AFGHANISTAN: POTATOES

Efficient fertilization and well-timed irrigation boost potato yields

Figure 1: Crops 6 weeks after planting.

Potatoes are the primary cash crop in the Central Highlands of Afghanistan. Yields are consistently low, averaging less than 12 tonnes per hectare. In 2011, CRS began addressing production issues beginning with seed storage[1] using a behavior change approach. Using simple seed selection and store-ventilation practices, storage losses were reduced to less than 5 percent from more than 40 percent, and the improved-quality seed from these stores yielded 30 percent more than the farmers' own traditionally handled seed. Farmers were encouraged by the simplicity and effectiveness of the behavior change approach[2] and were keen to address new production challenges.

During field visits, staff had noted that the emergence of many potato crops was erratic and very delayed, resulting in many weak plants incapable of fully utilizing sunlight, soil water and nutrients. Crops were often maturing late and were susceptible to dry summer conditions and early frosts. As seed from the modified stores was performing better, it was likely that further simple behavior changes at planting would considerably improve growth and yields.

Traditional practices

The potato plant has a small root system and is generally planted on ridges, which limits root growth and the uptake of water and nutrients. For rapid early growth, nutrients and water must be near the planted seed tuber. Most farmers in the Central Highlands spread their organic manure over the entire field before ploughing; as they do with inorganic fertilizers, when used. In the ridge formation, much of the fertilizer lay in the furrow between ridges or was placed above the seed tuber and was largely unavailable to the plant. Furthermore, soils were often dry at planting time, and irrigation was withheld until after the plants had emerged. As a result, germination was often delayed, and root growth was slow due to the lack of moisture, and further inhibited by nutrients not being close to the seed tuber.

Highlights

- The high success rates after introducing simple storage behaviors led to farmer enthusiasm for trying other simple practices
- Yield increases of more than 30 percent resulted from simple behavior changes at planting
- Households that had not participated in the trainings learned the behaviors from neighbors and were practicing them
- Increased organic matter in the immediate root zone increased resilience to dry weather

1. See Agricultural Behavior Change Brief 1: *Improved storage transforms potato crop*
2. See Agricultural Behavior Change Introduction: *Introducing social behavior change to agricultural development*

Behavioral approach

In its agricultural livelihoods programming in Middle Eastern and Central Asian countries, CRS has been introducing a flexible behavioral approach based on social behavior change and industry-wide best practices developed in the health sector. Simple, responsive, low-cost, low-risk practices capable of giving a measurable (30+ percent) increase in productivity are identified and promoted through short, timely trainings.[3] For the potato crop, three behaviors were suggested: the efficient application of available fertilizers, a reduced planting depth, and optimal timing of early irrigation.

Recommended changes

To encourage early crop development, three simple behavior changes were suggested:

(a) Place all the organic fertilizer immediately below the seed tuber at planting, serving as a readily accessible source of nutrients and also as a 'sponge' to retain water when the surrounding soil dries. Inorganic fertilizer, if used, is similarly applied.

(b) Plant at a shallower depth to hasten emergence.

(c) Irrigate immediately after planting, ensuring that the water level comes to the height of the seed tuber.

No other messaging was given, although community members were free to ask questions on any related topic.

CRS organized a training that was open to all community members just prior to planting. A male and a female member of each household was encouraged to participate—since both are directly involved in planting—to allow for equitable discussion and planning within the household. Trainings were less than an hour long, for minimum disruption to daily household routines. A demonstration plot was also established with the three recommended behaviors alongside the farmer's traditional behaviors. Seed source and all other practices were the same. Farmers were encouraged to regularly observe the plots, and group meetings were held at "catalytic moments": in late spring to observe the differences in establishment, and again at harvest to discuss yield differences.

Outcomes

Demonstrations in 130 villages have been planted since April 2012. From the outset, staff reported replication within and between villages, with frequent requests from other communities for training. In October 2013, yield data was taken from 96 farmers' own replications of the demonstration in 12 villages. Plots using the improved planting behaviors yielded an average of 32 percent more healthy tubers than those using the traditional practices, and losses harvest due to disease and damage were reduced by 21 percent (Table 1).

In feedback sessions, farmers noted that the even, early, vigorous emergence remained apparent throughout the growing season (Figure 1).

Table 1: Yield from a 20 m length of traditional and improved behavior plots (n=96)

Behavior	Weight of healthy tubers (kg)	Weight of discarded tubers (kg)
Improved	66	9.2
Traditional	50	11.6
Difference	16	2.5
% difference	32%	-21%

During a farmer feedback session organized by CRS in 2018, almost all the participants, male and female, were aware of the improved practices, whether or not they had attended the training. In that year, the Central Highlands suffered a severe drought, yet participants reported that their total harvest doubled, from 20 to 40 seer (70 to 140 kg), which they attributed to the improved planting practices. As farmers were using superior quality seed from their improved, ventilated stores, not all of the yield increase can be attributed to the planting behaviors. Yield increases arising from the improved quality of the seed from the improved pits are now estimated at 30 percent, suggesting a major additional contribution from the improved planting behaviors.

Field visits by the project teams confirmed that emergence and early vigor were much improved with the recommended behaviors. Staff also noted that during the dry summer of 2018, when farmers had placed organic manure under the seed-piece that acted as a sponge, plant growth continued longer into mid-summer, a time when moisture is essential for the bulking of the tubers. The suggested planting behaviors are clearly contributing to increased resilience to dry conditions and possible climatic changes.

Lessons learned

- Early, quick and visible successes encourage farmers to seek other improvements.
- Simple, low-cost, low-risk behavior changes were easily trialed and adopted by highly vulnerable households.
- Opening trainings on simple behavior changes to all community members allowed all households to benefit while not disadvantaging the most vulnerable.

3. See Agricultural Behavior Change Introduction: *Introducing social behavior change to agricultural development*