# Vegetable Production in Balkh Province of Afghanistan and Recommendations to AWATT

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In August 2008, I traveled to Afghanistan as part of a USAID project-Afghanistan Water, Agriculture and Technology Transfer (AWATT). The project is a consortium of four U.S. universities (New Mexico State University, Colorado State University, University of Illinois, and Southern Illinois University) designed to provide better water use efficiency in Afghanistan, to identify and address gaps in other agricultural projects that have been implemented in country, and to transfer readily adaptive agricultural technologies to Afghan farmers. This paper provides an overview of what I observed for vegetable production activities in Afghanistan.

Afghanistan is a developing country that has been at war for the last several decades, and is currently an ancient culture trying to become westernized. Motorized vehicles, bottled water, wireless internet and cell phones are readily available, although many are still using animal pulled carts as the primary mode of transportation. Afghanistan has an agriculturally based economy, although most production and harvesting activities are done by hand without much mechanization in the overall agriculturally-based system. This country has a very dry climate, with everything covered in dust, but there is an elaborate system of canals that provide water to crops. About one-eighth of the land is tillable (about 9 million hectares), while two-eighths of could be used as dry rangeland (about 18 million hectares). There are 34 provinces in Afghanistan. The Balkh province is in the north and is the only province that borders Uzbekistan, although it also borders Tajikistan and Turkmenistan. Historically, there are 18 canals in the Balkh province, although there are really only 11 that are functional with most obtaining their water from the Balkh-Ab river basin. The 11 canals are referred to as the Balkh-Ab canal system. The Balkh province is very dry, with really no significant rainfall occurring during the production season.

Water is a critical issue in a dry climate and is of the utmost importance to a developing country like Afghanistan. Water is an important limiting factor for agricultural crop production not only in the Balkh province but throughout the country. All high value horticultural crops are irrigated with mostly surface water obtained from the various canal systems. Right now, there are too many people (primarily down-stream users) that are not receiving the water they deserve due to over-use by up-stream users, especially if rice is grown upstream. The water distribution process from the canals is quite complicated as farmers receive so many minutes of water based on the amount of land they have; and, the frequency in which they receive water differs based normally on how far they are from the canal. Typically, the closer a farmer is to the canal, the more water, while further away, the less water. For one jireb of land (2,000 $m^2$ or one-fifth of a hectare), farmers in the Balkh province get 10 minutes of water use from the canal with the frequency ranging anywhere from about 7 to 30 days. Mirabs are responsible for water distribution and are employed by the Ministry of Energy and Water. A farmer that we visited irrigated every 12

days; however, since other crops also need to be irrigated, his onions only got irrigated about once a month and this frequency provided drought conditions, which related to small onions that had to be harvested earlier than normal to just obtain some revenues from the crop. So, water is really a limiting factor to vegetable production in this province.

Although wheat and cotton are the two primary agronomic crops grown in the Balkh province, vegetables are an important part of agricultural production in the Balkh province. There is a wide assortment of vegetables grown including cabbage, cucumber, garlic, lettuce, melon, okra, onion, potato, spinach, squash, tomato, and watermelon. The two most widely grown vegetables are okra and tomato, although I also observed significant acreages of melons, onions, and watermelons. Okra is the vegetable that is most often observed growing in community gardens. It surprised me that through my extensive travels in the province, I observed more hectares of okra compared to any other vegetable including tomato. Many Afghans told me that this was the number one preferred vegetable in Afghanistan and it was readily available at most markets that I visited. However, both onion and tomato production is also significant around the Mazar-e-Sherif area. During peak production, tomatoes in this region average about $1 Afghani per kg due to no sufficient cold storage facilities. The Director of Balkh Provincial Ministry of Agriculture and Irrigation indicated that tomato prices would likely increase to $100 Afghani/kg with adequate cold storage facilities. He also suggested that more basic infrastructure is needed in his province and cold storage facilities are at the top of this list.

Vegetable production in the Balkh province is normally about 2-3 weeks earlier than in temperate regions of the eastern U.S. There is no specialized technology used that readily conserves water use, such as plastic mulch and drip irrigation, which is normally used in water-starved dry climates. However, low tunnels are used to produce 'out of season' cucumbers and as tomato transplant beds. Tomato transplants are pulled out of these beds and used as bare-root transplants. Most all vegetable production activities are done by hand with little mechanization, except maybe some tilling of the soil.

Raised beds that are about 4 feet wide are used for vegetable production with two rows generally planted near the furrow on either side. Depending on the vegetable grown, this often allows enough space for a small path between the two rows, so that maintenance and harvest activities can be done without having to step down into the deep furrow that is often muddy. Small holes are made into the raised beds at the proper in-row spacing depending on the vegetable crop grown, with manure (typically sheep manure) and diammonium phosphosphate (DAP) placed into the hole prior to placing in the vegetable transplant and covering roots with soil. Composted sheep manure (at least 1 year old) is a favorite manure of vegetable farmers. These vegetable plants are later sidedressed with Urea. Soils are mostly alkaline ranging in pH from about 7.5 to 8.5. There is really no long term soil management program used by farmers to improve the soil's physical condition or organic matter content.

Crop rotations are somewhat used, with the previous crops grown and crop water use requirements considered in the rotational scheme, but not always. For example, crops that have low water-use requirements (such as wheat) are often grown at the same time on another portion of land under the farmer's control with a high value horticultural crop that requires lots of water. This will allow the farmer to often divert water designated for the wheat crop to be used for

horticultural crops, but again this depends on the numbers of jarebs that a particular farmer has at his disposal.

We also noticed that pest management is critical to vegetable production in the Balkh province, as many vegetable insects and diseases have often become the major limiting factors to vegetable production in the province. However, although pesticides are readily available, most farmers lack a basic understanding of pesticide use and the timing of pesticide applications. Several specific vegetable pest problems are described briefly in the next section.

**Specific vegetable and fruit crop observations.**

*Cucumber*. Although most cucumbers grown were the beit alpha types, I did observe some slicing types being grown as well. However, some cucumbers are direct seeded into raised beds and covered with plastic low tunnels for 'out of season' cucumber production, while most are transplanted during the spring and summer months in the production system previously described. Typically, cucumbers imported from Pakistan sell for about $30 Afghanis each, but the ones grown in low tunnels for 'out of season' production will sell for about $70 Afghani. All of these cucumbers are marketed domestically, and farmers can make about $200 Aghanis/$m^2$, twice a year, for 'out-of-season' cucumber production which is a significant amount of revenue.

*Watermelon and melon.* Watermelon cultivars are mostly open-pollinated types and include 'Charleston Gray', 'Crimson Sweet', and 'Sugar Baby'. Currently, orange- and yellow-flesh cultivars, such as 'Orangeglo' and 'Tendersweet Orange Flesh' are being evaluated; and, many Afghan growers are really excited about the marketing potential of these types. Although watermelon fruit are mostly sold by piece, in the near future, many growers will probably start selling by the kg to improve revenues, especially with the orange- and yellow-flesh cultivars (Mark Henning, personal commun.).

For melon production, all are local landraces, with seed saved from ope-pollinated fruit and replanted each year. Afghanistan is the last arid temperate climate in central east-Asia before China, which is provides an optimal climate for melon production if sufficient moisture is available. Locally-produced melons are typically white-fleshed and very sweet and tasty. Locally grown melons can also be easily found at road-side and other markets. Often times at road-side markets, these melons were the only product being sold. These melons can typically be purchased from about $80 to $200 Afghani, depending on the province in which they were produced. Those produced in the Balkh province tended to cost around $80 to $90 Afghani.

Since most watermelon and melon cultivars are open-pollinated, growers will typically select and extract seed from fruit having the highest quality and largest size to use as seed next year.

The melon fly is probably the most limiting pest to production and there is currently a lot of research effort being directed at management methods for this pest by both governmental and non-governmental organizations. Other significant problems that I noticed included blossom-end rot in watermelons, especially 'Charleston Gray' types, and Fusarium wilt especially on 'Sugar Baby' watermelons.

*Pepper.* Pepper is widely utilized as an additive to many different Afghan dishes as well as eaten fresh. The Dehdadi district in the Balkh province is well known for chile pepper production, with most exported to Pakistan. Peppers are often dried, although most are sold fresh. Since peppers plants often sit in water for extended periods due to the flooded conditions provided by the irrigation system, Phytophthora blight was observed to cause about a 10% to 15% loss in most production fields.

*Potatoes.* There are limited amounts of potatoes grown in the Balkh province. Most potatoes produced in Afghanistan are grown in the Bamyan province which is south of the Balkh province, but has a much higher elevation more suitable for potato production. There are lots of fresh market potatoes available at most roadside and other markets in Kabul that were produced in Bamyan province.

*Tomato.* Both processing and small fresh market tomatoes are produced in the Balkh province and both types can be readily seen in local markets. Many of the tomatoes produced in this province are shipped directly to the large Kabul market.

Sundried tomatoes primarily 'Roma' types are being developed in the Balkh province as a possible export crop to Turkey (Mark Henning, Personal commun.). Mature tomatoes are cut in half, spayed with 10.5% sulfur once that are laid out on a plastic tarp and then sprayed with the same sulfur concentration four hours after the initial spray. It takes about 4 to 5 days for these tomatoes to dry. The sundried tomatoes will not only provide a new market for growers, but will provide new jobs for women the community.

However, in 2008, only about a 10% yield was achieved with tomatoes produced in the Balkh province, as there were various constraints to their production. The tomato fruit worm provided about a 50% yield loss, blossom-end rot and sunscald provided another 20% loss, and an approximate 10% loss was due to fruit rot from soil contact, as tomato plants are not staked and fruit often contact the soil. Often times, 90% of the first set of tomato fruit is lost due to fruit contacting the soil.

*Strawberries.* There is great potential for strawberry production in the Balkh province. Growers can get about $120 to $200 Afs/kg, which is a significant amount of revenue. Day-neutral types such as 'Seascape' have been evaluated and have done well in the dry climate in northern Afghanistan (Mark Henning, personal comm.). It was estimated that about 700 kg can be obtained from 1 jireb, which is relates to about $100,000 Afs/jareb.

*Marketing of vegetables.* Many of the vegetable crops grown in the Balkh province are sold into wholesale markets in Mazar-e-Sherif, which is the largest city in the province at with a population of approximately 350,000. Most produce that is produced in Afghanistan is sold in-country as there is a huge domestic market for vegetables, although some melons and a few other vegetables are sold to Pakistan. Many vegetables are sold even before they are even harvested due to the limited production in Afghanistan. All vegetables that are produced in-country are utilized regardless of whether they are overripe, insect-laden or highly diseased. Even without adequate storage and postharvest facilities, all vegetables are used to some extent with little waste.

Afghanistan is economically linked to Pakistan and vegetables flow across the border in both directions. A significant amount of Afghan melons are sold in India, which has an ever-expanding marketplace. These emerging supermarkets in India will most likely play a future role in Afghan produce sales, including various vegetables besides melons. There is great potential for more Afghan vegetables to be marketed in India, but, only if more can be produced through better field production and management methods. More vegetable production can occur in Afghanistan to fulfill the needs for export markets, but there are multiple issues that must be addressed before this will happen including better water and fertility management, and pest control. However, most would agree that the basic problem of vegetable production in the Balkh province is drought conditions provided by inefficient water use.

**Recommendations.**

There are multiple pest problems of vegetables that need to be addressed. Due to the poor pest control tactics used and the lack of understanding of pesticide use and timing of applications by Afghan farmers, I would recommend that some type of cooperation between the AWATT project and the Durukshan Agricultural and Social Association be established to deliver essential pest control information to farmers. I would be willing to provide training and materials for disease management for a short-term assignment, which would also include information on nematology. However, without adequate pest diagnosis laboratories, it is difficult to provide the needed management information to growers since the pest problem cannot be definitively identified. Another possibility would be to conduct a few demonstrations with various biological control pesticides on vegetables.

Fertility issues in vegetable production and short or long term soil management is really not even considered in Afghanistan to any extent. Manures, DAP, and Urea are the only fertilizers used to produce vegetables and are used year after year without any recommendations provided by a soil analysis report. There is no sustainable soil management or fertility systems used to properly maintain organic matter levels or soil tilth. Thus, soil analysis labs are needed to properly advise farmers on soil fertility issues.

Strawberries and orange- and yellow-fleshed watermelons are unique crops that have great potential as high value horticultural crops in Afghanistan. Both can provide high revenues to farmers and apparently do well in the arid climate. Mark Henning of JDA would be the person to work with on these high value crops.