GROWING AND SAVING **WHEAT SEEDS**

Seed Production at a Glance:

- Produce quality seeds on-farm by selection of a field or intentionally producing a seed production plot.
- Select and treat seed that is a uniform variety with desired production and quality traits.
- Clean and sieve seeds to remove weed seeds and inert material. Separate large seeds to support germination and vigor.
- Harvest, handle and store seed separately from grain
- Store seed in a cool, dry place at 10-12% moisture.
- Allow for ventilation in storage facility and control insect and vertebrate pests.
- Treat seed with a fungicide and, if needed, an insecticide.
- Conduct germination and vigor tests to guide seed planting rate.

Wheat field in Al Hasakeh
(Photo Credit: i-APS)

PRODUCTION OF QUALITY SEED ON-FARM

The Government of Syria had a robust wheat breeding and seed multiplication system. Even with this intensive, subsidized process, 60 percent of farmers saved seed or purchased it from neighbors and traders. 80 percent of farmers replaced seed stocks with new, certified seed within 3 years.[1] In Northeast Syria now, certified wheat seed supply is severely constrained and rebuilding the seed multiplication industry will take years. Farmers will continue to retain wheat seed or purchase from informal sources, and buy certified seed every 2-3 years when available. This Fact Sheet addresses on-farm production of high quality seed, maintaining the distinctness, uniformity and stability of existing varieties. There are two methods for on-farm seed production:

- **Field Selection**: Farmers plant their wheat crop and identify a portion of their field that has high yield, is free from disease and insect infestation, has uniform variety, few weeds and has the characteristics they want. The field is harvested separately from the rest of the crop and grain are saved for seed.
- **Seed Production Fields:** Farmers pick a productive part of their land for seed production. This seed plot is managed differently than the regular crop:
  - Select a field that has good soil, free from weeds and disease. It is best that the previous crop in this field was a legume, never plant a wheat seed production plot that follows wheat in the crop rotation.
  - Plant seeds in rows, skipping a row at intervals to facilitate herbicide and pesticide application and rogueing of unwanted weeds and off-type plants. Use a seed that is lower than recommended rates.
  - Use modest amounts of nitrogen and full rates of phosphorus and potassium. Control weeds, insects and plant diseases. Rogue unwanted plants and off-type varieties. Leave a 2 m border around the seed multiplication plot.
  - Harvest by hand or by machine at 16-19 percent moisture.[2] Keep wheat seed separate from harvested grain.

SEED SELECTION

The key to maintaining good distinctness, uniformity and stability of the wheat crop is to select and treat uniform seed that has the uniform characteristics of your desired variety. Since seed has been used for multiple generations, there is significant mixing of varieties. Producing seeds using an intentional system for seed multiplication of the desired variety can refresh seed sources and grain quality until certified seed is more available.

When producing seed, it is important to rogue out weeds and unwanted wheat varieties to ensure uniformity of the seed stock. It is crucial to recognize the traits of the variety you want to retain. Pre-conflict, the GoS Public Authority for Scientific Research prepared a 'Wheat Guide' that documented the growth habit, height, seed head and beard characteristics with pictures of seed for each variety, the growing grain spike, and growth in the field.[3] For detailed descriptions, the Wheat Guide is available online at: http://gcsar.gov.sy/ar/wp-content/uploads/weatguide.pdf. Harvest plants that have the characteristics of the chosen variety and clean, sterilize and store seed according to good agricultural practices.

SEED HANDLING AND STORAGE

Once harvested, handling and storage of seed is crucial to maintain seed quality, avoid losses and ensure good seed germination and seedling vigor. Wheat seed and wheat grain should be harvested, managed and stored separately to ensure there is no mixing with grain, weed seed or impurities.

- Harvested grain should be dried in the sun or with a forced air drier to 10-12 percent moisture. Wheat seed should be threshed and thoroughly winnowed. Once trash and inert materials have been removed, wheat should be sieved using metal screens or mechanical methods using screens and specific gravity separators. The result will be a clean and separated seed sample. The pictures below illustrate an uncleaned and grain sample and a clean, uniform and treated wheat seed sample.
- The storage process maintains seed quality until the next planting season. Seeds should be separated from grain and stored in jute or polypropylene bags in a cool, dry room. Storage should be done on pallets to keep bags off the ground and should not touch the building sides. Ventilation should be maintained between pallets.
- Storage facilities should be monitored for insect and rodents. Before storing seeds, the room should be cleaned and sprayed with insecticide. Rodent baits will limit mice and rat infestation. Seed storage should be closely monitored for any insect or other pest buildup.
- Seed Treatment should be applied using fungicides to control seed-borne diseases such as loose smut and *Fusarium* species. Seed treatments help to preserve seed quality and protect seeds and seedlings from seedborne diseases that limit germination, seedling emergence and seedling vigor. If there are soil borne insects (for example wireworm) then seed insecticide treatments may also be applied.
- Seed treatment can be conducted on-farm if there are adequate treatment facilities. Otherwise, seed treatment should be done by mobile seed treatment operators or taken to a private sector of local authority managed seed treatment facility.

Treated wheat seed (left) vs poor quality seed sample
(Photo Credit: i-APS)

ON-FARM SEED TESTING

Seed testing before planting can guide the amount of seed needed for planting. Farmers indicate seed rates of 20-40 kg/dunum in Northeast Syria. These are already high seeding rates. If the germination rate and vigor of seeds is known, then seed rates can be adjusted, lowering the amount of seed required and seed costs. Farmers do not routinely perform germination tests of seed stocks before planting.[4]

- **Germination test**: Collect a 1 kg sample of seeds by taking 100 g seed samples from the middle of 10 bags. Conduct a germination test with 400 seeds (planted in sand or arranged in pleated paper). Heat seeds to 35 °C to break dormancy and hold seeds at 20 °C. Check them after 4 days and 8 days to count the number of germinated seeds.
- **Vigor test**: Use the cold test to check vigor. Collect soil from the previous year's field, grind and sieve the soil to form a uniform substrate. Cover an aluminum tray with 2 cm of soil. Spread the seeds evenly on the tray and cover seeds with 2 cm of soil. Cover the tray and place in refrigerator (10 °C) for 7 days. Then germinate seeds at 25 °C and check at 4 and 8 days. Check germination by counting only normal seedlings.

Use the aforementioned tests to calculate the number of g of seed to plant to achieve the desired plant population.

[1] Bishaw, Z., P.C. Struik, A.J. G van Gastel. 2011. Wheat and barley seed system in Syria: farmers' varietal perceptions, seed sources and seed management. International Journal of Plant Production 5 (4) October, 2011.

[2] Van Gastel, A.J.G., Z. Bishaw and B.R. Gregg. 2002. Wheat Seed Production. In Bread Wheat: Improvement and Production. Ed. B.C. Curtis, S. Rajaram and H. Gomez MacPherson. Food and Agriculture Organization of the United Nations. 2002. Rome, Italy.

[3] Anonymous. Wheat Guide. Public Authority for Scientific Research. 74 pp. http://gcsar.gov.sy/ar/wp-content/uploads/weatguide.pdf

[4] Food and Agriculture Organization. 2018. Seeds Toolkit: Module 3 Seed Quality Assurance. Food and Agriculture Organization of the United Nations and Africa Seeds. 2018. Rome, Italy.