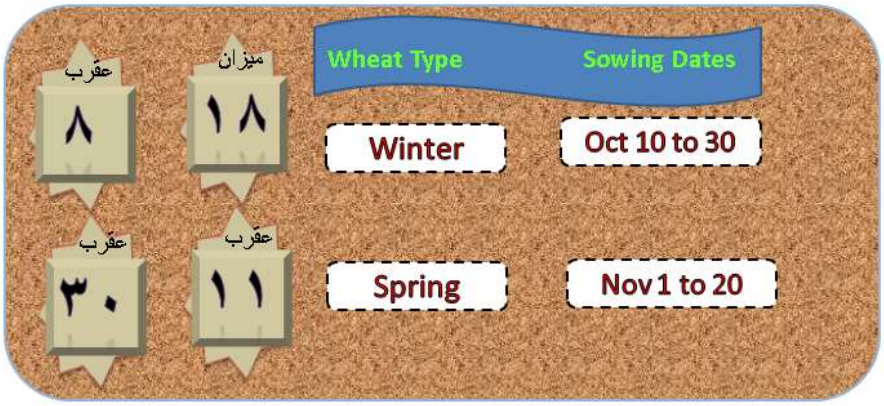
Section One:

Best Practices for Production of Wheat Under Irrigated Conditions



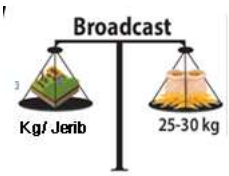
Date of Sowing

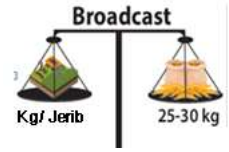
The sowing time of various field crops is governed not only by their growing cycle and environmental requirements but also by the necessity of avoiding the ravages of diseases and insect pests. Sowing at the proper time helps the wheat crop to express its growth pattern to the full extent in a particular environment (area), and therefore to maximize its yield. Significant research has been undertaken to determine the proper sowing dates of winter and spring wheat for the northern region of the country. Research results show that the best time to sow irrigated **winter wheat** in the **Northern Zone** is from the 2nd week up to the end of October **(October 10 to 30)** and the best time for irrigated **spring wheat** is from **November 1 to 20.**



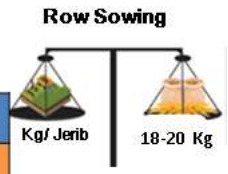
Seed Rate (Kg/Jerib)

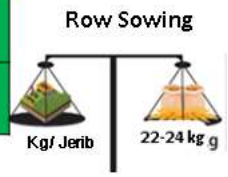
Proper population density and spacing greatly influences crop yield and quality, so it is very important for achieving the full potential of high-quality seeds and technologies. A below-optimum seeding rate may reduce resource use efficiency, yields, and final profit. Meanwhile, above-optimum seeding rates will increase the cost of production and may decrease yield by increasing disease and insect pressure, and by increasing the competition between plants for the uptake of minerals, water, and light, ultimately causing crop lodging, fewer kernels per head, or low kernel weight. Research has shown that the optimum seeding rate for irrigated wheat sown by the **broadcast method** in the Northern Zone is **25-30 kilograms per jerib (Kg/jb)** for both winter and spring wheat varieties. In **row cultivation** methods, the suggested optimum seed rate is **18-20 Kg/jb** for winter varieties and **22-24 Kg/jb** for spring varieties.





Wheat types	Sowing Method	
	Broadcast	Row Sowing
Winter wheat	25-30 Kg/Jerib	18-20 Kg/Jerib
Spring wheat	25-30 Kg/Jerib	22-24 Kg/Jerib





Farmers should use only high-quality seed that has a high germination rate (85-90%) and is free from weed seeds and disease. Farmers should purchase seed from reliable sources, and should ideally choose certified, and proven well-adapted varieties to the northern climatic zone of the country.

Fertilizer Timing and Rate

Smart use of fertilizers, especially those containing Nitrogen (N) and Phosphorus (P), can lead to significant wheat production increases.

Research has shown that for irrigated wheat in the **Northern Zone** of Afghanistan, fertilization gives best results at three growth stages: sowing, tillering, and before flowering. **DAP,** Diammonium phosphate (18-46-0), should be applied at the **rate of 30 Kg/jerib prior to sowing** the wheat or **at sowing**. DAP serves as a pre-plant starter source of nitrogen and phosphorus. Urea (46-0-0) should be applied at **18 Kg/jerib** along with DAP during sowing.

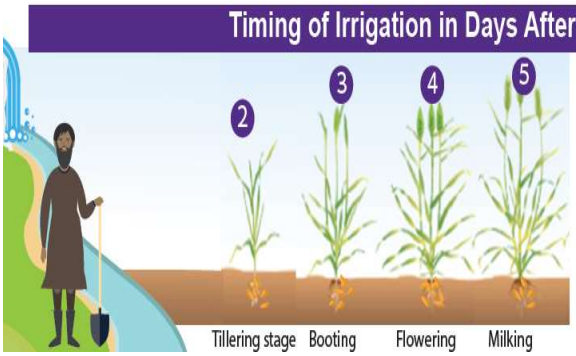
The second application of fertilizer is to provide a nitrogen source. **Urea** (46-0-0) at **20 Kg/jb** should be applied during the **tillering stage.** A third application of fertilizer (nitrogen in the form of urea at **14 Kg/jb**) should be applied **prior to the flowering stage**. Nitrogen applied after jointing will have less effect on yield.

Type	**1st At sowing**	**2nd Tillering**	**3rd Before Flowering**
Rate	**Kg/Jerib**	**Kg/Jerib**	**Kg/Jerib**
DAP	**30**	**----------**	**---------**
Urea	**18**	**20**	**14**

Crop observation and time of application of fertilizer are essential in effective use of these inputs to optimize crop yield and quality.

Timing of Irrigation

Water is a vital input for crop growth and efficient utilization of plant nutrients. Appropriate water supply at critical stages of crop growth contributes to improved yield and possibly even grain quality. Excess water may cause lodging in wheat and create more favorable conditions for pest and diseases, significantly impacting the yield.



	Cold Regions	Warm Regions
1	Before sowing	Before sowing
2	21-DAS	21-DAS
3	Booting stage	February
4	Flowering stage	March
5	Milking stage	Flowering stage
6		Grain fill

Agronomic research has shown that for the **Northern Zone in Irrigated production,** water availability is most critical at five identified stages. Irrigating before sowing is important to ensure proper germination. The second irrigation should be given 21 days after sowing if field observations indicate low soil moisture due to lack of rainfall. The third, fourth, and fifth stages for irrigation are Booting, Flowering (also known as Anthesis), and milking (also known as dough). In warmer locations within the Northern Zone, the six most critical stages of growth at which irrigation should be timed are: before sowing, 21 days after sowing, February, March, flowering, and the period of grain filling. These critical stages need special attention for the proper growth, optimum tiller development, and yield.

Weed Management

Wheat fields are commonly infested with both grasses and broad-leaved weeds. To realize the full yield potential of the wheat

crop, proper weed control is essential. Among various methods of weed controls, chemical control can be effective. Both **pre-plant and post-Emergence chemical herbicides** are effective for weed control in wheat when applied at appropriate times and targeted to the most threatening weeds. For specific information regarding chemical recommendations please consult the DAIL provincial extension office or contact the MAIL Plant Protection Office located in the Kabul, Badam Bagh office.

Non-chemical methods can also be effective when done in a timely manner. For example, farmers should plow under germinated weeds 30-40 days prior to sowing wheat. Additionally, farmers can control newly germinated weeds by hand pulling or mechanical methods when weeds are small, ideally when weeds are at the two- to four-leaf stage. Do not allow weeds to mature and produce seed. Sow dense cover fodder crops following wheat harvest to prevent weed encroachment in late summer and fall. **Remember: NO SEEDS MEANS NO WEEDS.**

Section Two:

Best Practices for Production of Wheat Under Rain-Fed Conditions

Date of Sowing

Seeding date has a significant effect on yield potential per unit area. Research results indicate that the best time to sow rain-fed wheat in the Northern zone is **December 1 through December 15** when the rain or snowfall come during this period. Otherwise farmers should wait until the rain comes to sow the seed, so that it germinates uniformly.

Seeding Rate

Based on research, the optimum seeding rate for rain-fed wheat sown by the **broadcast method is 14-16 Kg/jerib in the Northern zone.** This seeding rate contributes to increased yields and a higher return on farmers' investment in the cost of improved seeds. Farmers should seed only high-quality seed with high germination rates of 85-90% that are free from weed seeds and disease. Ideally, farmers should purchase certified, improved, and proven varieties well-adapted to the climatic zone and rain-fed conditions, and should buy seed from reliable sources.

Wheat types	**Sowing Method**	
	Broadcast Kg/Jerib	Row Sowing Kg/Jerib
Rain-fed Wheat	14-16	----------

Lower seeding rates (14 Kg/jb) should be used in dryer areas where rainfall is less plentiful, while higher seeding rates are recommended where rainfall is more likely to occur, or when the wheat is sown later in the season. Late sowing results in lower numbers of tillers. However, using seeding rates that are too low can lead to excessive tillering, resulting in delayed maturity, increased weed competition, and failure to exploit the crop's full growth and

yield potential. The key is to seed at an optimum plant population with uniform distribution for efficient use of available resources.

Fertilizer Timing and Rate

Pre-planning, crop observation, and timeliness are essential in effective use of fertilizers. Research has shown that for rain-fed wheat in the **Northern Zone**, fertilization is best conducted at two growth stages. **DAP,** Diammonium phosphate (18-46-0), should be applied at the **rate of 12 Kg/jb prior to sowing** the wheat or **at sowing**. DAP serves as a pre-plant starter source of nitrogen and phosphorus. Little response has been seen in Afghanistan to applications of potassium (K_2O). Adequate soil moisture is needed for working the soil and mobilizing fertilizer nutrients. The second application of fertilizer is a nitrogen source, **Urea** (46-0-0) at **11 Kg/jb,** which should be applied during the **rainy season**, preferably **prior to the jointing stage**.

Type	1st At sowing	Application Points
Rate	**Kg/Jerib**	
DAP	**12**	**Apply at sowing time**
Urea	**11**	**Apply during the rain period**

Nitrogen applied during dry conditions may depress growth and reduce yield. The jointing stage in a wheat crop is visible evidence that the plant has entered the reproductive stage and is more responsive to added crop nutrients. Top-dressed N should applied in the root zone prior to jointing stage.

Weed Management

Wheat fields are commonly infested with both grasses and broad-leaved weeds. To realize the full yield potential of the wheat crop, proper weed control is essential. Among various methods of weed controls, chemical control can be effective. Both **pre-plant and post-chemical herbicides** are effective for weed control in wheat, when applied at appropriate times and targeted to the most threatening weeds. For specific information regarding chemical recommendations please consult the DAIL provincial extension office or contact the MAIL Plant Protection Office located in the Kabul, Badam Bagh office.

Non-chemical methods can also be effective when done in a timely manner. For example, farmers should plow under germinated weeds 30-40 days prior to sowing wheat. Additionally, farmers can control newly germinated weeds by hand pulling or mechanical methods when weeds are small, ideally when weeds are at the two- to four-leaf stage. Do not allow weeds to mature and produce seed. Sow dense cover fodder crops following wheat harvest to prevent weed encroachment in late summer and fall. **Remember: NO WEED SEEDS MEANS NO WEEDS.**

USAID
FROM THE AMERICAN PEOPLE

GRAIN
GRAIN RESEARCH AND INNOVATION

MAIL

Thank you for your service in providing research-based information to the farmers of Afghanistan to increase wheat production and quality. Please contact your nearest research station managed by the Agricultural Research Institute of Afghanistan (ARIA) with any questions or other feedback.

CIMMYT
International Maize and Wheat Improvement Center

Global Center for
Food Systems Innovation
MICHIGAN STATE UNIVERSITY