Apple production and management training report in Debre Birhan, Ethiopia

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The Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-in-development projects supported by the United States Agency for International Development (USAID) as part of the U.S. Government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING is creating opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three regional projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads the program's monitoring, evaluation and impact assessment.

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Day one (theoretical and practical training)

Theoretical training session

The Africa RISING project in Ethiopia highlands provided a two-day training on apple production and management in Debre Birhan town from 23–24 January 2021. Fifteen participants including Kebele development agents and experts attended the training hosted by Abiye Astatke and Gurmessa Anissa from Faji private apple farm. The training constituted key theoretical topics of apple production and management.

Site selection, land preparation and planting

Apple does best in areas with an altitude of 2400 masl and above. It also needs fertile soil, a protected site (fence) and windbreak. Water is very critical to apple production. It was mentioned that any farmer who has a plan to plant apple seedling needs to have at least one source of water (irrigation from a different source, pond and water harvesting structures).

Land preparation should start 3–4 weeks before the actual planting time. Pits with 50 cm deep and diameter of 60 cm should be prepared. During soil excavation, the topsoil and soil from the inner part should be put in a separate place (different edge of the pit). One week before the actual planting, soil from the top should be returned first and soil from the inner part mixed with compost or well-decomposed cow dung should be placed at the top. This will help to improve the fertility of the soil as well as the soil structure. At planting, the grafted point should be 10–15cm above the surface of the soil. While planting, the seedling should be placed straight (90^0) and it need also to tie with a supportive small peg placed near to it.

Types/varieties of apple

Apple varieties/types are grouped into three depending on chilling requirement. Low chill needs 250–500 chilling unit and the varieties tested in our country from this group include Anna, Princissa, Dorsett Golden and CP-92. The medium chill requires 550–1,000 chilling unit and varieties like Gala, Fuji and Primicia were tested in Ethiopia. The high chill apple needs more than 1,000 chilling units and they are not common in Ethiopia. Low chill apples like Anna go to dormancy twice a year and continue in dormancy for 3–4 weeks. The low chill apples give yield twice a year. However, medium chill apples like Gala go to dormancy once a year and stay in dormancy for 4–5 months. Varieties from this group (medium chill) give yield once a year. Farmers should know the variety they planted in their field because this has a serious impact on the management they should have to follow on their apple trees. Abiye Astatke from his experience advised most of the highlands of north Shewa have < 600 chilling units, which is best suited for low chill varieties.

Growth stages and the cycle of highland fruits

Generally, highland fruits have eight growth stages and three cycles. Break of dormancy, sprouting, blossoming/flowering, fruit set, fruit and sprout development, fruit ripening, leaf drop and dormancy/rest period are the eight growth stages. The three cycles of highland fruits are vegetative, generative and dormancy periods. The key activities farmers have to do concerning the growth stage are leaf defoliation after 2–3 weeks of the dormancy period, followed by pruning and training of apple trees.

Watering/mulching

During dry seasons, single ring should be made around each apple tree to retain enough water for the plant. The size of the ring depends based on the branching capacity of the tree. Mulching of apple trees should be done using different grasses available in the area. Abiye shared his experience of watering and mulching apple trees for the trainees. He provides 50–60 litres of water for each apple tree per week. Apple needs enough moisture, especially during flowering and fruit setting stages. Mulching has a double advantage which serves as weed control and conserves moisture in apple production.

Fertilizer application

Abiye and Gurmessa emphasized that the use of organic fertilizer like compost and well-decomposed dung are better options rather than using chemical fertilizers for highland fruit production. Abiye from his experience advised trainees to add three buckets of well-decomposed dung or compost for each young apple tree. However, this amount should be doubled if the apple tree starts giving fruits. The best time to add organic fertilizers is when the plant ends its dormancy period.

Weed and pest management

Apple trees should be free of any weeds to avoid the competition for soil nutrients, water and sunlight between the tree and weeds. From their experience, the trainers mentioned that it is possible to cover the free space between apple trees with annual crops like garlic, onion, carrot, lettuce and beetroot. The common pest on apples include aphids, apple red mite, wooly aphid and scale insects. The best option to control pests are planting garlic in the free space and spraying of pyrethrum. The last option will be the use of insecticides.

Disease control

The common fungal diseases on apple trees include powdery mildew, downey mildew, rust, root rot, damping off, leaf curl and smut. These diseases mostly attack leaf, stem, flower and fruit of the apple. Abiye and Gurmessa reminded trainees that the control options for diseases are planting of apple seedling with appropriate space. If there is severe disease occurrence, uprooting and burning infected trees is advisable. For fungal diseases, Abiye advised farmers to use the juice of a shrub locally called “endod” which he got a certificate of recognition from the concerned office.

Each of the participants got an apple brochure and a temperate fruit manual for further reference. Additionally, training materials on posters have been handed to the woreda and kebele agricultural offices.

Practical training session

On this session, training participants had the opportunity to see types/varieties of apples and different management practices (watering, mulching, fencing, well-decomposed animal dung application and single rings around each apple tree) which were properly implemented at Faji integrated farm. Training participants were also exposed to the practical demonstration on leaf defoliation, pruning and training of apple trees.

Photo 1. Abiye Astatke giving practical training on leaf defoliation, pruning and training of apple trees (photo credit:ILRI/Temesgen Alene).

Day two (visit to project beneficiary farmers)

On the second day of the training, the apple seedling management of Africa RISING-engaged farmers at Adisgie kebele was visited. The strengths and weaknesses of the management issues of the apple tree seedlings at each farme were properly evaluated by the group and cross learning was facilitated. The management issues observed, discussed, commented and agreed for future improvements during the visit are summarized as follows.

Watering

Participant farmers observed good water access from the nearby irrigation scheme as compared to other kebeles and/or villages at Basona Worena woreda (i.e., deliberately selected for demonstration purpose by Africa RISING and the woreda). Farmers mentioned they have special access to the water every 15 days for their apple seedlings. Abiye advised farmers to water their apple seedlings every three to four days for better survival and good performance. Farmers agreed to store water using different options or use local drip irrigation techniques for the proper watering of their apple seedlings.

Photo 2. Kebede G/Michael demonstrating his apple seedlings management practices for the training participants during the visit (photo credit: ILRI/Temesgen Alene).

Fencing

Most of the beneficiary farmers properly fenced their apple tree seedlings. However, we found a few farmers who did not fence their seedlings appropriately. Their reason was busy with crop harvesting and threshing as well as no free grazing (i.e., most of the fields are covered with crops both on the main season as well as off-season). Finally, it was agreed to properly fence the seedlings. Fencing is one of the key management preconditions for the success or failure of seedlings.

Mulching

During the visit, we found a few farmers who did an excellent job in practicing mulching using available grasses in the area. But most of the beneficiary farmers did not practice appropriate mulching practice. In the end, it was agreed by all the farmers to properly mulch each apple seedling using available means as a crucial strategy to conserve available soil moisture.

Photo 3. Kes Fantu Gebre Kidan showing how he manages the apple seedlings at his farm plot for training participants during the visit (photo credit: ILRI/Temesgen Alene).

Single rings around each apple tree

A few farmers practiced single ring around each seedling at their plot. However, most of the beneficiary farmers did not practice single ring management practice appropriately. It was reached a consensus to form a single ring to retain enough water for the plant during the dry season.

Compost or well decomposed animal dung application

All the farmers use well decomposed animal dung at the planting of apple tree seedlings in July 2020. Abiye recommended farmers to continue the application of either compost or well decomposed animal dung to their seedlings rather than using inorganic fertilizers in the future too. The most interesting thing we observed during our visit was most of the farmers planted kale between the open space of the seedlings which is a good mechanism to compensate the yield from their plot of land up until getting the first fruit harvest from the apple trees.

Photo 4. Gizachew Merede did a great job in managing the seedlings sharing his experience with training participants during the visit (photo credit: ILRI/Temesgen Alene).

Recommendations

- The farmers were highly motivated to participate in the apple program after visiting the farms. At the time of the training, the low chill apple trees on the farm are at the last stage of the fruiting cycle which means that the trees are bearing fruits. The farmers were surprised by the number of fruits that each tree was bearing. It is recommended to arrange field visits for farmers to visit apple trees at different stages of the cycle (during dormancy and flowering) to envisage the full picture of apple management.

- As farmers from most highland areas do not know the management of apple seedlings or apple trees, it is suggested that farmers of Adisgie who are participating in the apple program should be visited by extension workers at least every month. Every two months, it is recommended that an expert from Faji farm accompanying Africa RISING and the woreda horticultural staff would visit the farms to share experiences not only with farmers, but also the woreda experts.