

Needs Assessment on Horticulture in Afghanistan

**Future Harvest Consortium to Rebuild
Agriculture in Afghanistan**

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International Center for Agricultural Research in the Dry Areas
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Executive Summary

Over the last few decades, power struggles and natural disasters have greatly impoverished Afghanistan, leading the country to the lowest levels of economic development. Afghanistan, however, has a long history of mercantile activity and a unique natural environment that supports the production of quality horticultural produce that at one time supplied 40 to 60% of the country's export earnings. The reestablishment of a viable horticultural sector should, therefore, play a critical role in the re-development of a stable and prosperous society.

The rebuilding of the country's horticulture can provide abundant employment opportunities and significant income at the farm level, and foreign exchange at the national level. Horticulture provides a critical source of nutrients and production diversity and represents the most attractive alternative to current poppy cultivation in rural areas.

The reestablishment of horticulture must focus upon quality produce, with increased production emphasizing sustainable practices with effective linkages to markets, both local and international.

To succeed, the following steps must be taken:

1. Conduct a market analysis to identify trade opportunities for Afghan horticulture products and establish framework for a viable, market-oriented horticultural sector.
2. Conserve existing genetic resources.
 - a. Rescue and conserve horticultural genetic resources of Afghanistan
 - b. Establish ex-situ and in-situ conservation facilities
 - c. Map the genetic diversity of Afghanistan's horticultural species
 - d. Characterize and evaluate horticultural traits
 - e. Develop a genetic resources national database
 - f. Reintroduce valued germplasm collections from foreign gene banks
3. Develop programs that will enhance horticulture production capacity, diversity and quality, and improved postharvest handling systems.
 - a. Provide input and plant materials from private and public agencies
 - b. Conduct a rapid rejuvenation of existing orchards
 - c. Develop effective farming systems
 - e. Develop community level subsidiary horticultural industries
 - f. Implement improved postharvest practices and horticulture handling, shipping and marketing systems
 - g. Establish farm trade associations or cooperatives
 - h. Determine relationship of horticulture capability to diversified diet needs for enhancing human nutrition
4. Develop human resource programs providing knowledge and skills at local, regional and national levels.
 - a. On-farm training and demonstration centers
 - b. Training materials
 - c. Vocational education programs
 - d. Disseminate information

e. Establish educational partnerships

Given the inevitable limited resources, emphasis should be focused on progressive and respected farmers who have historically held significant influence in the country's community structures and social patterns. In addition it is important to have community-level involvement while giving due consideration to the role of elder's within communities. This will allow for program development to be more vigorous and produce more far-reaching results.

Introduction

BACKGROUND

Over the past 20 years, Afghanistan has been devastated by conflict and a debilitating three-year drought which has resulted in the collapse of the economy, destruction of infrastructure, massive displacement of the population, and widespread malnutrition and dependence on food aid. Afghanistan now has one of the lowest levels of per capita food availability in the world. Seventy percent of the Afghan population is estimated to be malnourished, and over 7 million face starvation. Afghanistan has the world's fourth highest mortality rate, with more than 25 percent of children dying before reaching age 5. As the World Bank has described, "Afghanistan, which has always been at or near the bottom of most poverty and social indicator rankings, must now be considered the poorest, most miserable state in the world." The country will require substantial rehabilitation and reconstruction assistance to regain its food security and reduce poverty.

Agriculture is clearly of central importance in the establishment of a stable and prosperous society in Afghanistan. Prior to the Soviet and civil wars, 70-80 percent of the country's population was engaged in agriculture. Despite its difficult terrain, adverse climatic conditions and limited arable land, Afghanistan was largely self-sufficient in food and a significant exporter of some agricultural products, with the agriculture sector accounting for about half of the Gross National Product. Nevertheless, between 1979 and 1992, food production in Afghanistan dropped by 40 percent. Agriculture was the mainstay of Afghanistan's economy and its regeneration is fundamental to the nation's recovery.

The government of Afghanistan has identified agriculture and rural development as key priority areas in its development strategy. Pillar two of the Afghan National Development Framework outlines rehabilitation of agriculture and irrigation infrastructure as key components of its developmental strategy.

The International Center for Agricultural Research in Dry Areas (ICARDA) was invited by USAID to coordinate and provide technical assistance for restoring agriculture productive capacity and food security in Afghanistan. At the first Steering Committee meeting for the Future Harvest Consortium to Rebuild Agriculture in Afghanistan held January 2002, the following four major thematic components were selected.

1. Seed Systems and Crop Improvement
2. Soil and Water
3. Livestock, Feed and Rangelands
4. Horticulture

Steering Committee institutions and their representatives were selected to discuss and develop each theme, and charged with the responsibility of developing needs assessments for each area. An initial exchange of ideas at this meeting generated the following preliminary list of actions necessary to advance Afghan horticulture.

Most Urgent Actions

1. Diagnose current horticultural situation within the country to identify priority needs.
2. Support Afghan private sectors by enhancing their production/commercialization/marketing capacities.
3. Strengthen/establish farm nucleus nurseries for multiplication of local materials.
4. Establish local community-driven structures involving women farmers.
5. Create public awareness, seek support and raise visibility of the role horticultural crops as a replacement for poppy cultivation.
6. Reestablish vocation and University level training programs, strengthen governmental and private consulting and extension capacity, and develop educational and training materials.

Medium-to-Long Term Actions

1. Assess current conservation activities, involve and educate communities and other stakeholders in conservation projects.
2. Rescue local varieties and repatriation foreign-held genetic materials,
3. Increase documentation capacities for PGR and associated IK (link to other Consortium Projects)
4. Characterize/evaluate local germplasm using participatory approaches.
5. Establish horticultural subsidiary industries in rural areas (postharvest, packaging, processing, marketing, value-added products).
6. Train farmers in modern agricultural production methods (link to other Consortium Projects).
7. Develop mechanisms and policies for germplasm exchange inside and outside the country (link to other Consortium Projects).

The expected outcome and results of these measures are:

1. Development of a modern, sustainable and competitive market-driven horticultural sector
2. Replacement of poppy cultivation with high-income agricultural products.
3. Conservation of valuable genetics resources and re-introduction of lost genetic material through repatriation.
4. Increased scientific and technical capacity at national, governmental and community levels.
5. Establishment of nurseries and germplasm multiplication capacity.
6. Establishment of PGR protocols and infrastructure, integrate Afghanistan into the international and regional PGR networking community (such as CATCN-PGR).
7. Diversify production systems and develop sustainable income sources in risk prone agricultural areas.
8. Improve nutrition of population.
9. Rehabilitate natural and agro-ecosystems through better deployment of horticultural crops.
10. Increase availability of timber for household uses.

The following are the terms of reference for the development of present Needs Assessment in Horticulture.

- i. Review documentation on Afghanistan's historical conditions and trends in horticultural production.
- ii. Collect and analyze information on the current state of agriculture and the role of horticulture in Afghanistan.
- iii. Gather information and build understanding of circumstances in Afghanistan by interacting with NGO's, governmental institutions, and other organizations.

- iv. Identify areas and tasks that require greater greatest attention in terms of priority and according to resource availability.

HORTICULTURAL POTENTIAL

Horticulture is one of the areas of greatest challenge and opportunity in this war-torn nation. Afghanistan has a long tradition in horticulture and a reputation for high quality produce. Nevertheless, chaos, continuous warfare, and governmental tyranny have destroyed much of its potential. In 1972, horticultural commodities supplied 40 to 60% of all export earnings. Afghan's dried fruit once accounted for 60% of the world's market. Horticultural production is now estimated at less than 30% of 1978 levels. Many fields are abandoned, many orchards destroyed, and tree nurseries, and seed sources, water, input and knowledge are limited or non-functional.

Afghanistan's environmental conditions are highly favorable for many tree crops, vegetable species and seed production. There are a large number of endemic horticultural species while the wide range of agro-ecological zones provides a long season of consistent supply. Afghanistan is a unique center of genetic diversity and of great value to the international horticulture community. Carrot, radish, cherry plum, apricot, peach, pear, apple, walnut, pistachio, fig, grape, pomegranate, melon, almond, are among the species present across the country and likely provide a unique array of useful agro-botanical traits. Horticultural crops are relatively water-efficient, contribute to significant production diversification and are a source of much needed nutrients for the population. Horticulture is land and labor intensive which is an advantage for poor farmers and sharecroppers. Cottage industry processing of horticultural products generates income for women and families. Considering the regional reputation for high-quality produce and the expanding global opportunities, horticulture can once again become a source for export earnings.

According to FAO (2000), Afghan farmers are showing an increased interest in cash crop production from which they have a comparative economical advantage over the production of traditional subsistence crops. The national annual per capita income in Afghanistan has been reported to be \$300, and the rural population income is significantly lower. Horticulture crops are in a strong position to support food security and the rehabilitation of Afghan rural economy because:

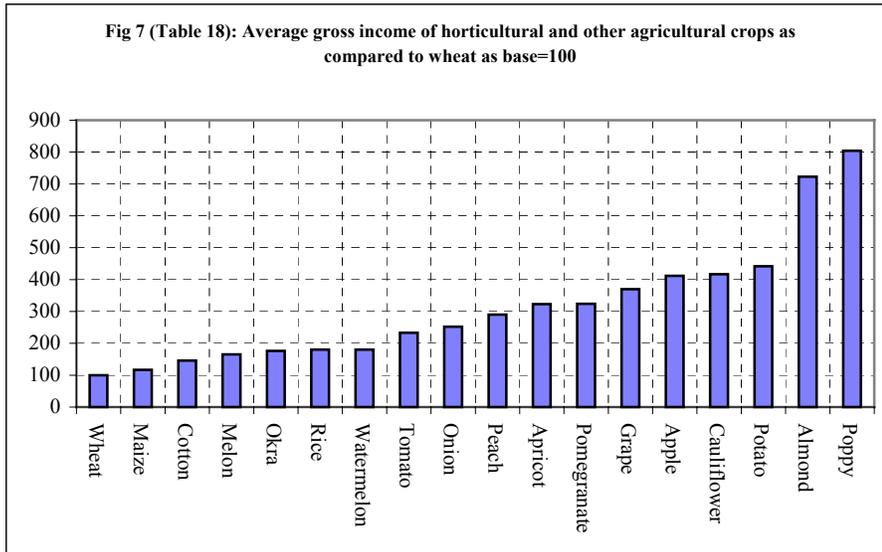
- Most Afghan farmers are already familiar with horticulture crops and are very receptive to innovative extension messages when their immediate interests are obvious;
- Horticulture crops represent a wide range of species that can be grown in the diverse agro-ecological zones inside the country over an extended period during the year that can be extended further if crops are grown under protected cultivation, e.g. plastic tunnels;
- Horticulture crop production is land and labor intensive, which creates employment;
- Horticulture crop cultivation is a high income generating activity; this is an advantage for poor farmers and sharecroppers looking to generate income;

- Horticulture crops are relatively water-efficient (income per unit water consumed), which is an advantage in Afghanistan where water is a limited resource;
- Horticulture crops include a wide range of short cycle crops (vegetables) and perennial crops (fruits and nuts), the combination of which (e.g. through intercropping and mixed farming systems) makes a horticulture-based farming systems economically diverse, nutritionally balanced, and environmentally sustainable;
- Peri-urban horticulture crop production contributes to creating job opportunities for urban and peri-urban populations while contributing to alleviation of poverty and malnutrition in urban areas;
- Cottage industries that provide packaging and processing of horticulture products diversifies income generation and is amenable to disadvantaged groups (i.e., women, disabled) and provides additional income security for families;
- There is a high demand for a wide range of horticultural products on regional export markets.

Therefore, under the current context of Afghanistan, horticulture crops benefit from a number of relative opportunities and comparative advantages over grains and other commodity crops. In spite of very traditional and conservative cultural habits, Afghan farmers are generally quite receptive to innovations, which has been demonstrated by their historic responsiveness to regional opportunities for their horticulture produce.

An important additional consideration that impacts the viability of horticulture is the role that poppy cultivation has played in Afghan crop production. There is currently strong international and regional pressure to reduce poppy production in Afghanistan. Success, however, will depend upon the development of viable crop alternatives that can sustain the rural economy. Poppy farming is labor intensive and requires a sound sense of crop production practices. It is estimated that some 2.8 million people are directly involved in poppy cultivation. Alternatives to poppy are urgently needed to provide both employment and income substitution. Horticulture production is similarly labor intensive and requires much of the same farming knowledge as is required for poppies. Several horticulture crops offer viable economic alternatives for the grower and with the development of external markets for Afghan horticulture produce; the relative attractiveness of horticulture substitutes is likely to improve.

Fig 7 (Table 18): Average gross income of horticultural and other agricultural crops as compared to wheat as base=100



Summary

The development of a modern horticulture, with all its components and elements, will be a significant challenge but has great potential to contribute to the redevelopment of the Afghan economy. Presently, Afghan horticulture is characterized by a low level of technology and reliance on practices that have been discarded elsewhere in the world. The lack of any significant 'modernization' in Afghan horticulture over the past 25 years, and the relative historical and environmental advantages of the country, have provided Afghanistan with an unusual opportunity to develop a modern and competitive horticultural sector. Afghanistan can now benefit from the lessons learned from horticulture in the developed world and make a technological leap forward that will allow the production of horticultural products of unique regional and international value.

Afghanistan

THE COUNTRY

Afghanistan lies in central Asia (between 29° 35' - 38° 40' latitude and 60° 31' - 74° 55' longitude), covering an estimated area of 647,500 square kilometers of land area and reportedly 248,187 ha of water bodies (2,482 sq km, some 1.0% of total land area). Completely landlocked, it is surrounded by Tajikistan, Uzbekistan, and Turkmenistan in the north, Iran in the west, Pakistan in the south and southwest, and China in the northeast. Its area is composed of mountainous and desert areas where the Iranian Plateau borders the mountains of Central Asia. The Hindu Kush mountain range splits Afghanistan from east to west.

The country is divided into thirty provinces, each province consisting in a number of districts. Within these districts most families live within villages. Rural households make up some 80% of the total national population of approximately 27 million. A large proportion of the population is of young age; in 2001, it was estimated that around 42% of the country's population was between the ages of 0 and 14. This number can partly be explained by the relatively high population growth rate (3.48%) and low average lifespan (40 to 46 years of age, according to varying reports on life expectancy).

Afghanistan accommodates a large variety of ethnic groups, the overwhelming majority of whom are Muslims, usually either follower of Sunni or Shi'ih factions. The people of Afghanistan are related to many of the ethnic groups in Iran, Pakistan, Tajikistan, with cultural influences that go further away to various places including Kyrgyzstan, Mongolia, China and the Arabian Peninsula. There are several ethnic groups that predominate the social landscape, whose proportions are estimated to be the following:

Pashtuns	38%
Tajiks	25%
Hazara	19%
Aimaks, Turkmen, Balochs, etc.	12%
Uzbeks	5%

The extreme linguistic and ethnic diversity in Afghanistan is the result of millennia of human migrations, political upheavals, invasions and conquests. This context has historically led to a great deal of interethnic strife, at the social and political level, constituting one of Afghanistan's major underlying causes of conflict. Religious similarities do not contribute to ameliorating this discord; approximately 84% of the population is Sunni Muslim and 15% Shi'ih Muslim.

The conditions of most transport facilities are very poor and less than one seventh of all roads are paved, transport for any distance in Afghanistan is reportedly difficult. Public transportation usually takes place in overloaded buses and trucks, and in rural areas travel is mainly by foot, donkey or horse. Communication networks have been destroyed, and electricity generators and lines are largely inoperative, making electricity consumption extremely low.

An assessment of health infrastructure and medical service clearly ranks Afghanistan as one of the countries with the worst health situation in the world. Besides the fact that 70% of the population is malnourished and 7 million face starvation, Afghanistan has the fourth highest mortality rate, reaching 25% for children under 5 years of age. Most medical professionals have fled the country during the last couple decades of conflict, and it is estimated that there is one

health center for every 100,000 people. In spite of the abundance of infectious and parasitic diseases, in addition to the widespread war injuries, the majority relies on indigenous healing beliefs. With regards to education, over two thirds of Afghans are illiterate, which includes some 85% of the female population. The quality and availability of education are very poor.

It is convenient to divide Afghanistan into four major geographic zones: the northern plains, the central mountains, the eastern and southern mountains, and the southern and western lowlands. The northern plains are relatively low, about 400 asl though the latitude rises rapidly toward the foothills of the central mountain region. The plains of the north are separated from the rest of the country by the rugged Hindu Kush mountain range. This mountain range extends from Pamir in the northeast to the central and eastern parts of the country. In this area, even the valleys lie at around 3000 m above sea level. In the winter the snow line descends to about 2000 m and most of the passes on the mountains become impassable.

Most of Afghanistan has a sub-arctic mountain climate with dry cold winters, except for the low lands, which have arid and semi arid climates. In the mountains and a few of the valleys bordering Pakistan, a fringe effect of the Indian Monsoon, coming usually from the southeast, brings moist maritime tropical air in summer. Annual rainfall ranges from 100 mm to 400 mm. Afghanistan has clearly defined seasons; summers are hot and winters can be bitterly cold. Summer temperatures as high as 49°C have been recorded in the northern valleys. Midwinter temperatures as low as – 9°C are common around the 2000 m elevation level in the Hindu Kush. The climate in the highlands varies with elevation.

Plant population in Afghanistan is sparse but diverse. Common trees in the mountains are evergreens, oaks, poplars, wild hazelnuts, almonds and pistachios. The plains of the north are largely dry, treeless steppes and those of the southwestern corner are nearly uninhabitable deserts. Common plants in the arid regions include camel thorn, locoweed, spiny rest harrow, mimosa, wormwood and a variety of sagebrush.

AGRICULTURE

Agriculture has traditionally been the largest source of economic output in Afghanistan, and an estimated 80% of the country's population is engaged in the rural economy. Agriculture in Afghanistan is largely a household activity, with women and children as well as men having important roles in crop production, horticulture, and the rearing of livestock. Tragically, agricultural activity has been depressed by three years of drought and more than two decades of war. Environmental degradation caused by the pressure on the natural resource system, including plowing of steep hills, stripping of brushwood for fuel, and use of animal dung for fuel rather than fertilizer, has further reduced productivity. As refugees return to rural areas, pressure on natural resources—particularly water and forests—will likely increase, raising risks of further environmental degradation.

Afghanistan's topography is of great influence in its agriculture, creating a large diversity of conditions for its production. Only some 12% of Afghanistan's land is arable, whereas 46% of it consists in permanent pastures and 3% of it forests and woodlands. Irrigated land is 3,300,000 ha (1993 est.), equivalent to some 5.1% of Afghanistan's total land area.

Cereal production, the main determinant of domestic food supply, has fallen by almost 40% since 1999, and is only half of what it was in prewar years. Food supplies are critically dependent on cereal production and cereal import requirements are currently about 2 million

tons. Besides opium poppy, cotton was the major industrial crop in the pre-1979 scenario; also in this period a small area of sugar beet was grown. Sugar beet production declined to only 2,000 ha, and has currently seemed to stop almost entirely, although a large factory in the north is said to be intact. A 1997 FAO Survey indicated that while cotton is still grown in the north, it is no longer processed inside the country. With regard to opium poppy cultivation, production was almost completely eradicated under the Taliban regime enforcement from 2000.

Agriculture relies heavily on irrigation, since rainfall is scant and highly variable over those parts of the country where topography and soils are suitable for cultivation. Prewar surveys indicated that 80% of wheat and 85% of all crops were produced on irrigated land. Since 1996 the irrigated area has declined by around 60%. Irrigation is dominated by small and medium river valley schemes owned, operated and maintained by village communities. This high level of community ownership should provide a strong basis for a sustainable, community-driven approach to rehabilitation. Large-scale irrigation schemes covering over 100,000 hectares (ha) are found in the northern and western plains, but these are plagued by severe management problems, water logging and salinity, and by induced and destructive changes in river regimes. In 1997, the area requiring rehabilitation was about 1.7 million ha.

While landholding patterns in Afghanistan vary greatly, both between and within districts, sharecropping is common on irrigated lands. Most farmers, an estimated 80%, own their land whereas the remaining 20% are landless but obtain a percentage of the harvest by reason of their labor. Larger land holdings can be found, however most farms are small in size and are managed at a family level. Although there are differences between provinces, farms between 0.2 and 2 hectares appear to be the most common. Poorly-designed and controversial land reform programs were undertaken in the 1960s and 1970s, but in the past two decades re-allocated land has largely reverted to original owners or been seized by commanders. Disputes and conflicts over land ownership or usage are common in parts of the country.

Through the 1980s, the livestock sub sector provided food, draft power and fiber, and was a major source of cash income. Livestock also accounted for about 40% of total export earnings. While herd numbers declined significantly during the war years, herds (particularly sheep and goat) did begin to recover in the mid-1990s, only to be devastated by the current three-year drought. Herd numbers are estimated to have fallen significantly since the drought began.

In the late 1970s, horticulture accounted for around 40% of the country's export earnings, though occupying only 6% of the total arable land and 12% of the irrigated land. Horticultural production declined rapidly during the war years, but began to recover significantly after 1992. A 1996 FAO survey found that 40% of orchards were less than 15 years old, indicating strong resilience among farmers, replanting and improving their orchards.

Large amount of arable land, particularly in the southwest and northeast of the country, were devoted to poppy production prior to the Taliban ban. The area under poppy cultivation was reduced considerably under the ban, but began to rise again in 2001. Further increases are likely in the absence of alternative income sources (agriculture, non farm income-generating opportunities), and effective enforcement of the drug ban. A growing, less vulnerable, more diverse rural economy that provides opportunities for rural resources recovery must be coordinated with other programs including education, health, accessibility, rural finance, and private sector development to form a multi-sectoral launching platform achieving this vision.

Sustained rural recovery will require ensuring free access to domestic and external markets, promoting efficient functioning of input and output markets, and facilitating local and community ownership and management. Food insecurity is likely to persist in the short term, so a

combination of programs that increase food and livestock production, create wage employment opportunities and provide a safety net for the vulnerable groups may be required. Early delineation of public and private sector roles in these initiatives is needed to avoid creating a system that crowds out the nongovernmental sector in the long term.

Rural recovery cannot be discussed without parallel discussion of critical natural resource issues. The major environmental challenge facing Afghanistan is the impact of return of refugees on already stressed water and forest resources. When the refugees return to rural areas, the carrying capacity of the land will depend not only on food and fuel supplies, but more broadly on success in rehabilitating agricultural systems, particularly irrigation systems, seeds and fertilizers. If food and fuel support is not available, people are likely to practice environmentally degrading methods of agriculture, and sources of energy, simply to stay alive. In this context, the development and implementation of sound policies for natural resource management will be critical in the long-term to Afghanistan's long-term prospects for a strong agriculture sector, and to the well being of rural households and communities.

In the short term, the priority for the rural sector will be the recovery of farm production and irrigation capacity on a selective basis, coupled with a program to address key policy and institutional capacity issues that enable the Afghan government to guide and support growth, while avoiding threats to natural resources through overexploitation of groundwater, and degradation of soils.

In implementing this program, the fostering of markets and engagement with the private sector will be crucial, in particular:

- (i) Access to domestic markets will be a critical stimulant for recovery in the short term and for success of the reconstruction effort in the medium and long term.
- (ii) An open trading regime with bordering countries will provide the goods needed by communities and thus facilitate the recovery process. In the case of agriculture it will facilitate bringing consumer goods into rural areas.
- (iii) Private partnerships will help reduce risks, perceived by the private sector and communities.

A comprehensive approach to water management and livelihoods would become the focus of the approach as scheme rehabilitation progresses. Over time, there could be an increasing focus on the integrated management of soil, pasture and forests in each watershed to improve water harvesting and conservation with the aim of improving groundwater recharge, reducing the vulnerability to drought, and enhancing and increasing opportunities to improve livelihoods. Whenever possible indigenous knowledge, coping strategies and skills would be incorporated and strengthened. At the same time, standards for technical advice and assistance to farmers and village organizations would be improved and appropriate international best practices introduced.

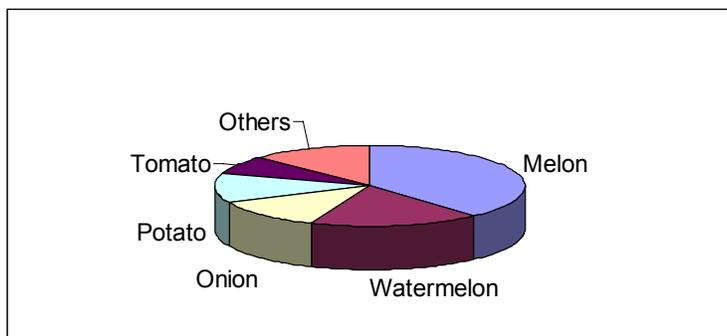
HORTICULTURE

Horticultural crops are an important part of the agricultural sector in Afghanistan. In the late 70s, horticulture accounted for around 40% of the country export earnings, though occupying only some 6% of the total arable land and 12% of the irrigated land. A 1997 FAO Survey indicates that an area of 140,000 ha of orchards, 92,000 ha of vegetables, 112,000 ha of cotton

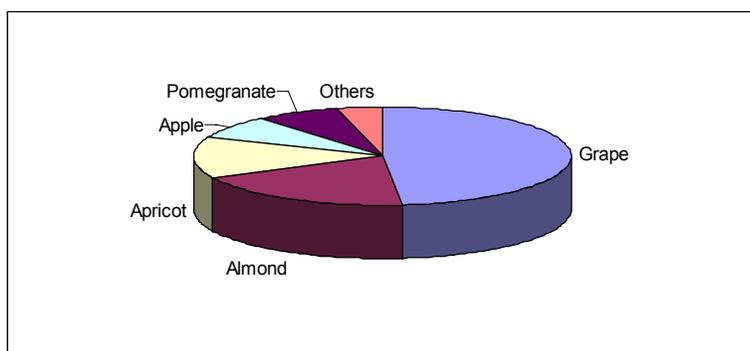
and 5,000 ha of sugar beet were planted in 1976. There is no breakdown of either the orchard crops or the vegetable crops although it is known that horticulture crops consisted of significant areas of grapes, apricots, apples, almonds, walnuts, mulberries and melons. Raisins, dried apricots and almonds numbered among the country's major exports. Vegetables included large areas of potato, which is a common element in Afghan diets as well as onions, tomatoes and eggplant. While horticulture crops covered only a small part of the total agricultural and irrigated area economically they were very important. They were primarily high value cash crops, which at the same time broadened the nutritional base of the population.

After declining during the war years, horticultural production area somewhat increased after the war due to farmers' preference for more remunerative cash crops as an alternative to poppy. Horticultural crops represented an important source of income (gross income per unit area is three to seven times that of wheat, which make horticultural crops a good alternative to poppy production). Nevertheless, there is insufficient information on the current status of horticulture production. According to current information provided, the orchard area had declined from 140,000 ha in 1997 to 70,000 ha. During this period vegetable area had remained more or less constant at 90,000 ha.

The major vegetable crops in Afghanistan include melon, watermelon, onion, potato and tomato, with these five species representing 87.4 % of the total area under vegetable cultivation:



Meanwhile, the major fruit crops and vines include: grapes, almond, apricots, pomegranate and apples trees, covering a total of 95.9% of all orchards/vineyards:



Afghan dried fruits (mainly almonds and apricots) accounted for 60% of the world market in 1982, but declined to 16% in 1990. The share is much lower now, but the products are still important foreign exchange earners. Horticultural crops represent the most viable alternative to poppy cultivation, however this will require rehabilitation of the country's fruit processing centers and transport systems.

Horticultural production can contribute to a less vulnerable, more diverse rural economy that provides opportunities to women and men and improves their livelihoods. Peri-urban horticultural crop production, and the associated markets and processing facilities, help supplement employment in urban areas. Horticultural crops activities such as weeding, harvesting, sorting, processing, etc., provide significant labor opportunities to women. This can help address a serious consequence of the continued conflict in Afghanistan that has resulted in the widespread destruction of family life; many women have been widowed or have lost the male members of their household. Single women now head many rural households. In 1999, women heads occupied 11% of horticultural crops farms; these percentages are now likely much higher.

Horticultural crops and their wild relatives play a fundamental role in the ecosystem rehabilitation and provision of sustainable agriculture. Intercropping vegetables with fruit trees to maximize land use efficiency is part of traditional farming system of Afghanistan. Fruit trees such as pistachio and almond are known to provide optimal use of scarce water resources and marginal land, and provide some income even in years of extreme drought or crop loss.

Afghanistan is also a unique center of genetic diversity of vegetable and fruit species such as carrots, radish, melon, cherry, plum, apricot, peach, pear, apple, walnut, pistachio, fig, grapes, pomegranate, almond, etc. However, gene bank facilities have been destroyed in 1992, and the country has no capacity for maintaining varieties purity or stocking vegetable seeds. Genetic erosion of horticultural crops has been observed at both inter- and intra-specific levels.

The most recent analysis of the status of horticulture in Afghanistan was documented by the FAO in 2000. This survey clearly illustrates the disruption that has occurred in this sector and describes the primary limitations that existed at that time. The horticultural sector in Afghanistan has experienced rapid and significant changes over the course of recent years, first with a decline of activities which coincided with the beginning of the war and the emigration of refugee populations in 1980's, and followed by a gradual rehabilitation which started in the early 90s and then another decline due to the intense civil war between 1997-2002.

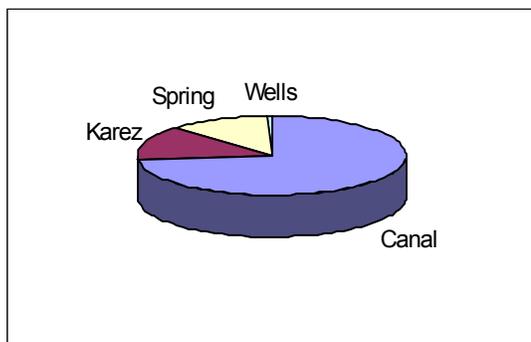
This study, which is the most detailed available, also assessed the primary limiting factors for horticultural production, as they existed in 2000. It can be presumed that all conditions have now worsened substantially.

In 2000, horticulture in Afghanistan suffered from the following constraints:

1. A deficit in irrigation water is reported in 73.8% of the surveyed area and is considered by farmers the main limiting factor for the development of horticultural crops. A large part of previously existing irrigation systems (over 30%) have been damaged or destroyed by the war, whereas another part (15-20%) is unusable due to abandonment.

Irrigation is currently made through:

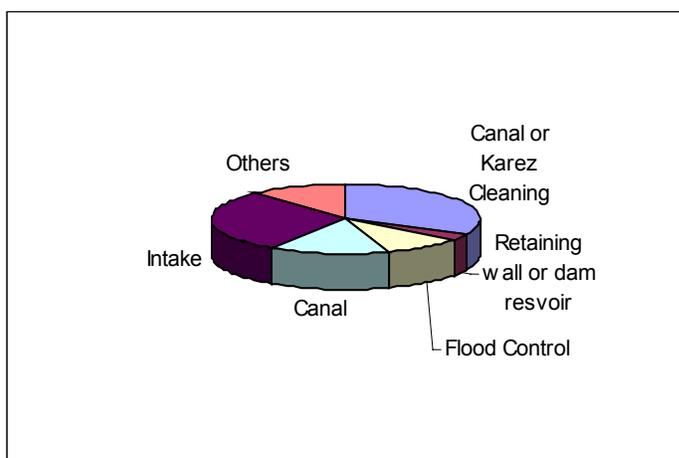
- Canals 72.9 %
- Karez 14.6 %
- Springs 11.9 %
- Wells 0.6 %



A "karez" (or "kanat") is an old traditional irrigation system, which was developed centuries ago in the arid regions of Iran and Afghanistan. It is a handmade network of underground tunnels with a very slight slope (about 0.001%), which tap water from aquifers and transports it by gravity to the ground surface. The tunnel size varies from about 0.7 to 1.2 meter in diameter and with a length that can reach several kilometers. In Afghanistan the longest karez reaches 13 km. Every 20 to 30 meters, these tunnels are connected to the ground surface by vertical wells that are used for the periodical cleaning of the karez (excavation of silt material), and for the aeration of the tunnel. The average discharge of a karez is of about 100 to 250 liters/second, that is enough to flood/irrigate 25 hectares of land. Construction of new karez may nowadays appear uneconomical, but their good maintenance and protection is essential to preserve large areas of irrigated land. Therefore, digging of deep wells near a karez should be strictly avoided as it may result in a lowering the aquifers feeding the karez.

The main requirements for the rehabilitation of irrigation infrastructures are:

- Cleaning of canals and Karez 32.3 %
- Repair of water intake infrastructures 29.0 %
- Repair of canal infrastructure 14.3 %
- Flood control/ water harvesting 12.5 %
- Others 11.9%



2. Another severe limitation to the development of horticulture crops is the very low level of farm power with an average of only 57.7 pairs of oxen, 2.6 tractors and 0.4 threshers per 1000 hectares. Based on standard requirements, this area requires 200 pairs of oxen, 17 tractors and 32 threshers.

3. There is a low level of crop diversification, and more than 95.9% of the fruit orchard and vineyard area is planted with only 5 different fruit species, which are:

a. Grape	48.4 %
b. Almond	19.6 %
c. Apricot	12.9 %
d. Apple	7.8 %
e. Pomegranate	7.2 %

Similarly 87.4% of the vegetable crop area is represented by only 5 species:

a. Melon	38.0 %
b. Watermelon	18.0 %
c. Onion	12.0 %
d. Potato	12.0 %
e. Tomato	7.4 %

4. The management of the horticulture crops also remains at a very low technical standard. In fruit orchards and vineyards only:

- a. 28.1 % of farmers practice pruning;
- b. 21.4% control pests and diseases;
- c. 11.3% use chemical fertilizers;
- d. 11.1% use improved budded cultivars.

In the case of vegetable crops, farmers' awareness and knowledge of intensive crop management practices is slightly higher, however only:

- a. 59.8% of farmers control pests and diseases;
- b. 47.2% use chemical fertilizers;
- c. 29.9% use improved seeds;
- d. 18.4% of villagers have a farmer using plastic tunnels.

5. There is very poor level of post-harvest technology, including:

- a. Poor grading
- b. Absence of cold storage facilities
- c. Lack of adequate packing material
- d. Absence of farmers' organization to market their products significantly contributes to high levels of postharvest losses.

6. High prices of agricultural inputs (e.g., farm equipments, fertilizers, pesticides, seeds, etc.) represent a very severe limitation.

7. The government extension services are very weak and growers indicate a great shortage of modern technical information. Sources of information are:

- | | |
|---------------------------------|-------|
| a. Government extension workers | 5.8% |
| b. NGOs/Aid agencies | 5.7% |
| c. Close village neighbors | 34.1% |
| d. Progressive farmers | 35.2% |
| e. None | 19.2% |

8. A lack of market information and poor marketing channels prevents growers from recognizing or taking advantage of local and regional opportunities.

Land Use in Horticulture

The arable agricultural resource base is approximately 7.5 million hectares of cultivable land, which is divided into rain fed and irrigated land. The rain fed area is estimated at about 4 million hectares, but the area actually cultivated in a given year varies considerably depending upon climatic factors and the area left to fallow.

In all, about 3.5 million hectares of land were cultivated in the pre-1979 period of which 2.43 million hectares were irrigated. The extent of land currently under irrigation is uncertain. The 1993 satellite data (FAO, 1997) indicated that the amount of land cultivated had not changed significantly, despite known damage to the irrigation systems. More recent data (FAO, 2001) indicated a decline of cultivated irrigated areas to about 1.5 to 1.7 million hectares. The area planted in rain fed crops fluctuates considerably from year to year, depending upon climatic conditions. In a good year, however, the area may be as much as 1.4 million hectares. In a drought year, the same area may be reduced to less than 300,000 hectares.

On the average, 9.9% of the total arable land area—irrigated and rain fed—was used for cultivation of horticulture crops, of which 5.3% were dedicated to orchards and 4.6% dedicated to vegetable crops. In districts where all horticulture crops need irrigation, 16% of irrigated land is used for horticulture crops. As a comparison, a non-field survey by the World Bank in 1977 indicated that only 6% of arable land and 10% of irrigated land were used for production of horticulture crops.

Therefore, horticulture crops play an increased role in the rural economy. The highest recorded percentage of land used for horticulture crop cultivation in pre-urban districts of main cities is between 25% and 45% of irrigated land area.

Comparative Status of District Orchards Between 1978 and 1996

The 2000 FAO field survey revealed that:

- 74,918 ha were orchards in 1978
- 88,389 ha were orchards in 1996

This represents an average of 18% increase between 1978 and 1996. Furthermore, the report indicates that on the average:

- 20.8% of orchards are 0-5 years old
- 21.1% of orchards are 6-15 years old
- 58.1% of orchards are more than 15 years old

This indicated a significant impact on fruit tree nursery projects initiated in the 90's for the rehabilitation of the fruit sub-sector. Also, since more than 40% of orchards are less than 15 years old, it's important to note the spontaneous interest farmers have shown to promote fruit production even during war time.

- Private orchard fruit species with specific tree spacing and managed care to promote intensive crop production were reported in 1978 to occupy a total area of 63,563 ha and in 1996 a total area of 78,850 ha. This represents a 24.1% area increase during the 18 year period.
- Fruit species growing on marginal land plantations, often scattered and at random planting distance, were reported to occupy 33,616 ha in 1978 and 21,723 ha in 1996. This represents a 35.4% decrease in area planted during that period.

Table 1: Comparative status of orchards per fruit species between 1978 and 1996

a) Fruit species cultivated in intensive orchards

Fruit Species	Total area (ha) in 1978	Total area (ha) in 1996	Percentage increase/decrease 1978-1996
Grape	33766	38190	13.1
Almond	9551	15493	62.2
Apricot	8292	10164	22.2
Apple	3581	6189	72.8
Pomegranate	5469	5668	3.6
Peach	1046	1447	38.3
Plum	603	746	22.7
Pear	445	396	-11.0
Sour cherry	358	264	-26.3
Sour orange	187	113	-39.6
Sweet cherry	65	62	-4.6
Loquat	99	57	-42.4
Persimmon	22	30	36.4
Sweet orange	40	21	-47.5
Guava	2	6	200.0
Lemon	3	3	0
Lime	2	1	-50.0
Total	63536	78850	24.1

b) Fruit species growing on marginal land

Fruit Species	Total area (ha) in 1978	Total area (ha) in 1996	Percentage increase/decrease 1978-1996
Mulberry	28616	17674	-38.2
Walnut	3249	2398	-26.2
Fig	1141	1104	-3.2
Quince	268	241	-10.1
Russian olive	252	215	-14.7
Jujube	90	91	1.1
Total	33616	21723	-35.4

Table 2: Comparative status of vegetable crops species between 1978 and 1996

Vegetable species	Total area (ha) in 1978	Total area (ha) in 1996	Percentage increase/decrease 1978-1996
Melon	24534	29021	18.3
Watermelon	11495	13709	19.3
Onion	6008	9159	52.4
Potato	5123	9138	78.4
Tomato	4284	5682	32.6
Okra	1561	2610	67.2
Eggplant	1264	1875	46.9
Cucumber	1084	1597	47.3
Carrot	607	791	30.3
Turnip	492	581	18.1
Bean	444	490	10.4
Spinach	344	439	27.6
Cauliflower	218	374	71.6
Squash	174	240	37.9
Snake cucumber	128	167	30.5
Cumin	14	120	757.1
Hot pepper	55	78	41.8
Ridge guard	44	67	52.3
Pepper	44	58	31.8
Leek	48	42	-12.5
Pumpkin	31	37	19.4
Radish	20	30	50.0
Pea	8	10	25.0
Table beet	4	8	100.0
Garlic	1	4	300.0
Peanut	1	4	300.0
Coriander	2	2	0.0
Cabbage	1	1	0.0
Mustard	3	1	-66.7
Total	58036	76317	31.5

Table 3: Average yield and comparative gross income of horticultural crops as compared to other crops

Crop	Average yield (Kg/ha) *	Average gross income/ha (\$US)	Income in comparison to wheat (base=100)
Field Crops			
Wheat	2170	440	100
Maize	3360	517	117
Rice	2275	792	180
Cotton	1645	642	146
Fruit Crops			
Almond	2415	3179	723
Apple	10325	1814	412
Apricot	8890	1423	323
Grape	9065	1628	370
Peach	7630	1275	290
Pomegranate	9730	1424	324
Vegetable Crops			
Cauliflower	29260	1833	417
Melon	11690	725	165
Okra	7070	774	176
Onion	12845	1109	252
Potato	14175	1943	442
Tomato	10710	1024	233
Watermelon	14350	792	180
ILLICIT Crops			
Opium poppy	70	3535	804

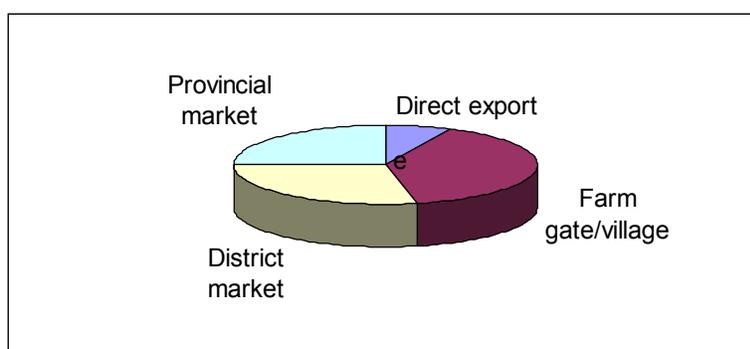
* Average yield in 79 selected districts in Afghanistan.

Source: FAO G:DP/AFG/96/004, Field Document 3 (2000)

Main locations where farmers are marketing horticulture products

Based on Afghan farmers surveyed reports indicate:

- 39.0 % of villages market their horticulture products at farm gate/farm level;
- 29.7 % in district level markets;
- 24.6 % in provincial level markets;
- 6.7 % export their products directly out of the country



In many cases farmers contract crops to traders. Fruit crops and some vegetable crops such as potatoes are often contracted before harvest. The yield is estimated and the trader oversees the harvesting and packing processes. The main reason for such a practice is the absence of marketing systems in Afghanistan. Most farmers do not have transportation option to carry their products to district and provincial level markets.

It is more common for peri-urban district farmers to market their own products. In which case, they are in a better position to negotiate with traders and wholesalers.

Farmers from cross-border districts have a greater opportunity to export their own products at a better price.

Handling, packaging and marketing practices

There are no packaging standards for horticulture products in Afghanistan. Survey results (FAO, 2000) indicated:

- 38.3 % of villages use jute bags
- 34.3 % villages use crates
- 19.6 % villages use baskets
- 7.8 % villages use other materials

Marketing problems for horticulture products

Afghan farmers surveyed ranked horticulture marketing problems as follows:

- 1st Poor roads;
- 2nd Limited market information;
- 3rd Lack of storage and processing facilities;
- 4th/5th Lack of farmer cooperatives and limited market bargaining power against traders.

Before the war, the Afghan Export Department of the Ministry of Commerce provided information to traders and export-quality criteria were established for horticulture products (e.g. raisins). The Agricultural Bank and several cooperatives also provided information to farmers. These services were disrupted by war. Nowadays traders and farmers have no access to centralized market information. These issues need to be addressed through an integrated approach in order to rationalize the entire chain of production, grading, storage, packaging, processing, transport and marketing of horticulture crops.

Summary

Horticulture clearly plays a critical role in the Afghan economy and is essential for the reestablishment of the rural economy.

The 2000 FAO survey provides a clear and relevant account of the status of horticulture as it existed in 2000.

No data more recent than this has been collected though it can be presumed that all conditions have worsened.

The FAO survey and the preceding account of horticulture in Afghanistan illustrates the primary constraints that will require immediate attention if horticulture is to regain its position as a foundation of Afghan agriculture and a key source of rural income.

In the following section, we identify the primary constraints to the revitalization of horticulture in Afghanistan and propose a priority list of intervention activities.

Recommendations For Horticulture Development

Marketing, Statistical Analysis and Economic Forecasting

The urgent and immediate need exists to conduct a market analysis of domestic, regional and international trade opportunities for Afghan horticulture products and to determine steps that need to be taken to develop a viable, market-oriented horticulture sector.

Activities should include market demand surveys and local production practices and capabilities assessments so that an integrated assessment of opportunities can be developed. It will be necessary to utilize available documentation and published information, on-ground assessment and modern survey activities, as well as key informants. The involvement of both international experts and local Afghans in all aspects of the study will be essential to ensure realism and accuracy of the assessment, and to help train a cadre of Afghans for future work.

I. Determine production capacity, seasonality and availability of Afghan produce

Local demand and regional productive capabilities will be assessed and cataloged. Initially there will be a focus on priority areas selected by virtue of regional stability and transportation constraints. Surveys will include:

- a. Local and regional analysis of in-demand products
- b. Presumptive survey of capability
- c. Analysis of primary constraints

Local production capacity and qualities of horticulture crops will be surveyed utilizing all available information.

- a. Identify historical and current horticulture crop production locations
- b. Determine local supply capacity (i.e., land, water, labor, inputs, technical capacity, market access, security)
- c. Identify inputs (i.e., agriculture credit, planting materials, fertilizer, agrochemicals, boxes, shipping containers, etc.) and services (i.e., collection and packing facilities, refrigeration, transport, etc.) that may not be sufficiently available
- d. Evaluate current production practices, determine possible improvements, and estimate quantitative and qualitative outcomes.
- e. Estimate current and potential marketable yields, as well as costs of production, handling and distribution
- f. Identify status of producer, processor, marketer, and trade organizations (if any)
- g. Determine potential for raising rural income, generating employment and contributing to food security

- h. Identify alternative development interventions needed to stimulate and support commercial horticulture
- i. Determine sustainability of proposed interventions
- j. Integrate into local agriculture systems

II. Quantification of the current and potential market demand for horticulture products

Using a combination of field investigation, key informants, and published information, initial surveys will be conducted to identify and prioritize current and potential markets for the most promising crops.

Major markets to be examined are:

- a. Domestic
 - 1. Kabul
 - 2. Herat
 - 3. Kunduz
 - 4. Jalalabad
 - 5. Kandahar
- b. External
 - 1. Pakistan
 - 2. India
 - 3. Iran
 - 4. Gulf States
 - 5. Europe

Studies will include:

- a. Weekly price and produce availability survey
- b. Local, regional and international market demand survey
 - 1. Produce market
 - 2. Food processing market
 - 3. Household consumption patterns and demands
- c. Market structure analysis

Tasks will include:

- a. Identification of key economic factors for main horticulture crops and supply chains
- b. Reconnaissance-level analysis of existing patterns of internal distribution and external trade
- c. Analysis of current and anticipated demand for fresh and dried products in the domestic market

- d. Situation assessment and outlook for relevant horticulture products in neighboring countries with a view toward identifying end-markets or niches in which Afghanistan might have comparative advantage due to geography, access, seasonality, quality, cost, ethnicity or other factors
- e. Examine regional demand in Southeast Asia and the Middle East and study European markets for high-value specialty products and niche markets and for hybrid seed and value-added products
- f. Gather and process information on product demand, quality standards, phytosanitary requirements, price trends, payment terms, etc., for horticulture products in several international markets
- g. For selected domestic and regional produce deals, estimate the range of prices and marketing margins during the most likely market windows
- h. Identify current and potential comparative advantages in fresh and dried horticulture crops for developed country markets
- i. Where realized or potential comparative advantage appears, identify the most promising markets and plausible competitive strategies to pursue
- j. Identify key constraints that must be overcome to realize opportunities for select domestic, regional and international markets

It is important to recognize that in Afghanistan there is a deficit in food production, which obliges any market analysis to pay keen attention to the balance between horticulture production for the domestic market – based on nutritional necessities and internal demand - as opposed to horticultural production for the external market, as a source of export revenue. Thus, nutritional conditions and requirements need to be determined and must relate to market needs.

III. Production of a predictive economic model to guide investments and management decisions

In order to guide financial and capacity-building investments and management decisions, the following elements will need to be considered:

- a. Variables
 1. Production costs
 2. Production capacity
 3. Rate of return
- b. Assumptions
 1. Existing conditions
 2. Removal of primary constraints
 3. Fully modernized production
- c. Perspective
 1. Internal market
 2. Regional market
 3. International market

Different levels of productivity, market contexts and conditions, as well as future trends will be considered and modeled. All variables will be considered to model marginal economic benefits from investments in horticulture production and marketing. Based upon a comparison between present and projected conditions, this work will need to identify:

- a. Promising crops for both internal and export income generation
- b. Critical constraints to production
- c. Specific economic and social rate of return on investments in inputs
- d. Key constraints to market profitability and long-term sustainability
- e. Recommendations for short-term and long-term investment

Conservation of Plant Genetic Resources

Afghanistan is home to considerable unique germplasm. It is a unique center of origin and genetic diversity for many different crops that are of great value to the entire international community. Nevertheless, there are neither plant variety protection plans nor genetic conservation programs in Afghanistan today. Genetic erosion of horticulture crops has been observed at both inter-specific and intra-specific levels and actions are urgently needed to rescue and safeguard these resources.

Development of programs that will address these objectives require the primary action such as:

1. Rescue and conserve Afghanistan's wild and cultivated genetic horticulture crops resources

Afghanistan is a unique center of origin and genetic diversity of great value to the entire international community. Carrot, radish, cherry plum, apricot, peach, pear, apple, walnut, pistachio, fig, grape, pomegranate, melon, almond, are among the species present across the country in a unique array of useful agro-botanical traits. Additionally, many other commodities can be grown and are being grown under local conditions.

There are two major tasks to rescue and conserve these genetic resources:

- a. Eco-geographic surveys of targeted species
- b. Collection and conservation of genetic resources

2. Establish basic ex-situ and in-situ/on farm conservation facilities

To allow for safe and effective conservation programs, the establishment of a series of facilities is critical to efforts. The types of facilities that would need to be established are:

- a. Ex-situ seed gene banks (for short-term and long-term conservation)
- b. Ex-situ field gene banks for recalcitrant species
- c. On-farm community gene banks

3. Assess and map the distribution of the genetic diversity of vegetable and fruit tree species

4. Characterize and evaluate important horticultural traits

A great deal of work will need to take place with regards to cultivar use and propagation capacity. Biological and physical resource inventories should be conducted that will examine:

- a. The suitability of existing cultivars
- b. The potential for improved cultivars
- c. The potential for new crops

Programs will need to consider the adaptability of germplasm to local conditions in Afghanistan, such as the following:

- a. Soil properties
 1. pH : high (around 8.2)
 2. organic matter : low
 3. soil structure : poor
 4. Ca content : high, producing calcareous soils
 5. N and P availability : low
 6. P fixation : high
 7. K availability : medium to high
 8. Fe and Zn content : low
- b. Water properties
 1. quantity : drought
 2. quality : salinity
- c. Local ecological adaptability
 1. pollination
 2. diseases and pests

The characterization and evaluation of horticulture cultivars will require assessment of agromorphological traits using established descriptors.

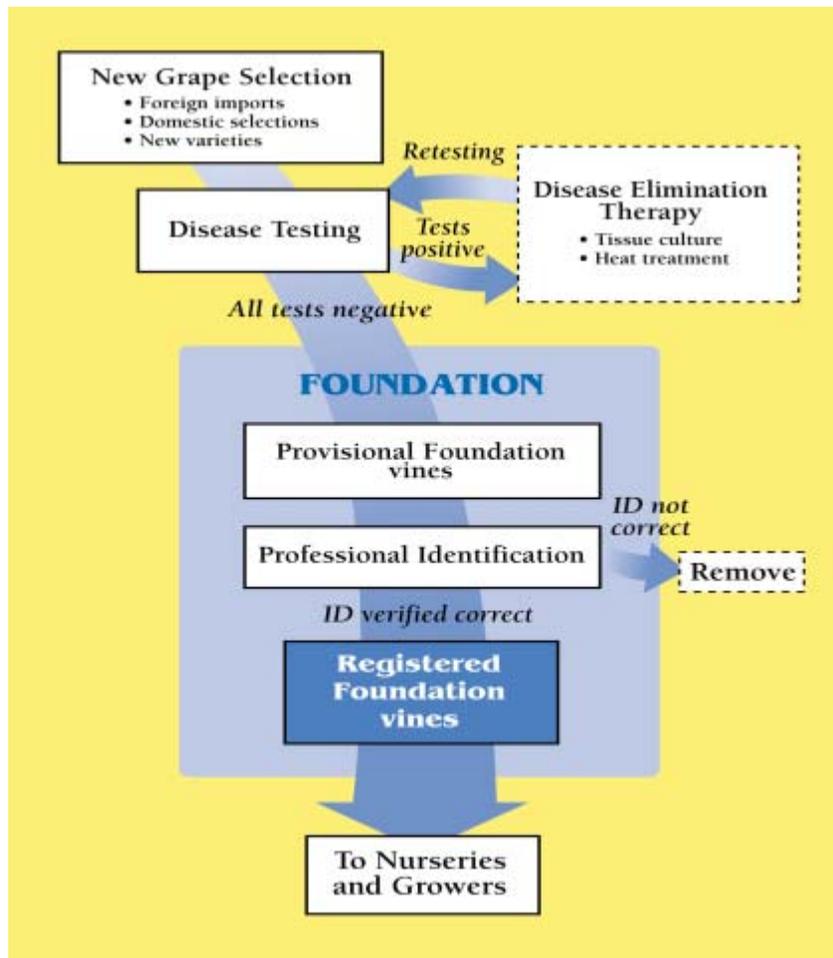
5. Documentation and information sharing

This primarily requires the development of a national database to record and disseminate information on genetic resources.

6. Reintroduction of germplasm collections of value from foreign gene banks

Since Afghanistan has no plant variety or patent protection plans, the country's capacity to utilize some of the best modern cultivars from abroad has been seriously affected. Therefore, a major consideration linked to this line of action is the establishment of a germplasm protection mechanism. This will allow for a structure that will safeguard reintroduction programs of foreign cultivars.

The following is a sample of the processes involved in selecting, testing and releasing grape cultivars. This is the type of program that needs to be designed and implemented for horticulture crops in Afghanistan.



Currently, Afghanistan has no plant variety or patent protection plans. Genetic erosion for horticulture crops has been observed at both inter-specific and intra-specific levels, and unique actions are required to rescue and safeguard these resources. Afghan varieties may provide an important market niche or international resource; germplasm however, will need to be protected to provide Afghans the relative advantage this represents. The lack of plant variety protection rights also compromises the country's capacity to utilize some of the best modern cultivars from abroad, which will not be made available in the absence of this protection. At the same time, imprudent adoption of high yield cultivars and modern practices may compromise Afghan horticulture and threaten its relative market advantage.

Therefore, germplasm protection mechanisms would make many outstanding cultivars available to Afghanistan by enabling them to:

- a. Rescue, safeguard and utilize Afghan's own genetic resources
- b. Import and utilize some of the best modern cultivars from abroad
- c. Reestablish modern breeding programs and benefit from the outcomes

Enhance Production and Postharvest Capacity, Diversity and Quality of Horticulture Products

To insure availability of high-quality horticulture products for domestic and international consumers, it is necessary to consider all components of the production process from field to market.

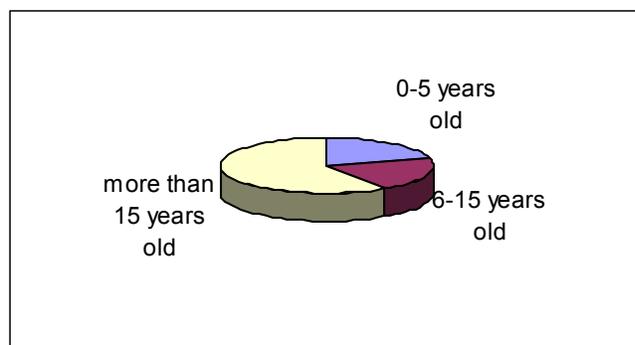
I. Facilitate the provision of high-quality, cost-effective inputs and plant materials through public and private participation and partnership

The key requirements for an enhanced provision of essential inputs are:

- a. Expand soil and water surveys to cover key horticulture regions and crops (to be conducted/coordinated with work following guidelines released by the Soils and Water Needs Assessment team)
- b. Conduct analysis of fertilizer demand for key horticulture regions and crops (work that can be carried out with the International Fertilizer Development Center)
- c. Develop "model" village enterprises to distribute and monitor the use of chemical, horticultural and genetic inputs (potential employment for women, orphans and disabled)
 1. Fertilizer and pesticide distribution and management (equivalent to a Pest Control Advisor)
 2. Seed multiplication, seedling production, budding, grafting, pruning, community nursery.
- d. Strengthen government-based community advisory services

II. Rapid rejuvenation of existing orchards

A large number of aging orchards can be found throughout the productive regions of Afghanistan. A 2000 study indicates that 58.1% of existing orchards are over 15 years old, many of which are much older than that.



These orchards were historically well managed and are of potential high yield and quality but have been abandoned or mismanaged due to political unrest and unattractive market

conditions. Many of these orchards can be quickly rejuvenated through proper horticultural techniques. This will require the establishment of a systematic and extensive program to demonstrate rescue methods and provide needed materials. These demonstration programs would include:

- a. Cultural practices
 - 1. Top grafting with local and introduced materials
 - 2. Pruning methods and tree reformation
 - 3. Promotion and training of suckers
- b. Fertilization strategies
- c. Irrigation methods
- d. Pest management

Training materials will need to be developed and a cadre of trainers to demonstrate rescue techniques will need to be trained. There is a coincident requirement for the provision of critical inputs including pruning equipment, pest and disease control materials, budding materials, etc. These activities will need to be coordinated with horticulture market studies and germplasm programs in order to insure selection of appropriate cultivars.

III. Develop farming systems that are sustainable and sensitive to market opportunities, input availability, and environmental fluctuations

There are two primary activities that have been identified for the development of highly effective farming systems:

- a. Develop an agro-ecosystem analysis of climatic zones, map and conduct GIS analysis to determine crop-growing regions.

This activity is essential to the long-term viability of horticulture in Afghanistan as it represents the essential basic information to guide cultivar selection and management practices. In a market-based horticultural system it is essential to develop a database of potential production capacity and the seasonality of supply.

- b. Identify and work with progressive farmers in each important region to modernize and optimize production and farming systems.

This will require, initially, the critical task of identifying progressive farmers. Recent surveys (FAO, 2000) indicate that 35.2% of farm communities consider progressive farmers their sources of information for extension support in agriculture, thus representing the most commonly cited source of information for these villages. Therefore, it is expected that highly effective methods of farmer selection be proposed.

Elements that would require attention are:

- 1. Water harvesting, water productivity enhancement, drought mitigation techniques

The 2000 FAO Horticultural Survey indicates “the training of farmers on improved water resources management practices should be treated with top priority as part of integrated programs for crop production development”.

2. Cultivar and crops selection

In 1996, 95.9% of orchards/vineyards were established with only 5 different fruit species, half of which being grapes (48.4%), followed by almond (19.6%), apricot (12.9%), apple (7.8%) and pomegranate (7.2%). A finding of the FAO Survey (2000) is that the low level of diversification of fruit production in intensive orchards is a striking aspect of fruit production. The top five vegetable crops were melon (38%), followed by watermelon (18%), onion (12%), potato (12%) and tomato (7.4%). These results show a clear evidence of a lack of awareness on the part of farming communities on the technical and economical advantages of growing and consuming a diversified range of products to increase their farm income and to improve the nutritional status of their families. Meanwhile, the country has an excellent climate for growing all kinds of vegetable crops and there is a considerable potential to promote vegetable crops production in Afghanistan. Afghan farmers can also be innovative in cultivating new crops if they are confident to find a market for them. In particular, farmers in some districts showed an increasing interest in growing relatively new crops such as cauliflower, okra, as well as some spice crops such as cumin. The FAO explains that, "This issue was eventually addressed in the past through the introduction and promotion of various species and varieties of horticultural crops. However, the impact of this activity always remained limited..."

3. Integrated pest management (forecasting, biological control, chemical control)
4. Fertilization strategies and nutrient management
5. Farming systems (cover crops, intercrops, shade crops, mulching techniques, erosion and stabilization of canals and rivers)

Focusing efforts on progressive farmers will help ensure successful adoption of introduced methods and ensure longevity of impact as improvements are adopted within the local village and regionally.

IV. Develop community-based subsidiary industries in horticulture

The development of industries and activities at a community level will play a significant role in the enhancement of Afghanistan's horticultural production. These industries can focus on different components of the production and postharvest chain.

At the production level, the following represent village-based industries that can be developed:

- a. Nursery-based industries
- b. Seed multiplication
- c. Input supply
- d. Chemical and fertilizer supply
- e. Village "Pest Control Advisor" or its equivalent
- f. Pruning, grafting, budding

Within postharvest activities, some village and household processing industries include:

- a. Packaging and sorting
- b. Storage
- c. Processing
- d. Drying

- e. Juicing
- f. Pickles
- g. Jams and ketchups

V. Implement improved postharvest practices and develop an effective horticultural handling, shipping and marketing system

The steps that horticultural produce must go through, from harvest until consumption, are numerous and will require close attention if market opportunities are to be explored. Lack of an appropriate management of this chain of events has repeatedly proven to cause significant postharvest losses, losses that need to be minimized for efficient production and increased returns. Additionally, many other elements in the production system are often determined by postharvest and marketing factors, which is why the FAO, in their Horticultural Survey of 2000, explained that many programs aiming at overcoming low crop diversification remained limited, mostly because of the total absence of structures required for the grading, packaging, storage, processing and marketing of a wider range of perishable horticultural products.

Some of the postharvest problems that will need to be identified and addressed in each step are the following:

- a. Sorting
 - 1. bruising
 - 2. decay, insects and disorders
 - 3. inefficiencies
- b. Packaging
 - 1. leakage
 - 2. bruising
 - 3. environmental impact
 - 4. contamination
- c. Storage
 - 1. decay and disorders
 - 2. overripening
 - 3. off-flavors
- d. Transport
 - 1. overripening
 - 2. bruising
 - 3. breakage
 - 4. temperature control
- e. Marketing
 - 1. quality losses
 - 2. improper retail conditions
 - 3. consumer dissatisfaction

The importance of postharvest losses to horticultural viability is illustrated in the following table. In Egypt, as much as 43% of all produce is lost prior to reaching the consumer.

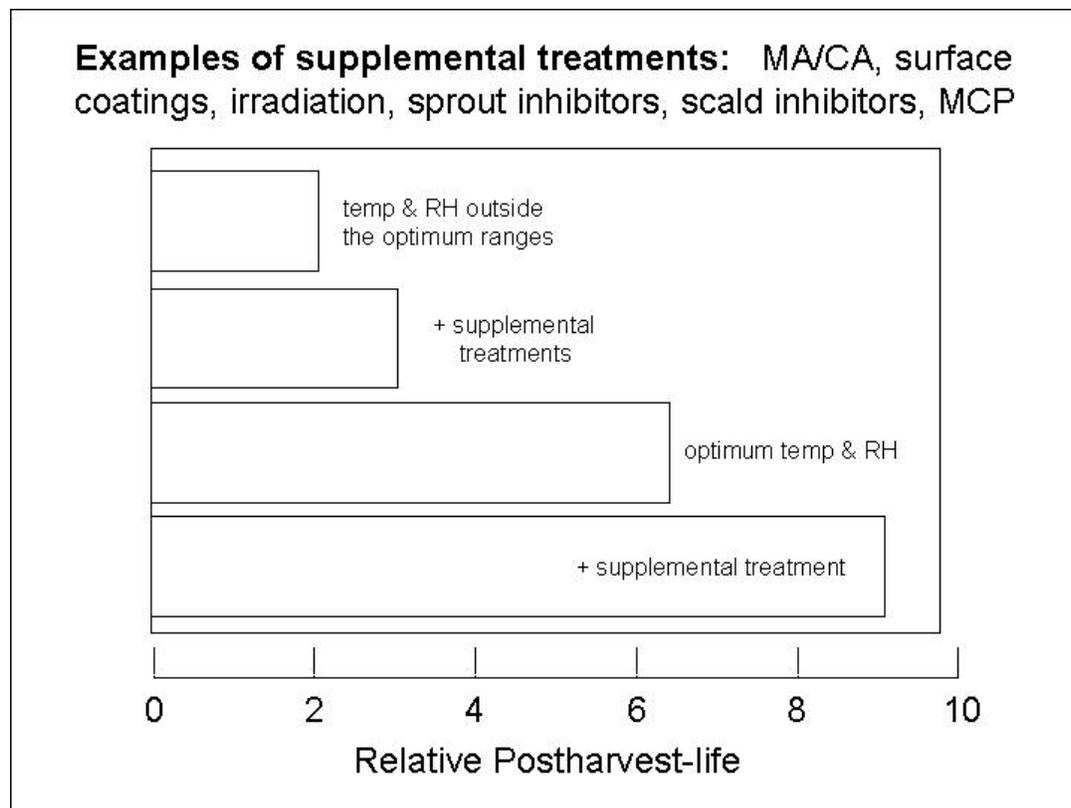
MARKETING SYSTEM LEVEL	Percentage loss of commodity	
	Potatoes	Tomatoes
Farm	11.9	9.0
Wholesale	1.5	20.0
Retail	4.2	14.3
Total	17.6	43.2

Source: University of California - Egypt, Agricultural Development Systems Project Final Report (edited by Blond, 1984)

Numerous postharvest treatments and practices are available. Their cost effectiveness and appropriateness for Afghan produce and conditions must be assessed. Processes include those that require a low level of technical know-how and financial investment to those that are technologically detailed and expensive. Benefits from postharvest improvements can accrue from very simple interventions that limit the exposure of the crop to high temperatures. Other treatments that are widely used in modern horticultural enterprises include:

- temperature control
- modified atmosphere
- controlled atmosphere
- surface coatings
- irradiation
- sprout inhibitors
- scald inhibitors
- MCA

The following graph portrays the benefits of supplemental postharvest treatments, in terms of relative postharvest life, and illustrates the central importance of temperature control, an intervention that can be implemented at very low cost (i.e. picking in the morning and shading harvested produce).



If horticultural produce is exported then international quality standards must be adopted, both in grading norms and health-related practices. Presently, packaging conditions in Afghanistan are sub-standard and result in an unacceptable level of damage for international produce. For example:

- 38.3% of villages use jute bags
- 34.3% of villages use crates
- 19.6% of villages use baskets
- 7.8% of villages use other materials

Poor roads, limited market information, lack of storage and processing facilities, absence of farmer cooperatives and limited bargaining power, all represent problems affecting horticultural marketing that need to be addressed.

To improve product postharvest and shipping, the follow activities must be conducted:

- Survey the available human resources for extension and applied research within both the public and private sector in Afghanistan, and develop a mechanism by which these individuals can be involved in training and extension activities.

→ Develop a training program in postharvest biology and technology of horticultural crops (see Human Resource Development below). This can include short courses to be held in Afghanistan and abroad. Along with these programs, provide a set of relevant books, publications, and audiovisual aids to the library of each institution or organization involved in postharvest handling of horticultural crops.

→ Survey the currently used postharvest handling systems for all major horticultural crops, and identify sources of postharvest losses in quality and quantity. Also, survey available facilities, equipment, and tools for postharvest handling.

→ Identify simple (and ultimately more advanced) modifications in the handling systems that could improve handling and reduce postharvest losses and determine the return on investment for each proposed modification.

→ Develop proposals for widespread implementation of selected promising modifications.

VI. Establish farmer trade associations or cooperatives

The administrative and fiscal organization of production and marketing chains plays a crucial role in the enhancement of production and marketing. The establishment of these organizational structures will be critical to long-term productivity and marketing success. Associations are required in the following areas:

- a. credit and finance
- b. consultancy
- c. contract growing
- d. import and export analysis
- e. quality control and safety
- f. certification and labeling

VII. Develop a diversified diet through horticulture to enhance human nutrition

Horticulture represents one of the most valuable sources of micronutrients for the human diet. When horticultural products do not constitute a significant part of the population's diet and do not contribute to the diversification of consumed food items, it translates into nutritional deficiencies that cause a series of health problems.

Studies need to be conducted on the nutritional status of the Afghan population, and on contribution of local fruit and vegetable consumption to diet. Based upon these studies, regional plans can be implemented that recognize the role horticultural production and improved diet quality on human health.

At the same time, it will be necessary to develop educational programs especially directed to women and children to highlight the role of horticulture in diet and health. Home garden projects and training plans will need to be launched to reach the key decision makers in domestic food consumption. According to FAO studies (2000), the existence of health structures (e.g. Basic Health Units) within a half-day walking distance was limited, with only 9.1% of village communities having access to such structures. On the other hand, on average, it has been observed that 60.7% of village communities had access to a building to be used as a school which may serve as a site for conducting integrated training programs for women on kitchen gardening and family nutrition, and school-garden projects for children.

Human Resource Development Program

Modern horticulture is technologically sophisticated, thus the reinvigoration of local horticultural production and development of new markets will absolutely require the implementation of training programs and the provision of technical resources. Training in germplasm and cultivar development, irrigation, fertilizer and pest management, cropping systems and postharvest management will have to be provided. The provision of knowledge, training and skill development at local, regional and national scales is the foundation of a modern horticulture.

A sequential intervention to provide the necessary technical information is clearly required. The first challenge is to provide technical information that is relevant to Afghan needs and available in local languages. In addition there is an immediate need to develop a cadre of professionals who can serve as the delivery agents for this information, first to progressive farmers and village leaders and then to the population as a whole. Subsequently, steps must be taken to develop the local educational and research facilities so that Afghans can develop their own relevant regional research, training and extension service.

Afghanistan has historically had an effective agricultural extension and training program that may serve as a model for future revitalization of this sector. At the national level, the agricultural research and technology transfer system (ARATT) has in the pre-war past effectively contributed to enhancing agricultural productivity, generating the surplus for export, and improving the welfare of the nation. Its development role in the 1960s and 1970s, and promotion activities resulted in the adoption of improved seed, fertilizer and improved technologies. The system, established some 50 years ago, integrated research and extension in one organizational structure to promote new technologies for improving crop and livestock production. At a later date this structure, was separated into 2 departments, which are discussed below.

The Department of Agricultural Research is composed of 11 sub-department; the Soils, Irrigation, Agronomy, Horticulture, Industrial Crops, Seed Improvement, Plant Protection, Agricultural Machinery, Animal Husbandry, Poultry, and Planning and Statistics. In the pre-war past, the department carried out its mission through 24 research stations (7 main, and 17 sub-main), covering the geographic and agro-climatic variability of the country. The total area of the stations was about 1750 ha. Except of a few relatively large stations (200-500 ha), all other stations have areas around 5 ha to 80 ha (Appendix 1). Some stations were working on improving crops, horticulture, and livestock, while others had focused on either one or more of these. Before the degradation of the system, the research stations had 1020 staff member of which 40% were located in the 7 main stations. The technical research staff accounted for 25% of the total staffing, and most were B.Sc. graduates with some having a Master's degree. The remainder was support staff.

The Department of Agricultural Extension has 8 units; Program Planning, Evaluation, Communication and Information, Field Crops (cereals, legumes, and forages), Oil and Industrial Crops, Horticulture (fruit and vegetables), Certified Seeds, and Rural Women Development. The department implemented extension activities, using extension methods and tools for transferring improved technologies promoted by the research system. Such activities were: demonstrations and field days; exhibitions; assistance to solve technical irrigation problems, improving nurseries, facilitating linkage between the Seed Company, Agricultural Bank, and rural communities, training farmers, and collecting agricultural data. Extension activities were carried out at the provincial and district levels through 400 extension units distributed all over the country. Each of these units had a head and a number of specific subject-matter specialists and extension workers (each in charge of the villages within an area of 1-2 km²). Each unit had enough office space and facilities, agricultural equipments and audiovisuals, vehicle, motorcycle, and a bicycle for every extension worker. A provincial office that includes a director,

3-4 specialists, and a few administrative staff managed the units in each province. During the 20-year period of conflict this capacity has been lost.

ARATT had effectively contributed to agricultural development. Improved technologies (germplasm and cultural practices) developed, adapted for different geographical and agro-climatic zones, and disseminated to farming and herding communities. More than 22 improved varieties of wheat were released, adopted by 60–70% of farmers, and with improved cultural practices have increased farmer' yield by about 50–100% over the local's. Many improved varieties were released for corn, cotton, pulses, and other crops. Horticulture had received due attention, with over 25 for different species of vegetables were released, 45 for grapes, 7 for apples, and many others. Improved breeds of cattle were introduced, and crossbred with local strains. Improved strains of poultry were also introduced and disseminated. Genetic improvement programs by selection were carried out for bettering yield and product quality of local sheep and goats, as well as feeding improvement. Vaccines for animal health were locally produced, and extensive veterinary health programs were implemented.

Due to the 20-year prolonged conflict, the capacity of ARATT has drastically declined. Many experienced technical staff have fled the country or taken other jobs. Some research station land has been confiscated by military forces or by influential people and used for other purposes. Equipment has been destroyed, stolen, damaged or obsolete. Currently, only 5 of the 24 stations are relatively well staffed, but very poorly equipped. Some 10 stations are not active at all, and the rest are only partially operational. Only 184 of the 400 extension units are now trying to resume providing some extension services (with no or poor facilities) for about 9760 villages out of over 30,000 villages. Returnee staff members of ARATT are increasing, but due to lack of communication, the administration in Kabul does not know the exact situation in many provinces.

The potential exists to establish and operate an efficient ARATT. However, all research stations and extension units are in a bad need for buildings rehabilitation, provision of office space, field facilities and operational equipment, and – above all – human resources. Institutional and policy innovation and intensive training to upgrade staff number and capacity, besides enhancing the knowledge, awareness, and experience of farmers and herders, are urgently needed. Acknowledging its crucial role for recovering the agricultural sector, the Ministry of Agriculture and Animal Husbandry (MOA) has given a first priority for rehabilitating the research and technology transfer system.

No.	Name, Location/ Province	Area (ha)	Staff Past	Staff Now	Remarks
1	Darul Aman in Kabul*	30	40	45	Active, research on C, L, V, F
2	Badam Bagh in Kabul	80	110	50	40% operating, fruit tree research
3	Qargha in Kabul, fruit	14	25	13	60% operating (fruit production)
4	Qargha in Kabul, vegetables	5	16	10	Partial operating (Veg. research)
5	Tarnak in Kandahar*	500	110	25	20% operating (F, V, C, L, I)
6	Kokaran in Kandahar ⁽¹⁾	48	35	0	Not active (F, C, I, V)
7	Spenghar in Kunduz*	40	45	NA	Active (C, I, V)
8	Chardarah in Kunduz	34	24	NA	40% operating
9	Ortabolaqi in Kunduz	80	100	0	Not active
10	Dehdadi in Balkh*	10	20	NA	16% operating (C, I, F, V)
11	Khas Bazar, Balkh-Mazar ⁽²⁾	80	65	0	Not active (seed production, research)
12	Urdo Khan in Heart*	216	65	40	30% (research & seed) C, I, V)
13	Falahat in Heart	50	20	0	Not active
14	Ghoore in Ghoorat	40	35	0	Not active (C, Pistachio)
15	Mullah Gholam in Bamyan	4	15	0	Not active (winter wheat, V)
16	Lab-e-Darya in Bamyan ³	5	28	0	Not active, used by the army
17	Bolan in Helmand	50	42	42	60% operating (C, I, V, F)
18	Rohani Baba in Paktia	40	35	35	Active, C,V.F
19	Sheshan Bagh in Nangahar*	14	35	35	Active (C, V, citrus)
20	Farm Jadeed in Nangahar	9	16	16	Active (Veg. seed production)
21	Pozishan in Baghlan*	102	85	0	Not active, was No. 1 station
22	Baysaqal in Baghlan	200	20	0	Not active, totally for rainfed resea.
23	Taloqan in Takhar	27	16	NA	30%, rainfed and irrig. (C, V, F)
24	Lal in Bodakhshan	20	15	0	Not active rainfed and irrig. (C, F)

C = cereal (mainly wheat, some corn, sorghum, and rice in warm locations)
F = fruit trees (grapes, stone-seed, and others; and pomegranates and citrus in warm locations
L = legume, mainly chickpea
V = all kinds of vegetables
I = industrial crops, including cotton and oil crops

(*) Main stations, non-asterisked are sub-stations

(1) Taken by influential people

(2) Taken by Taleban for housing, will be replaced by a new location called Takhtapool station

(3) Taken by the army

Besides addressing the system within national structures such as the ARATT, efforts will need to be made to increase knowledge and capacity at a broader level. Afghans need to be empowered to lead the development of a modern, market-responsive, and sustainable horticultural production system. The main groups that need to be targeted are:

- Farmers and producers, including women and disabled community members, in order to increase local capacity and employment
- Agricultural specialists, researchers and extension agents
- University personnel
- Afghan government members, including ministry personnel and staff

A survey of 7,003 villages carried out by the FAO in 2000, where farm communities within each village were requested to mention their sources of information for extension support in agriculture, indicates that government extension workers are identified as such sources in only 5.8% of all cases. This low number illustrates the devastating lack of resources within existing ministries. Considering their key role in the transfer of knowledge to farmers, it is of utmost importance to build the force they represent in the country.

Activities that should be implemented include:

A) On-farm training and demonstration

The establishment of demonstration farms and training centers will be required to help distribute modern horticultural knowledge to the farm level. Adequate locations would need to be identified, and centers could be crop-specific according to the host area. At these centers, physical resources - such as libraries, laboratories and equipment - could be rebuilt, and human resources developed as trainers and work teams.

Training could be directed to both Afghans and Afghan-Americans, giving priority to pre-existing horticulture experts in Afghanistan and returnees. An effort should be made to seek most progressive young farmers for training (members of developing grower and marketing associations), and at the same time to form a pool of Afghan students. Training could include agricultural production and technology, as well as business and marketing skills, but also English language and computer skills.

B) Production of training materials

Parallel to training processes, and included amongst the efforts in human resource development, the development of a set of deliverable and replicable horticulture production manuals will be necessary. Many manuals, information sheets and workshops materials are available regionally and internationally and can be adapted for Afghan conditions. Production manuals and crop fact sheets produced in the U.S. and elsewhere, and relevant web sites, could be translated and made available for training use. Both detailed publications with extensive information on different crops and production factors, as well as handouts and brochures that can be delivered to local farmers, should be included amongst translations. These materials should be integrated into training activities to form the basis of future extension of this knowledge to growers.

C) Vocational education programs

The training of researchers and extension agents is central to the rehabilitation and reconstruction of a stable and prosperous society in Afghanistan. The development of workshop interventions, designed to immediately impact the production capacity and delivery capability of the horticulture sector, can be a powerful tool for advancing the necessary human resource development. At the same time, the establishment of long-term collaborations should also be pursued, for institution building and scholar exchange for certificate, M.S. and Ph.D. programs. Short courses developed in U.S. universities and adapted to the Afghan context, could be offered by U.S. and Afghan experts. Workshops should be designed to train a cadre of agricultural specialists capable of workshop design, delivery and implementation.

D) Dissemination of information

Different means and media need to be identified for the dissemination of information on horticultural science and technologies. The BBC New Home New Life program represents an example of such a source for dissemination.

E) Development of education partnerships

Opportunities exist to form agreements of cooperation between Afghan universities, Ministries, and foreign universities and state governments, to assist with curriculum development and implementation. Based on mutually identified needs such partnerships could result in the development of extensive formal and informal training programs to upgrade the capacity and skills of university, extension and ministerial staff.

The strategy to rebuild human capital takes a variety of forms, both short- and long-term. Activities that are usually considered as training include workshops, information packages, exchanges, certificate programs and graduate level degree programs. The following table defines, and, in some cases provides examples of short- and long-term training interventions, as well as examples of short-term training

Short-term	Long-term
<p>Workshop: Approach 1: Group-training courses are structured learning programs based on needs analysis, to be designed for delivery of new knowledge or skills in specific areas of specialization.</p> <p>Approach 2: Collaborative Group Training courses to address specific problems and develop indigenous training capacity by the training of trainers.</p> <p>Information: The development of informational/training modules in a computer-assisted distance education form, to enable researchers and extension specialists/educators to access current information in a state-of-the-art form. These include decision support tools, specific information sets, research methodology, and professional support tools.</p> <p>Exchange: This activity includes the direct exchange of personnel for well-defined programs not to exceed 6 months. An example of this kind of exchange would be an OJT (On-The-Job) in a post-harvest activity such as cleaning, packing and storing where the trainee would work side-by-side with the specialist.</p>	<p>Exchange: This exchange is long-term OJT to develop expertise in a process that includes several areas of expertise.</p> <p>Certificate: A certificate program designed to provide an academic learning experience for a year based on work, observation, practice and individual guidance rather than the traditional graduate program of classes testing and research.</p> <p>Graduate: Long-term training includes both MSc and PhD training programs. These are to be based on needs analysis of the organization and prioritized based on specialty importance. A specific curriculum is to be developed for each individual in the program.</p>

The strategic interest of this endeavor is the restoration of the horticulture crops. Due to the devastation of the war and fuel wood crisis, in many areas this would require re-establishment of orchards with respect to demarcation, replanting and re-introduction of basic care principles, and the re-establishment of education and extension delivery of research, knowledge and materials. For this reason, the short-term training tasks must seek to produce:

- Trained trainers with expertise in education, extension and delivery techniques on horticulture and horticulture management
- A trained cadre of agricultural extension agents with current scientific knowledge and practitioner skills in horticulture.

Both the above outcomes address the human capacity needs required for re-habilitation of the educational process and hence the horticulture sector. It is anticipated, and expected, that trainers and extension agents from this group will ultimately be selected for advanced study, i.e., certificate, M.S. and Ph.D., for long-term institutional development.

Some of the subjects that need to be included in training efforts are:

- Trainer training
- Orchard management/tree crops
- Postharvest technology/process
- Agricultural business management
- Analysis and determinants of farming systems

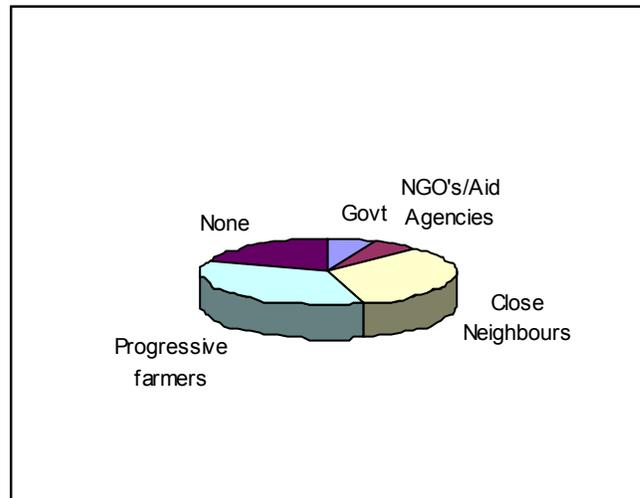
A monitoring and assessment plan will be necessary, and the crucial nature of follow-up efforts must not be overlooked.

Additional Considerations

There are several important considerations, critical to the execution of these tasks, which are related to community structure and functioning in rural areas.

A survey of 7,003 villages carried out by the FAO in 2000, where farm communities within each village were requested to mention their sources of information for extension support in agriculture, indicates key points for the transfer of knowledge to farmers.

1. Government extension workers	5.8 %
2. NGOs / Aid agencies	5.7 %
3. Close village neighbors	34.1 %
4. Progressive farmers	35.2 %
5. None	19.2 %



A main lesson learnt from this survey is that the prevailing channel for the exchange of agricultural extension information within/between the communities is through close village neighbors (34.1%) or through progressive farmers from the area (35.2%). This means that any development strategy will need to focus on community empowerment through community-level capacity building, improvement of horticultural practices and implementation of technology.

On another note, it is often difficult to refer to "local authorities" as reliable counterparts for supporting the implementation of long-term development programs. According to village communities who were requested to identify and rank the most prominent community level decision-makers who could act as regular counterparts to supervise the implementation of rehabilitation and development programs (FAO, 2000), elders always play a very important traditional role. An elder is usually an old respected and honest person from the Afghan community whose decisions are respected and accepted by the villagers. Traditionally he solves any kind of problem arising between the villagers and not allowing disputes to reach governmental authorities. Therefore the role of these elders must be taken into consideration for the elaboration of rehabilitation and development program strategies, though precautions will always have to be taken to ensure that they are fully committed to the goals and objectives of these programs.

These findings therefore clearly justify the crucial need for further developing extension programs with a focus on farmer training on improved orchard management practices. These programs will need to address, in an integrated fashion, the varying components of Afghan horticultural production, and consider the major setbacks that have been identified. The leading problems, as reported by the FAO, should be remembered and taken into account. The first and most important problem was the lack of irrigation water. The second most important problem was the prevalence of diseases followed by insects damages, lack of improved vegetable seeds and fruit varieties, prevalence of noxious weeds, lack of marketing facilities and smallness of farm size per family.

Task Summary

To sum up, coordinated action is required for rehabilitating Afghanistan's horticulture. The most critical tasks for the development of the horticultural industry are:

IMMEDIATE TASKS

- Conduct surveys of:
 - market opportunities
 - horticultural productivity and postharvest practices
 - germplasm and nursery conditions
 - conditions and management of soils, irrigation water and fertilizers
- Utilize Geographical Information Systems to determining target agricultural regions and crops.
- Conduct a rapid rejuvenation of existing orchards.
- Determine priority needs for local production chains, including the provision of inputs and the support of private sector development.
- Establish linkages between nutritional status of Afghan population and horticultural production

SHORT-TERM TASKS

- Facilitate the provision of high-quality, cost-effective inputs and plant materials – including the restoration of irrigation and power, and the establishment of essential infrastructures such as nurseries - through public and private involvement, and with the support of local technical assistance that will provide sustainable operation.
- Initiate training
 - at the grower level
 - at the consultant level
 - at the extension level
- Translate and publish technical materials.
- Implement improved postharvest practices and develop an effective horticultural handling, shipping and marketing system
- Provision of key inputs,
 - high-quality seed and improved plant varieties
 - fertilizers
 - irrigation technology
 - agricultural chemicals
 - postharvest materials and marketing infrastructure.

MID-TERM TASKS

- Reestablish demonstration farms that include
 - grower and extension training programs
 - on-farm demonstration projects and trials for new practices
- Establish property and germplasm protection protocols.
- Rescue, collect, characterize, evaluate and multiply local germplasm, using participatory approaches and incorporating indigenous knowledge
- Continue the identification and implementation of new crops, of value-added crops and of requisite production chains.
- Develop curriculum at Afghan universities, in cooperation with local faculty, and insure training of future scientists, teachers, innovators and marketers.
- Study and establish local community-driven structures, and facilitate development of subsidiary horticultural industries and activities at a community level
- Create system of support to the Afghan private sector for increasing and maintaining product quality, commercialization and marketing.

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Annex #1

CONCEPT NOTES

The following Concept Notes represent descriptions of several areas that need to be addressed, and corresponding specific tasks to be organized and carried out, in order to advance the rehabilitation of horticulture in Afghanistan. On the basis of these Concept Notes, proposals or program descriptions can be developed for funding the implementation of these tasks.

Concept Note I	Rapid rejuvenation of existing orchards
Concept Note II	Horticultural production and nutritional conditions
Concept Note III	Improvement of postharvest technology
Concept Note IV	Optimization of farming systems
Concept Note V	Germplasm rescue program

CONCEPT NOTE I

Rapid rejuvenation of existing orchards

Objective:

Development and diffusion of knowledge and technology that will allow old orchards to be transformed into vigorous, high-quality orchards.

Justification:

In the 1970's Afghanistan was a significant exporter of horticultural crops, which represented as much as 60% of Afghanistan's foreign exchange. A large percentage of existing orchards remain, but have been neglected and can no longer attain full production. There is an important need and opportunity to rapidly enhance orchard production through the utilization of appropriate horticultural techniques.

Tasks:

There is an immediate need for the development of a rapid, systematic and extensive program to rejuvenate the orchards of Afghanistan. Participatory survey work should be conducted to formulate an approach that can be adequately applied and disseminated for effective orchard rejuvenation. This program can be achieved rapidly and effectively through the development of training materials and the education of a cadre of trainers who will demonstrate rescue techniques to local lead farmers. There is a coincident requirement for the provision of critical inputs including pruning equipment, pest and disease control materials, budding materials etc. Subsequent activities would also include the development of nurseries and education on long-term orchard management practices.

Some of the elements of orchard renewal, to be integrated into any demonstration program, can include:

- Cultural practices
 - top grafting with local and introduced materials
 - pruning methods and tree reformation
 - promotion and training of suckers
- Fertilization strategies
- Irrigation methods
- Pest eradication and management

Rejuvenation activities should ultimately be coordinated with horticultural market studies and germplasm programs, in order to insure selection of appropriate cultivars.

CONCEPT NOTE II

Improvement of postharvest technology

Objective:

Study present Afghan postharvest handling systems, and implement improved practices and technology to allow realization of developing market opportunities.

Justification:

It has repeatedly been demonstrated that horticultural productivity is often reduced substantially (over 40%) by postharvest losses that can be easily avoided. This represents a major challenge in any agricultural marketing system. The postharvest component of the production chain in Afghanistan must be addressed if its horticulture is to be restored to international standards of quality and profitability.

Tasks:

An integrated program of intervention is required, including the following tasks:

- a) Survey the available human resources for extension and applied research within both the public and private sector in Afghanistan, and develop a mechanism by which these individuals can be involved in executing recommended tasks.
- b) Develop human resources through training programs that update the knowledge of select individuals about postharvest biology and technology of horticultural crops. This can include the organization of short courses in Afghanistan and abroad, along with the provision of relevant books, publications, and audiovisual aids to the library of each institution or organization involved in postharvest handling of horticultural crops.
- c) Survey and examine currently used postharvest handling systems for all major horticultural crops, including standards of knowledge and prevalent conditions, and identify sources of postharvest losses in quality and quantity. Also, survey available facilities, equipment, and tools for postharvest handling.

Some of the problems that will need to be identified and addressed in each step are the following:

- 1) Sorting: bruising, inefficiencies, decay, insects and disorders
 - 2) Packaging: leakage, bruising, environmental impact, contamination
 - 3) Storage: decay and disorders, over ripening, off-flavors
 - 4) Transport: over ripening, bruising, breakage, temperature control
 - 5) Marketing: quality losses, improper retail conditions, consumer dissatisfaction
- d) Identify several relatively simple modifications in the handling systems that could reduce postharvest losses, determine the return on investment for each proposed modification.

Numerous postharvest treatments and practices must be studied within local conditions and adopted. Possible postharvest treatments include:

- modified atmosphere

- controlled atmosphere
- surface coatings
- irradiation
- sprout inhibitors
- scald inhibitors
- MCA

- e) Insure a positive return on investments and emphasize involvement of the private sector in these projects.
- f) Monitor the adequate implementation of postharvest knowledge and technology, and evaluate its outcome in measurable terms

CONCEPT NOTE III

Optimization of farming systems

Objective:

The development of farming systems that are sensitive to market opportunities, input availability and environmental fluctuations, while demonstrating productive efficiency and sustainability.

Justification:

Afghanistan has a long tradition in horticulture and a reputation for high quality production. Nevertheless, chaos, continuous warfare and governmental tyranny have destroyed much of its potential. In 1972, horticultural commodities supplied 40 to 60% of all export earnings, which was provided by effective farming systems. However, presently many fields are abandoned, many orchards destroyed, and tree nurseries, seed sources, water, inputs and knowledge are limited or non-functional. A great amount of work needs to be carried out to insure the present establishment of effective farming systems.

Tasks:

The development of highly effective farming systems will require two primary activities:

- a) Develop an agro-ecosystem analysis of climatic zones, map and conduct GIS analysis to determine crop-growing regions

This activity is essential to the long-term viability of horticulture in Afghanistan as it represents the essential basic information to guide cultivar selection and management practices. In a market-based horticultural system it is essential to develop a database of potential production capacity and the seasonality of supply.

- b) Identify and work with progressive farmers in each important region to modernize and optimize production and farming systems.

Progressive farmers represent the most important source of information for extension support in Afghan agriculture (FAO, 2000).

Select farmers would be targeted to receive technical training and specific inputs to address in the following key areas:

- 1) Water harvesting, water productivity enhancement, drought mitigation techniques

As indicated by the FAO in a 2000 report, "the training of farmers on improved water resources management practices should be treated with top priority as part of integrated programs for crop production development".

- 2) Crop and cultivar selection

The low level of diversity of horticultural crop production in Afghanistan is striking, especially when contrasted with the outstanding natural conditions for growing many kinds of horticultural crops and the considerable potential their promotion should have.

This issue needs to be addressed through the introduction and promotion of various species and varieties of horticultural crops. Afghan farmers are much more open to innovation in producing new commodities if they are confident to find a market for them, which is why this aspect must be linked to horticultural market studies. The development of cultivar collection and evaluation programs will also need to be tied in with these endeavors.

- a. Integrated pest management (forecasting, biological control, chemical control)
- b. Nutrient management and fertilization strategies
- c. Farming systems (cover crops, intercrops, shade crops, mulching techniques, erosion and stabilization of canals and rivers)