

## Conceptual Design for Paghman Nursery Water Collection and Delivery



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Prepared by  
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**A concept design for irrigation water collection and delivery is presented here. Personnel with the Forestry Department, Paghman Nursery and Ismail Nasri contributed greatly to this conceptual design.**

**Its focus is primarily on the collection and delivery of water to the reservoirs at the upper portion of the nursery. However, irrigation infrastructure through the nursery is also discussed.**

**The proposed improvements have the following goals:**

- 1. Increase the amount water available for irrigation.**
- 2. Reduce maintenance required for the infrastructure.**
- 3. Provide for better usage and management of irrigation water during droughts.**
- 4. Provide for control of water as the first part of the larger planned irrigation improvements.**

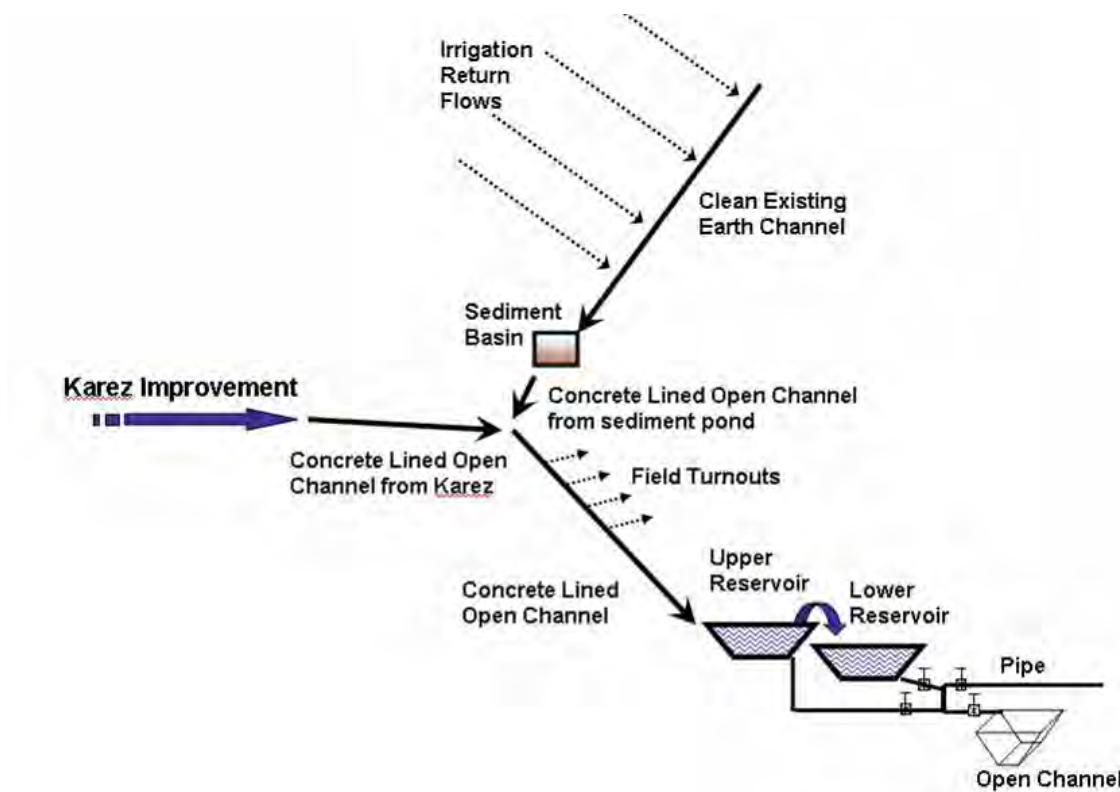


**Current Condition of Karez and Canal  
System to Nursery Reservoir**

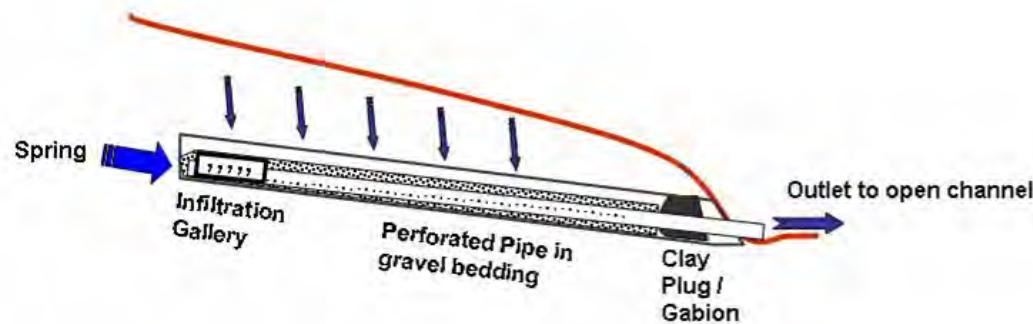
### **Present Condition of Water Reservoir:**

- 1. Inlet pipe damaged**
- 2. Outlet valve missing**
- 3. Huge hole at base**
- 4. Inadequate size for large-scale irrigation**



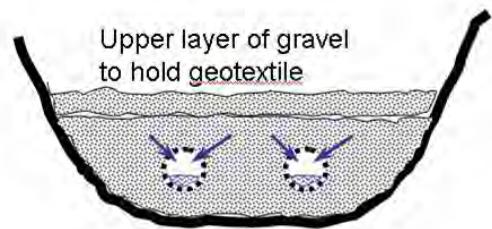


## Overview of proposed plan for collection and delivery of water to the reservoirs



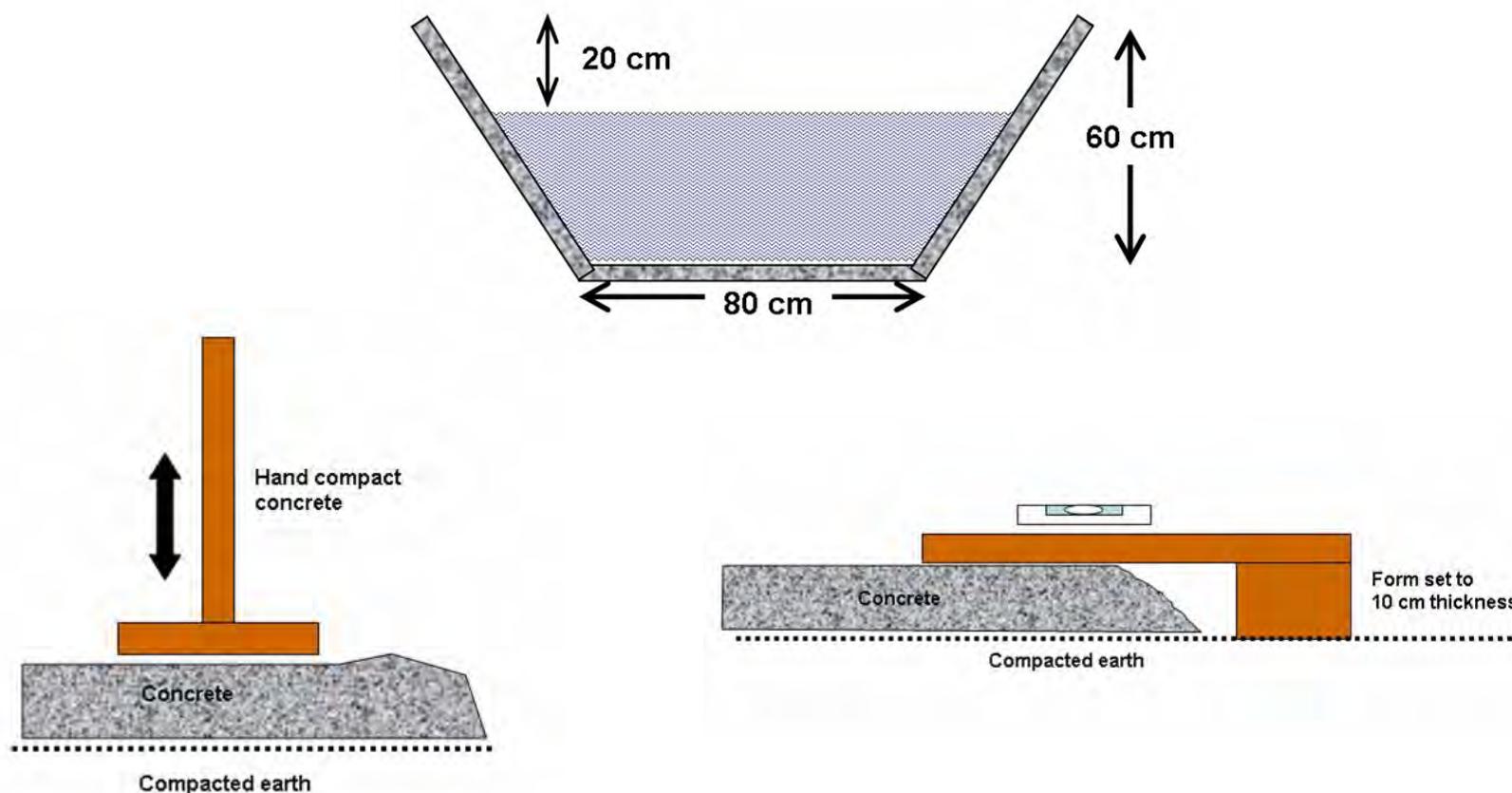
## A. Karez Improvement

Summary: Enhance existing Karez system with an infiltration gallery and pipe. This should reduce maintenance, reduce sediments in flows, and provide for more sustained flows. Underground and deep (>1 meter) excavation is potentially dangerous. Appropriate safety precautions should be taken.



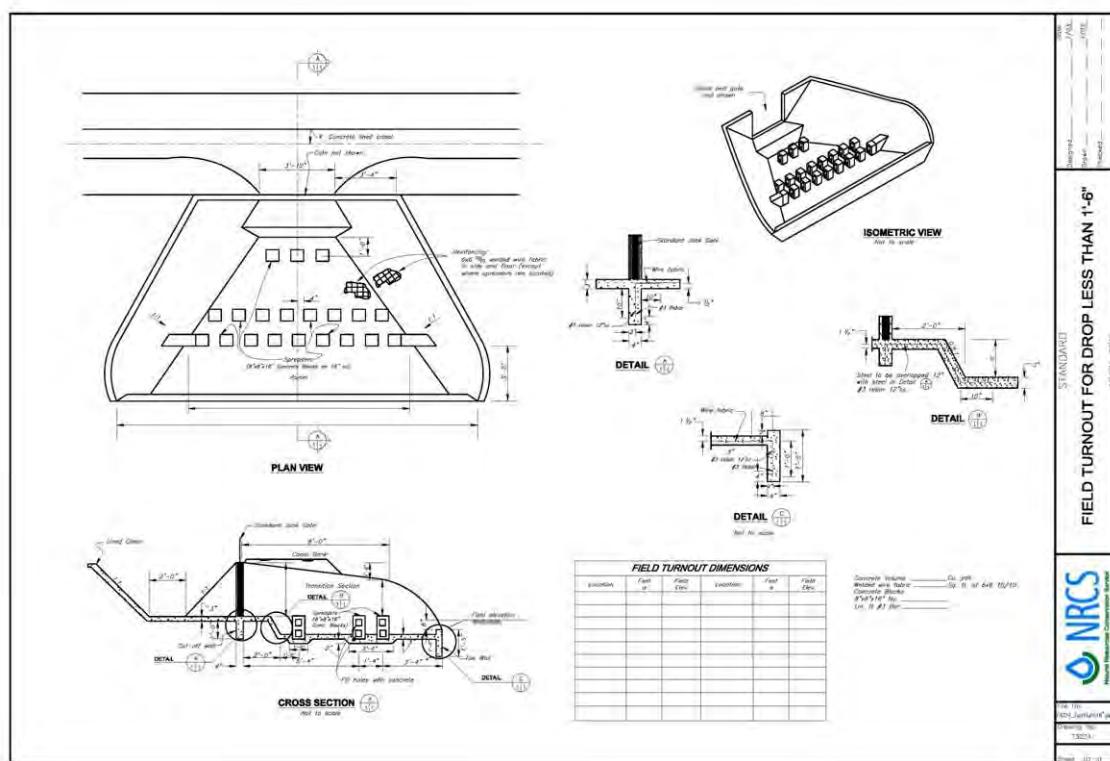
## B. Delivery of water to reservoir

Summary: This portion of the concept design addresses the movement of water from the Karez to the reservoirs at Paghman nursery. The canals would be constructed of concrete (to reduce water loss), and be of sufficient size to transport large amounts of water in the least amount of time.



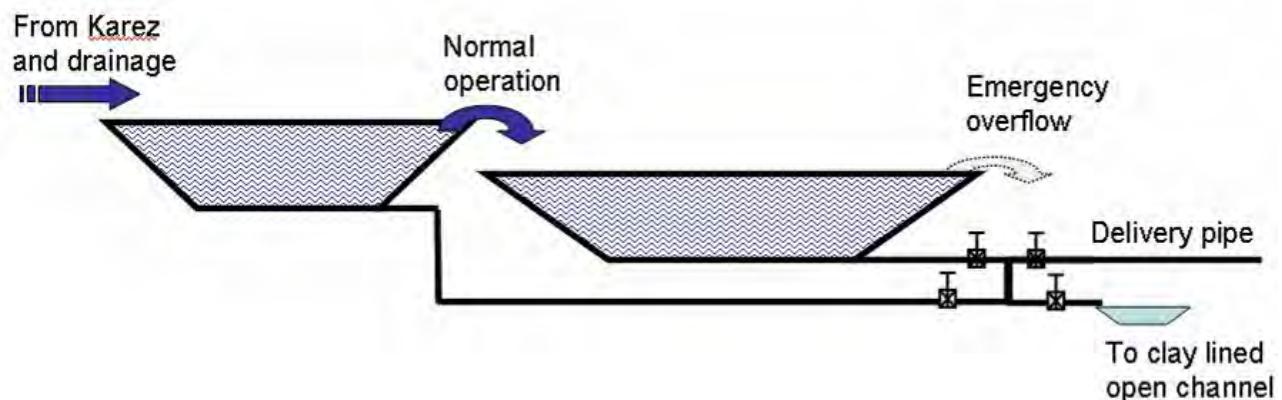
### **C. Turn-outs to provide water to farmers**

**Summary:** Farmers have created turn-outs in the existing earthen canal. These will be turn-outs installed in the concrete canal.



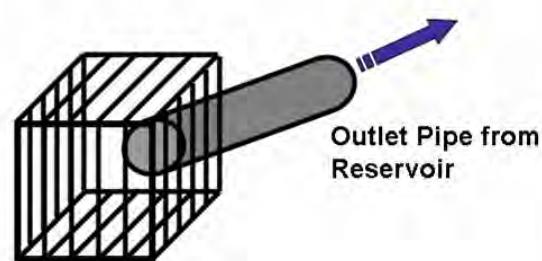
## D. Reservoir Improvement

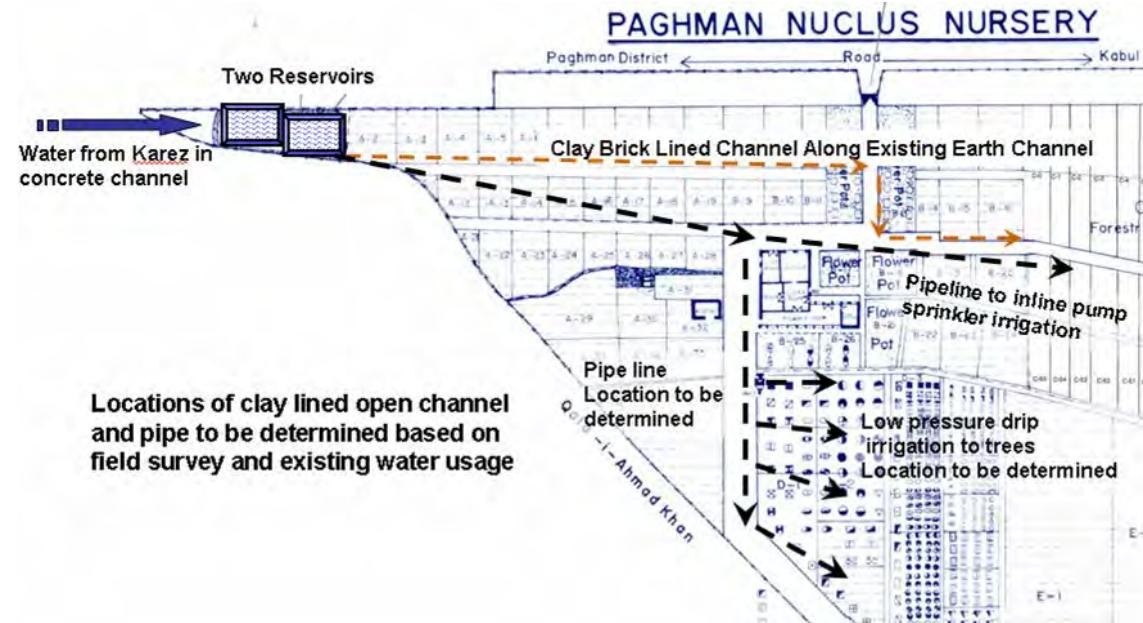
Summary: It is suggested that the existing reservoir be repaired and a lower one be constructed. These should operate in series with the upper functioning as a sediment basin as well as providing storage. A secondary security fence should be included around the reservoirs to reduce the possibility of theft, vandalism, as well as reduce the possibility of children or animals falling into the reservoirs.



## E. Outlet from Reservoirs

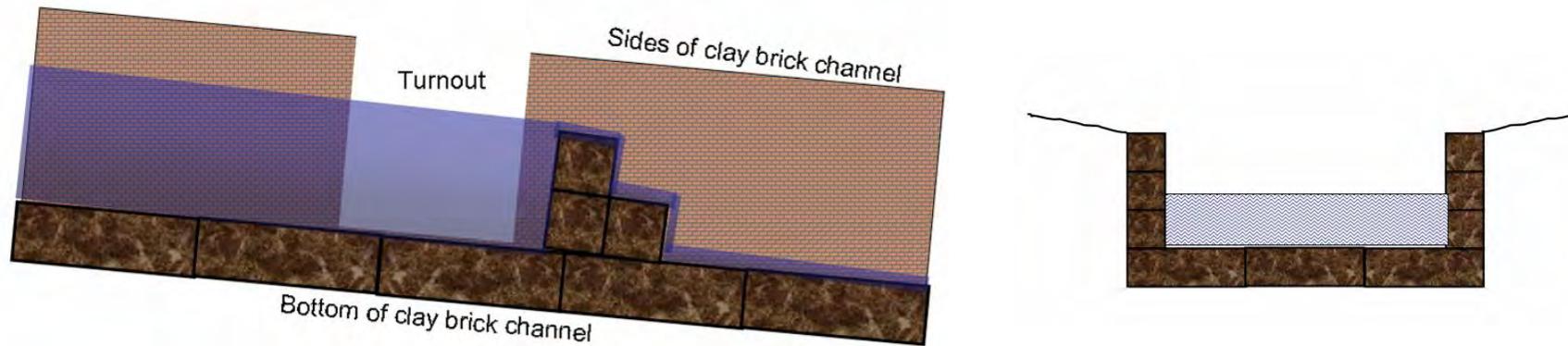
Summary: Outlet should be able to direct flows to both a pipeline and an open channel. Design should allow for flows to be directed to one or the other of these outlets for either or both of the reservoirs.





## F. Lined Open Channels

Summary: It is proposed that the existing earthen open channels be lined with clay brick. This will reduce loss of irrigation water to infiltration. This portion of the project can proceed in small stages and short lengths as funding is available.





## G. Delivery Pipe

Summary: A delivery pipe is proposed from the reservoirs to the nursery. This pipe would be used to provide water for drip irrigation and for sprinkler irrigation. It is expected that this part of the project will be constructed as a different phase from the previous items. Detailed survey information is required for design.



## Shadehouse Operation

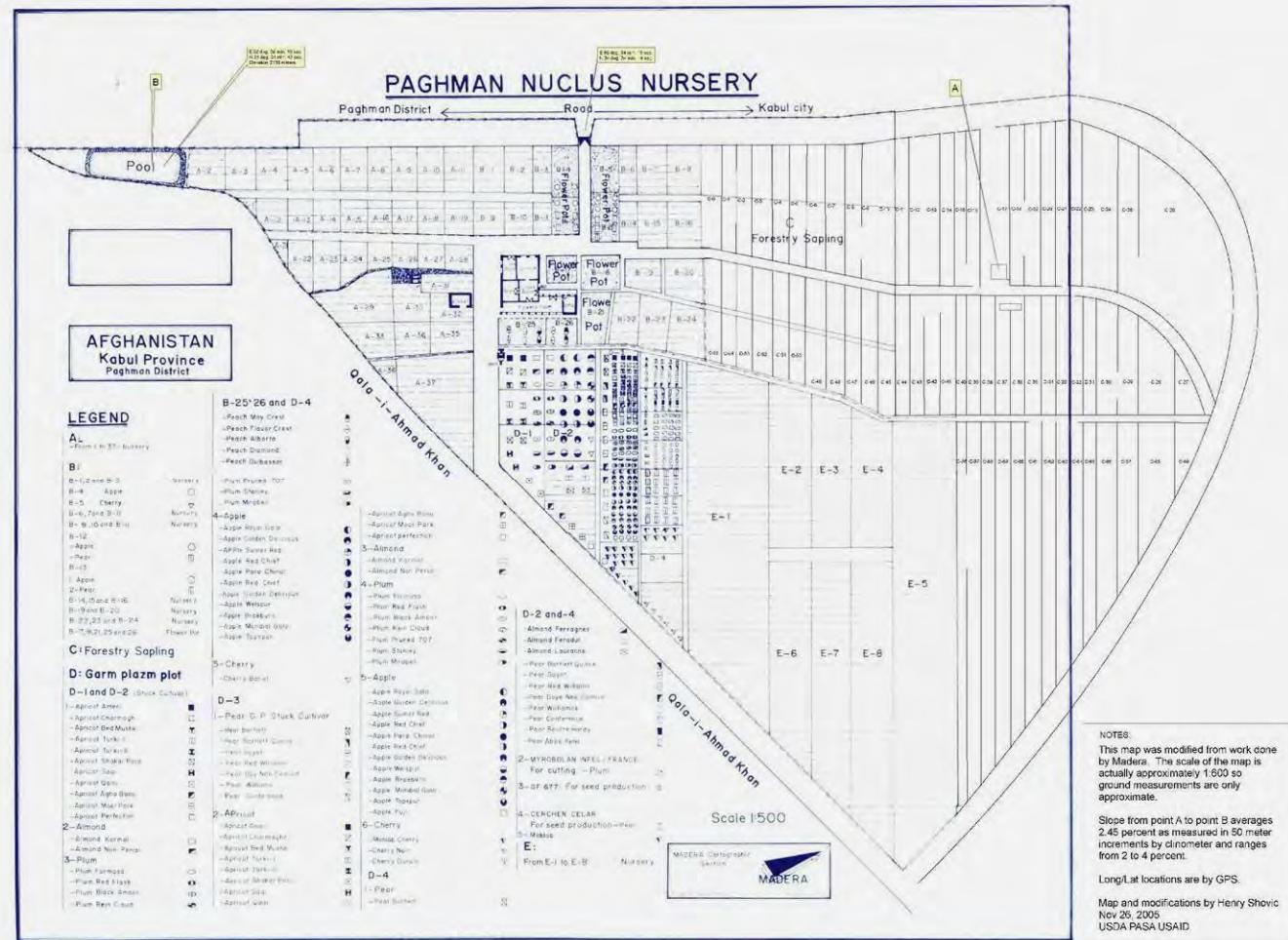
- 1. Shade will reduce water use in plants**
- 2. Manual operation of overhead shade.**
- 3. Plants can be watered with watering cans or irrigation systems.**
- 4. Make sure entire shadehouse is watered equally.**



## **Shadehouse Operation:**

- 1. 50% shade will reduce surface temperatures 6 C.**
- 2. White shade is more effective than black for reducing surface heat.**
- 3. Use shade when surface temperatures regularly >35 C**
- 4. Shade could increase plant shoot growth**
- 5. Pull back shade mid-October**





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