Carrot Aid Board Visit to Ethiopia

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assisted by Megbaru Ayalew

7-13th February 2019

1. Visit to Dan Church Aid Lidet Sitalew and Cecelie Winther, Friday 8th February 2019

Seed Multiplication Project

The first season was carried out by Mekanu Yesu at Dehana.

The second season was carried out by the Ethiopian Orthodox Church in Dawunt at 2600 m elevation. This involves a non-formalised **youth group** of 23 individuals, who have access to irrigation facilities. Individual farmers in the area do not have access to own irrigation facilities.

Theft of carrots from fields is a problem, even though carrots have a lower value than garlic. This is because carrots can be eaten raw as a snack by passing shepherds, local kids etc. As a result of this, 5000 Birr had to be paid for a guard house to protect the field at night.

The carrot variety **AUA-108 is now renamed Haramaya-1**, shows a wide variability in **germination** time of about 3 weeks between the first plants and the last plants to appear.

Shortly after the carrots have sprouted, the fields are **thinned**, and the removed carrots have been transplanted. It was found that these bolted about four weeks earlier than the undisturbed carrots, prompted by the stress of being moved. Thereafter, they grew as well as other carrot plants that are transplanted at a later stage during root to seed production, as they are irrigated.

Carrot flowers are visited by large numbers of **bees and parasitic wasps** that predate on crop pests, so carrot cultivation has a good synergy with bee-keeping and pest control. These insects are only active in the morning, and so not a threat to farmers who tend the plants if they do so in the afternoon.

Debre Zeit managed to produce 600 kg/ha, whereas at Dawunt 135 Kg of seed was harvested from 0.1 ha. Of this about 5% were impurities (vegetative matter from the carrot plants), so the real harvest is about 127 kg, i.e. **1270 Kg/ha** – twice the quantity from Debre Zeit. The better result is thought to be due to (1) higher elevation and consequent lower water stress, and (2) the higher winds that reduce powdery mildew, and (3) harvesting from primary, secondary and tertiary umbels at Dawunt, compared to primary umbels only at Debre Zeit.

The carrot fields that were used for seed production were full of **self-sown carrots** the following year. These were left by the farmers who had sown garlic, and then removed during the thinning, and consumed as baby carrots.

Haramaya-1 carrots become very large, but do not taste as good as the original Nantes variety. A future option is to conduct a study to find out the **optimum growing time for Haramaya-1**, as the price of carrots per kg is higher when carrots are smaller, and therefore more tender and sweet. Dense sowing/ planting of carrots encourages the carrots to self-prune into smaller plants. It is hoped that the optimum will be within three months, that would allow Haramaya-1 carrots to be grown in areas where irrigation is not available, i.e. under rain-fed conditions alone. This will allow the carrots to be grown far more widely, including in lighter sandy soils that are less prevalent in the irrigated areas that sometime include black cotton soils.

Ethiopians are very aware of the problem of **night blindness**, know as 'davint' in Amharic. No stigma is attached to being open about having this condition, and people who have it will readily take leave early when visiting, to get back before nightfall. Lidet will ask his partners if they know which areas are most heavily impacted by night-blindness.

Lidet's daughter has been counting the number of seeds per umbel of Haramaya-1 carrots. From her sample of 20 umbels, an average of **1700 seeds per umbel** was reached. Given that mature carrot plants can produce 100 umbels, this gives ca. 17,000 seeds per carrot plant. From discussions with Haramaya University, however, it was pointed out that only seeds from the primary umbels should be harvested, as they produce the strongest carrots. These are also the first to mature, and doing this will reduce the duration of seed harvesting. This advice is already mentioned in the coming carrot manual.

The **roll out of Haramaya-1** will require the permission and cooperation of relevant government officials at regional and zonal levels. This will be easier if the seeds can be certified. There will be a need to train the woreda extension officers, to give the seeds to model farmers in each kebede (usually about 5-10 per kebede – with a variable number of kebedes in a woreda, where 30 would be a good working figure). Other farmers can also receive the seeds, but the project is only likely to succeed if there are model farmers in the neighbourhood who they can contact if there are questions etc.

The **Haramaya-1 carrot cultivation and seed production manual** is expected to be ready in about 2 months. Dan Church Aid will give it to their farmers who are already receiving their vegetable and seed distribution package, which will allow for feedback on the manual.

The **carrots manual and seed kits** can be packed by Dan Church Aid in Addis Ababa. As they will be printed on glossy 'china-clay' paper, that is only water-resistant, they should be packed in A5 sized zip-lock bags so that the farmers can take them to the fields and reduce the risk of them becoming damaged.

During the rainy season of mid 2019, Dan Church Aid will conduct a **trial of growing Haramaya-1 carrots under rain-fed conditions** only, to test (a) the performance of the carrot in lighter/sandier soil types, and (b) the marketability of the smaller (baby) carrots that are expected to be produced, to see whether such carrots can be a viable crop for growing on non-irrigated land during the rainy season. It is expected that the smaller carrots will sell well, and be more palatable to children to eat, thus increasing the likelihood of them ingesting beta-carotene.

2. **Visit to the Ethiopian Institute of Agriculture at Debre Zeit** Getachew Tabor, Friday 8th February 2019

The Afghan carrot **DZARC-5 has shown no improvement** with multiple generational selection, as it continues to outcross. In addition, the root is weak and ugly, many fork, and some are hairy. On the plus side, it has a very high yield, is tender and has a sweet taste.

Getachew has asked professional advice on whether it is prudent to continue to try and improve this variety. His counterparts have all responded that **Carrot Aid should stick with the Haramaya-1 carrot**. This advice is borne out by Haramaya University's experiences with a similar carrot from India (see notes below).

According to Getachew, no **certification process exists for seed quality** in Ethiopia.

Dr. Getachew Tabor with various types of carrot seed varieties tested at Debre Zeit.

3. **Visit to Haramaya University** Professor Kebede Weldetsadik, Dr Jemal Youssef Hassen (Acting President of Haramaya University), Dr Wassu and Tewodros Bezu, PhD student, Monday 11th February 2019

The **development of AUA-108/Haramaya-1** variety was initiated and then conducted by a student under Professor Kebede Weldetsadik, and took 11 years to reach stability and uniformity. The variety originated from the carrots seeds that local farmers near Haramaya were growing, and it is thought that these were a mixture of Nantes and Chantenay. Development was conducted with 400-500 plants in each generation. The primary objective - as ordered by the authorities - was to produce commercial carrot seeds in Ethiopia, to reduce the need to import carrot seeds.

Professor Kebede did his PhD in Horticulture during 4 years (1998-2002) at Sveriges Lantbruksuniversitet SLU's Alnarp campus in southern Sweden, near Lund. Since developing AUA-108, he has been promoted to Vice-President for Community Engagement and Enterprise Development, and is therefore in charge of Haramaya University's projects that serve the community. Some years ago, he was approached by an Israeli horticulturist, who had the idea of promoting tomato cultivation as a financial alternative to khat, that is widely grown around Haramaya and Harar. With minimal resources, this project – Fair Planet https://www.fairplanetseeds.org - is showing promise, and have prepared a high quality manual.

Some years ago, Professor Kebede tested a **carrot variety from India**. Just like DZARC-5 from Afghanistan, it was hairy and ugly, but produced a high biomass. Local consumers refused to even consider buying it, so further development was stopped.

Dr Jemal Youssef Hassen was unhappy that EIAR had released AUA-108 without permission. We responded that it had happened as a kind of 'mission creep' as a consequence of multi-variety trials and Carrot Aid had been informed that the variety had been approved for public release. Carrot Aid had however been concerned about the need for requesting permission from Haramaya, and this was the original reason for Megbaru to get in touch. Also, Carrot Aid had planned a visit since 2016, but local partners had advised against this as the security situation had been unpredictable. These points were accepted, and because Carrot Aid's purpose is a non-commercial release of seeds, **provisional approval was given for Carrot Aid to continue with using the Haramaya-1 variety**, **subject to establishing a proper MOU and following correct procedures to ensure optimal seed quality.**

Doctor Wassu Mohammed expressed his concerns about maintaining the identity of Haramaya-1, and of releasing seed that might be sub-standard and/or contaminated by disease. Haramaya University apply heat or chemical treatments to effect this. He also voiced his worries about patent protection for Haramaya's work, copyright issues etc. and stated that any NGOs etc. that wish to use the Haramaya-1 variety for non-commercial use should have a clear agreement with the university to ensure adequate quality control of onward seed production.

At least 200 plants are needed to multiply Haramaya-1 seeds, suggesting that this is a population rather than a stable variety. The plants need to be tightly spaced, to limit the formation of secondary and tertiary umbels.

It was agreed to establish an **MOU between Carrot Aid and Haramaya University**. This would include the following points:

1. Haramaya University would check the quality of the 135 Kg seeds already produced by Dan Church Aid, but will not certify these.

2. A proper mechanism will be established for future seed release:

    a. A certified seed producer will multiply Haramaya-1 seeds received from Haramaya Univerity. These seeds will receive a certificate from Haramaya University.

    b. The certified Haramaya-1 seeds may be sent out free of charge to farmers, with a recommendation to the farmers that they always replenish with certified seeds, but also allowing them to produce seeds for future own consumption. However, these are expected to lose the superior Haramaya-1 qualities after about 3 generations.

    c. Haramaya and Carrot Aid are not responsible for the future quality of any seeds multiplied by the farmers.

Tewodros Bezu, a PhD student who has worked on the Haramaya-1 carrot, mentioned that Carrot Aid might assist Haramaya university with **materials for the proper packing of seeds** and **testing carrots for their nutritional values**. Professor Kebede saw no problem in exporting a limited quantity of Haramaya-1 seed to Denmark, where it could be grown and thereafter tested for Beta-carotene at Aarhus.

It was agreed that Tewodros Bezu tedrosneguse@yahoo.co.uk would be **Haramaya University's primary contact person** with Carrot Aid (Phil).

Dr. Kebede and Tewodros were both very happy to receive the copies of Carrot Aid's reports from EIAR and DCA.

Professor Kebede Woldetsadik (above) and Dr. Jemal Youssef Hassen (below).

Phil with Tewodros Bezu.