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CLIMATE CHANGE ADAPTATION, COMPETITIVENESS AND COLLABORATION AMONG FRUIT AND VEGETABLE FARMERS THROUGH DEMONSTRATION ORCHARDS AND PLOTS

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Project implemented by WEglobal and its consortium partners

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The team that worked on the experimental programme included Tara Sharafudheen, Team Leader, EU4Lankaran project, Masum Burak, Key Horticulture Expert and Mohsum Mohsumzade, Office Manager and Project Assistant.

1. LEARNING BY DOING, THE NEED FOR DEMONSTRATION ORCHARDS AND PLOTS

The Lankaran-Astara economic region of Azerbaijan is primarily an agricultural region well known in the former Soviet Union for its fruits and vegetables. The region has in part a sub-tropical climate and has the comparative advantage of producing fruits and vegetables early in the season. However, the competitiveness of the region has been reduced.

The key crops that are important from a socio-economic viewpoint were identified and value chain analysis done by the EU4Lankaran project team. The SWOT analysis done with farmers made it clear that the farmers did not understand the need for soil analysis for proper plant nutrition and the need to use certified seeds or saplings. The agricultural production techniques used by farmers were insufficient, and farmers lacked adequate knowledge of modern agricultural methods. These deficiencies lead to yield losses and a decrease in production quality resulting in low marketability of the produce and income for the producers.

The project as part of the effort to improve applied research and smart technology transfer and initiated a programme for demonstrating new varieties and improved production techniques for fruit and vegetable producers in five districts of the region. These were Lerik, Yardimli, Masalli, Lankaran and Astara. The experimental plots covered apple, potatoes, tomatoes, mandarins and lemons.

1.1. The Objectives of the Programme

The programme covered multiple objectives. These aimed to:

- introduce new resources, methods and practices among producers regarding climate adaptation
- educate farmers on new varieties including climate resilient varieties and through a scientific method identify the most suitable and productive cultivars in each district
- increase productivity and thus profitability of production based on new varieties and new systems.
- demonstrate to other farmers scientific techniques and productive varieties for popularizing among producers
- enable farmers to learn by doing and through field trainings
- form producer groups and increase collaboration among small farmers
- create WhatsApp groups for participating producers for just time in support

1.2. Criteria for selection of participants

Selecting the right farmers to participate in the programme was key to its success. A lot of time and effort was spent in identifying farmers and plots for the demonstration. Each farmer and plot were visited by the project team. There were three key criteria for selection of participants.

1. Leading and experienced farmers who were willing to participate and take on the responsibility of caring for the crops and to share their experience and the expertise gained.
2. Suitable plots with access to water and with easy access for monitoring by the team and experts

1.3. Key Partnerships

The demonstration orchards and plots were organised through a four-way partnership to ensure success and follow up after the period of the project. The key partners for the project were farmers, the State Agriculture Development Centres in each district, and scientific supervision from the Research Institute for Fruit Growing in Guba and the Research Institute for Vegetable Growing in Baku.

Each partner had certain responsibilities and contributed specific expertise to the programme. SADC helped to identify farmers, set up meetings to explain the initiative to producers and help to meet with farmers and in selection of the plots through field visits.

The Research Institutes agreed to support the experimental plots, provide seeds and saplings for potatoes and apple, and training on planting and production. The experts from the two institutes were also members of WhatsApp groups and provided just in time advice.

The project put the initiative together, provided certified seeds, saplings, seedlings. In addition, soil analysis was done at the behest of the project. Training was provided on proper agrotechnical care. The team also closely monitored the plots and orchards and were on call to deal with all issues related to the demo plots. Producer groups were formed in each district and connected in real team through WhatsApp. Experts were also members of these groups to offer advice on time as needed.

The partnering farmers played a crucial role in the programme by allocating their land for the demonstration orchards and plots. The farmers committed to being progressive producers ready to modernise their production, follow the guidelines of the experts and

the institutes scientific staff. They also were open to sharing their experience with other producers.

The officials of the District Agriculture Development Centres helped to identify potential farmers as per the criteria for selection. In organizing the demo plots, the District Executive Authorities and SADC helped to organize meetings with farmers eligible for participating in the experiments.

2. FIRST EXPERIMENTAL INTENSIVE ORCHARDS AND PLOTS IN THE REGION

2.1. Lerik District

2.1.1. Intensive Apple Demonstration Orchards in Lerik

The unique ecological and soil conditions of the district which is a biodiversity hotspot make the most suitable district in Azerbaijan for apple growing. The district has the potential to produce the highest quality of apple in Azerbaijan. The position is currently held by Guba district. The tradition of apple growing is gradually dying in Lerik district and most of the varieties grown were not marketable due to lack of storage.

For the first time, ntensive apple demonstration orchards were established to introduce new varieties of apple on clonal rootstocks in this mountainous region. Effort was made to ensure productive growth by ensuring the suitability of the soil through soil analysis and augmentation of the soil if required.

A market survey was carried out in Lankaran bazar the main market for apples from the disrict to identify marketable varieties. These were identified as Gala, Pink Lady, Starkrimson, Golden Delicious and Granny Smith cultivars. These also happen to be well known international commercial apple varieties which could be exported in the future. Certified bare root saplings of these 5 varieties were purchased from Azting, the sapling provider for the Research Institute for Fruit Growing in Guba. A total of 2,010 saplings of semi-dwarf rootstock MM106 were distributed to 7 farmers. A total of 2.5 ha of intensive apple orchards were established in 6 villages, Lalahiran, Hiveri, Divaagac, Vistan, Gurdeser and Laladulan. The main demo plot for field visits and field days was established in Lalahiran on .8 hectares. (See Table 1). Boards were put up to identify these orchards and the main demo orchard has been getting visits from local farmers.

Table 1: Apple Demo orchards in Lerik

Village	Farmer	Area (ha)	Varieties	
			Name	Quantity (Kg)
Divaagac	Kemal Mammadov	0.40	Granny Smith G. Delicious Pink Lady Gala **Total**	80 80 80 80 **320**
Hiveri	Zahir Hasimov	0.25	Starkrimson G. Delicious Pink Lady Gala **Total**	50 50 50 50 **200**
Gurdeser	Gulmirza Mammadov	0.25	Granny Smith G. Delicious Pink Lady Gala **Total**	50 50 50 50 **200**
Lalahiran	Meharremali Zeynelov	0.80	Starkrimson G. Delicious Pink Lady Gala **Total**	160 160 160 160 **640**
Laladulan	Alekber Salayev	0.30	Granny Smith G. Delicious Pink Lady Gala **Total**	60 60 60 60 **240**
Hiveri	Talat Valimammadov	0.40	Starkrimson G. Delicious Pink Lady Gala **Total**	80 80 80 80 **320**
Vistan	Alizadani Ibadov	0.10	Granny Smith G. Delicious Pink Lady Gala **Total**	20 20 20 20 **80**
Total		**2.50**	**Grand Total**	**2000**

The launch event of the Intensive Apple Orchards in Lerik district was held at the main demo orchard in Lalahiran village on 2nd April 2024. The event was attended by 80 farmers and the representatives of SADC, the Director of the Research Station of and experts from the Fruit Research Institute for Fruit Growing.

The project team also used this programme as an opportunity for collaboration. For the first time in the region a “Lerik Apple Producer Group” was formed. The group also had its own interactive platform via a WhatsApp group which included project expert and an apple expert from the Research Institute, and SADC staff. Just in time agronomic advice was provided via this group. The farmers also shared photos of their orchards and experiences via this platform.

Launch event of the first Intensive apple demonstration orchard Lalahiran, Lerik District

Training by expert from Research Institute in Guba

Soil analysis reports being explained to farmers

2.1.2. Potato Demonstration Plots

Launch of Potato Demo Plots in Kelvez village, Lerik District

The Lerik potato is priced as delicious rainfed mountain potato, in the region. It is seen as natural, environment friendly as the farmers mainly use manure for fertilizer. Potato cultivation is important from a socio-economic point of view as families also grow the crop for their own sustenance and store it for the winter. It also contributes significantly to

raising the income of the population in Lerik District and up to 30% of the cultivated fields are given to potato cultivation (Analysis of Apple and Potato Value Chain in Lerik District, EU4Lankaran, 2024). The potato also fetches a premium price in the Lankaran market. The quantities however are small and do not reach the main wholesale Meyveli market in Baku.

It was clear from field visits that the farmers did not know which varieties of potato they were planting. They buy seed potatoes from Jalilabad district which has large scale commercial cultivation in plain areas. These seed potatoes are often the lowest quality and often not suitable for the mountainous areas. They also get seed potatoes from Iran and from neighbouring farmers. These are not certified seeds. The productivity of potatoes is low. In Lerik district in 2022 the average yield was just 14.3 tons per hectare. The selection of and production of seed potatoes for Lerik needs a different approach. There are several microclimates in the district. Zuvand, the area famous for growing potatoes is quite different from Piran or other areas with a lower elevation. The selection should for such an area, should involve scientific breeding and acclimatization research, organization of demonstration plots and “field days” enabling producers to gain hands-on knowledge and experience.

To change this vicious cycle into a virtuous one, one hectare of demonstration plots were established in the plots of 8 farmers in 6 villages. These are Kelvez, Kelexan, Yukari Amburdere, Razgov, Mahlaband and Hiveri villages which are most suitable for potato growing (Table 2). Of these all the villages except Razgov are in the biodiversity hotspot of Zuvand. Before seed potatoes were planted soil analysis was done and recommendations made for augmenting some plots.

Certified seed potatoes of eight new high yielding varieties suitable for mountain areas were introduced. These include four local and four international varieties. The local varieties were procured from the Research Institute for Vegetables via their seed station in Tovuz district. These were Vagif, Sevinj, Amiri and Chanibel. In addition, four international varieties were purchased from Buta Agro company. These were Soraya, Colombo, Bernina and Orchestra.

Table 2: Potato Demo Plots in Lerik (06 April 2024).

Village	Farmer	Area (ha)	Variety	
			Name	Quantity (Kg)
Kelvez	Nesimi Ağayev	0.1	Amiri Sevinc Chanibel Vaqif Colombo Orkestra Soraya Bernina **Total**	45 25 30 15 60 60 60 60 **355**
Kelvez	İsa Mammadov	0.1	Amiri Sevinc Chanibel Vaqif Colombo Orkestra Soraya Bernina **Total**	45 25 30 15 60 60 60 60 **355**
Kelvez	Alim Aliyev	0.1	Amiri Sevinc Chanibel Vaqif Colombo Orkestra Soraya Bernina **Total**	45 25 30 15 60 60 60 60 **355**
Yuxarı Amburdere	Sahib Qurbanov	0.4	Amiri Sevinc Chanibel Vaqif Colombo Orkestra Soraya Bernina **Total**	45 25 30 15 240 215 240 215 **1025**

Village	Farmer	Area (ha)	Variety	
			Name	Quantity (Kg)
Razgov	Kamran Saliyev	0.1	Amiri	45
			Sevinc	25
			Chanibel	30
			Vaqif	15
			Colombo	60
			Orkestra	60
			Soraya	60
			Bernina	60
			Total	**355**
Kelexan	Tahir Mammadov	0.05	Amiri	20
			Sevinc	15
			Chanibel	15
			Vaqif	10
			Colombo	30
			Orkestra	30
			Soraya	30
			Bernina	30
			Total	**180**
Hiveri	Mahaddin Quliyev	0.10	Amiri	45
			Sevinc	25
			Chanibel	30
			Vaqif	15
			Colombo	60
			Orkestra	60
			Soraya	60
			Bernina	60
			Total	355
Mahlaband	Ceyhun Hüseyinov	0.05	Amiri	25
			Sevinc	10
			Chanibel	15
			Vaqif	5
			Colombo	30
			Orkestra	30
			Soraya	30
			Bernina	30
			Total	**175**
Total		**1.00**	**Grand Total**	**315**

The launch event of the demonstration plots was held in Kelvez villages on 6th April 2024 with the participation of the District Executive Power, SADC, Small and Medium Enterprises Development Agency. Deputy Director of the Research Institute for Vegetables in Baku, Director of the Regional Research Station of the Institute, and 40 farmers.

The first" Lerik Potato Producer Group" was set up. This also formed the basis of increasing collaboration among farmers with a view to set up modern collaboration hubs for the potato value chain in the district. In additional a social media platform via a WhatsApp group was set up for producer group members. The group included experts from the Research Institute for Vegetables and Buta Agro, SADC and the project. Technical advice was provided to the farmers through their WhatsApp group which also served as a basis for exchange of experiences.

Planting of seed potatoes in Kelvez, Lerik District

3. YARDIMLI DISTRICT

3.1. Potato demonstration plots

Yardimli district is a mountainous district where the economy is dominated by agriculture. Animal husbandry is predominant. It is among the less developed districts in the country and placed in the lowest tier of the classification of districts on the Composite Regional Development Indec that was developed by the project to assess the level of development of the districts in Azerbaijan (Composite Regional Development Index for Azerbaijan, EU4Lankaran, 2024). Among the crops, potatoes, has a significant position. Local production meets the population's demand for potatoes plus the potatoes are sold to friends and relatives in Baku, Shirvan and other districts. These are people who settled outside the districts and among whom the taste of the mountain potatoes from the district is valued.

The important position that the crop holds is clear from the expansion of the area under potato cultivation. This expansion can be seen in the data from the State Statistics Committee. The area under the crop was 460 ha in 2000 and more than doubled to 928 ha in 2022. Potato production in the same years amounted to; 4798 and 8595 tons respectively. However, compared to the country and the Lankaran-Astara Economic Region (LAER), the yield is low. The yield was among the lowest in the country at just nine tons per hectare in 2022. Low productivity is due to the lack of varieties suitable for a mountainous terrain, the low quality of seed potatoes, as well as the lack of proper agrotechnical care and innovative technologies.

Farmers in Yardimli, like in Lerik were not familiar with different potato varieties, their distinguishing features and care. They bought their seed potatoes from Jalilabad district where varieties suitable for the lowlands and a different agroclimatic zone were available. The quality of these seed potatoes was low. Here yields not taste was the main criteria for selection. For mountainous zones like Yardimli and Lerik that are known for the taste of their potatoes both taste and productivity without chemical fertilizers are key criteria for selection of the varieties.

To introduce and test new varieties and train leading farmers in proper agrotechnical care of the plants, 8 different demo plots were established covering 1 hectare in 5 villages well known for potato cultivation. These were Avash, Deman, Arvana, Xanbulaq and Kurechi. A total of eight varieties of certified seed potatoes were planted in each plot. These included four local varieties, Amiri. Sevinj, Çanlibel, and Vaqif, the seeds of which were obtained from the Research Institute for Vegetables. The four international high yielding varieties introduced were Bernina, Soraya, Orchestra and Colombo. Buta Agro supplied

these. Orchestra and Colombo were known to yield as much as sixty tons per hectare in ideal conditions. For more details on distribution see Table 3 in the annex.

The launch event for the potato demo plots in Yardimli took place in the historic village of Deman on 4th April 2024. Those who attended the event included 40 farmers, Deputy of the Yardimli District Executive Authority, SADC. SMEDA and Deputy Director of the Research Institute for Vegetables. The first new varieties were planted at this event. Soil was collected from all the plots and the soil analysis results shared with farmers. It was interesting that the soil analysis on the whole showed that the soil in Yardimli was better than Lerik. However, productivity as mentioned is lower.

Table 3: Potato Demo Plots in Yardimli

Village	Farmer	Area (ha)	Variety	
			Name	Quantity (Kg)
Arvana	Cevanşir Haydarov	0.1	Sevic Chanibel Vagif Amiri Colombo Orchestra Soraya Bernina **Total**	20 25 - 40 60 60 60 60 **325**
Arvana	Şahmali Nazarov	0.1	Sevic Chanibel Vagif Amiri Colombo Orchestra Soraya Bernina **Total**	20 25 10 40 60 60 60 60 **335**
Arvana	Zeynal Abazaliyev	0.1	Sevic Chanibel Vagif Amiri Colombo Orchestra Soraya Bernina **Total**	20 25 10 40 60 60 60 60 **335**
Avaş	Ali Penah Aliyev	0.3	Sevic Chanibel Vagif Amiri	10 15 10 30

Village	Farmer	Area (ha)	Variety	
			Name	Quantity (Kg)
			Colombo	195
			Orchestra	178
			Soraya	210
			Bernina	125
			Total	**773**
Deman	Şemi Aliyev	0.1	Sevic	20
			Chanibel	25
			Vagif	10
			Amiri	40
			Colombo	60
			Orchestra	60
			Soraya	60
			Bernina	60
			Total	**335**
Deman	Tarlan Haşimov	0.1	Sevic	20
			Chanibel	25
			Vagif	10
			Amiri	40
			Colombo	60
			Orchestra	60
			Soraya	60
			Bernina	60
			Total	**335**
Xanbulaq	İskender İsayev	0.1	Sevic	20
			Chanibel	25
			Vagif	10
			Amiri	40
			Colombo	60
			Orchestra	60
			Soraya	60
			Bernina	60
			Total	**335**
Kürekçi	Zaur Aslanzada	0.1	Sevic	10
			Chanibel	10
			Vagif	10
			Amiri	10
			Colombo	45
			Orchestra	37
			Soraya	30
			Bernina	90
			Total	**242**
Total		**1.0**	**Grand Total**	**3015**

The first producer group for potato farmers was established as the" Yardimli Potato Producer Group". Simultaneously a WhatsApp group was set up with the participating farmers, experts from the Research Institute and Yardimli SADC staff. This facilitated exchange of experiences, just in time support from experts and advice from the project experts.

3.2. Launch of Potato demo plot April 4, 2024, Deman, Yardimli

Distribution and planting of the first seed potato by Deputy, District Executive Authority

4. MASALLI DISTRICT

4.1. Tomato Demonstration Plots

Masalli district was known across the former Soviet Union as a premier producer of prized tomatoes. There were large collective farms and processing facilities which now do not exist. Given this the district has a strong tradition of tomato cultivation which needs to be revived.

In Masalli, as of September 1, 2022, crops were harvested from 17,500 hectares. Of these 11,000 hectares were given to cereals and legumes, 900 hectares to potatoes, and 2000 hectares to various types of vegetable crops including 525 hectares of tomatoes. (Analysis of the Tomato Value Chain in Masalli district, EU4Lankaran, 2024)

In Masalli too the story was the same as in Lerik and Yardimli farmers did not know the cultivars of tomatoes by varieties. The identified them by shape, like the round one, the one that looks like a women's fingers etcetera. As acknowledged by the district authorities and SADC the lack of certified high-quality seeds and seedlings is a drawback for tomato

farmers. The local market often offers low-quality seeds, leading to reduced quality and yield. To enhance quality and yield of tomatoes in Masalli district and to ensure consistent and reliable production, there is a pressing need to establish quality seed production and a seed market. This market should be populated by reputable companies or seed producers that offer products tailored to the climate and soil conditions of Masalli. It would be beneficial to integrate renowned firms or distributors into the Masalli seed market, and more broadly, into the seed market of the Lankaran-Astara Economic Region.

In this situation the establishment of demonstration plots in Masalli to introduce for tomato growers to new high yielding varieties from a reputable source was crucial. Demonstration plots were established over 1.5 hectares in 7 villages with 9 farmers participating in this programme. Seeds were obtained from the famous Dutch seed company Enda Zaden through their distributors in Azerbaijan the HH group. The three F1 hybrid varieties selected for distribution were Yusuf, Sultan and Ulduz (Table 4). Prior to planting soil analysis was done and test results shared with farmers. A total of 50,000 seedlings were distributed.

Table 4: Tomato Demo Plots in Masalli

Village	Farmer	Area (ha)	Variety	
			Name	No of Saplings
Tekle	Üzeyir Nuriyev	0.40	Yusuf Sultan Ulduz **Total**	4180 4300 4400 **12880**
Tekle	Elman Qubadov	0.10	Yusuf Sultan Ulduz **Total**	1075 1100 1100 **3275**
Sığıncaq	Ramiz İbadov	0.20	Yusuf Sultan Ulduz **Total**	2150 2140 2250 **6540**
Şerefe	Şaiq Muhtarli	0.10	Yusuf Sultan Ulduz **Total**	1100 1200 1250 **3550**
Tekdam	Mürvet Şahbazov	0.10	Yusuf Sultan Ulduz **Total**	1100 1200 1200 **3500**

Village	Farmer	Area (ha)	Variety	
			Name	No of Saplings
Köçekli	Hafiz Kerimov	0.20	Yusuf Sultan Ulduz **Total**	2100 2200 2200 **6500**
Xıl	Rahmet Rahmetov	0.10	Yusuf Sultan Ulduz **Total**	1100 1200 1250 **3550**
Xıl	İbad Mammadov	0.20	Yusuf Sultan Ulduz **Total**	2130 2200 2300 **6630**
Xırmandali	Elza Ibrahimova	0.10	Yusuf Sultan Ulduz **Total**	1075 1100 1100 **3275**
Total		**1.50**	**Grand Total**	**49712**

The launch event for the first tomato demo plots was held in Tekle village on 9th July 2024. Those who participated included staff from the District Executive Authority, Masallı, SADC expert agronomist from the HH Group, and 25 farmers.

For the first time a Masalli Tomato Producer Group was set up with participating farmers, expert from the HH Group Ltd., SADC experts and project staff. The WhatsApp group set up alongside served as a forum for exchange of information and experience and advice from experts.

5. LANKARAN DISTRICT

5.1. Intensive mandarin and lemon demonstration orchards in Lankaran

Lankaran lemon is well known in the region and Azerbaijan for taste and aroma. However it is cold sensitive and needs extra protection in the winter. There is a strang paradox that the lemon from Lankaran is valued but the market is saturated with imports which provided 80% of the demand in 2022. In the same year, 58.2 percent of total production and 41.3% of the area under lemons was in the district. In recent years, production has increased due to expansion in area and yield. The provision of subsidies for intensive lemon orchards, play a significant role in this expansion.

Between 2015 to 2022, lemon production in the country increased 32.8 percent, by 33.7 percent in the economic region, and 12.4 percent in Lankaran district. The growth in the district is less than in the region and country. This is due to the increase in production in other districts, especially in Astara district. The yield is still low compared to other countries. There is wide scope for expansion of local production and improvements in productivity.

In addition, the region produces the total quantity of mandarins in the country being a sub-tropical zone of which 8% is in the district. The mandarin yield is also low. In Astara it is around 300 centiner/ha, in Lankaran 120 centiner/ha. There is ample potential to increase production as well as yield in Lankaran.

A familiar situation exists in the case of mandarins and lemons. Farmers are familiar with one or two varieties like Elite and New Georgia respectively and they plant the same cultivars. One person starts planting a variety and the others follow suit. There is no

attention paid to extending the season with early and late fruit producing cultivars. Elite the most popular mandarin variety is a mid-season. As a result, for three months in the year there are no local mandarins and the fruit is imported from Turkiye (Analysis of the Mandarin Value Chain in Astara district, EU4Lankaran, 2024)

With this objective of extending the season by introducing early and late varieties of mandarins and lemons, 1190 mandarin and lemon certified saplings were purchased by the project. An area of 1.73 ha of intensive citrus orchards were established in 4 villages: Yukari Nuvedi, Viruvil, Parakend and Vilvan with five participating farmers (Table 5). The cultivars distributed were Okitsu Wase as early, Carlic as mid-season and Un-shio as late cultivars for mandarin; and Meyer as early and Kutdiken as late cultivar for lemon. Soil samples were taken, and results shared with farmers.

Table 5: Mandarin and Lemon Demo orchards in Lankaran

Village	Farmer	Area (ha)	Variety	
			Name	No of Saplings
Yukari Nüvedi	Ali Mammadov	0.25	Okitsu Wase Carlic Un- Shio **Total**	50 50 50 **150**
Parakend	Hikmet Seyfiyev	0.10	Okitsu Wase Carlic Un- Shio Meyer Kütdiken **Total**	14 14 14 14 14 **70**
Viruvil	Maharram Kasimov	0.08	Okitsu Wase Carlic Un- Shio Meyer Kütdiken **Total**	12 12 12 12 12 **60**
Vilvan	Mayis Davudov	0.80	Okitsu Wase Carlic Un- Shio Meyer Kütdiken **Total**	112 112 112 112 112 **560**

Village	Farmer	Area (ha)	Variety	
			Name	No of Saplings
Vilvan	Saxayil Azimov	0.50	Okitsu Wase Carlic Un- Shio Meyer Kütdiken **Total**	70 70 70 70 70 **350**
Total		**1.73**	**Grand Total**	**1190**

The launching of intensive demo orchards was held in Vilvan village on 5th June 2024 with the participation of staff of the Lankaran District Executive Authority, SADC, experts from the regional Research Station of the Research Institute for Fruit, experts from the sapling producer company and 25 farmers. Training was provided regarding the right distances to plant the saplings; mounds were created where needed to avoid water logging.

The first Lankaran Citrus Producer Group was formed as a collaborative hub for citrus producers participating in the programme. A WhatsApp group was formed with farmers, experts from the regional Research Institute, SADC, expert from sapling producer company and project experts.

6. ASTARA DISTRICT

6.1. Intensive Citrus Orchards

Astara is the leading district in the Lankaran-Astara economic region and in Azerbaijan, for the cultivation of citrus fruits. This growth is also due to the subsidy provided by the government for intensive citrus production. Astara district accounted for 87.8 percent of mandarins produced in the country in 2022. In the same year compared to 2000, mandarin orchards in Astara district have expanded 5.1 times. The level of production increased from 11, 213 tons to 44,475.5 tons or 4.0 times. This increase in yield can only be explained by the introduction of intensive cultivation. Mandarin production in the Astara district is set to grow steadily as half the orchards are yet to bear fruit. The need for new markets and new products will become more important to avoid a glut and fall in prices.

Despite this scale of production, there are no citrus specialists in the region, the farmers are not well versed in proper care of orchards. The trees are planted close together and regular pruning which stimulates growth and improves both the quality and quantity of the fruit is not carried out. This was evident during field visits by the project team. As was the case in Lankaran district, no soil analysis is done to provide the needed nutrition for plants or to test whether the soil is suitable for mandarins. The same cultivars are grown by farmers and the popular variety produce fruit mid-season which means that there is no fruit in the market during certain parts of the season.

With the goal of providing early and late cultivars to extend the season and to use intensive citrus demonstration orchards as a tool for inculcating proper agrotechnical care to producers, the project established 2.2 hectares of intensive citrus orchards in the district. These are in 4 villages that are the epicentre of citrus production in Astara district: Penser, Kijebe, Ojakaran and Tengerud in the orchards of 7 leading farmers. Table 6). The cultivars provided cover the entire season. Of these Okitsu Wase is an early, Carlic a mid-season and Un-shio a late cultivar for mandarin; and Meyer is an early and Kutdiken a late cultivar for lemon.

The launch event for the intensive citrus demonstration orchards was held in Penser village on 10th July 2024. Those who participated in the event included staff from the Astara District Executive Authority, SADC, experts from the Research Station of the Research Institute for Fruit Growing, agronomists and staff of the sapling producer company and 20 farmers. Training was provided by the sapling provider on planting of the saplings and the proper distance between trees which is 5m x 3m for intensive orchards. Mounds were created for planting where there was a chance for water logging

to protect the saplings. Soil analysis was done, and results shared along with advice on augmenting the soil as needed.

Table 6: Mandarin and Lemon Demo orchards in Astara (10.07. 2024).

Village	Farmer	Area (ha)	Variety	
			Name	No of Saplings
Penser	Şair Babayev	0.60	Okitsu Wase Carlic Un-Shio **Total**	140 140 140 **420**
Penser	Bayramov Şurulla İmamali	0.20	Okitsu Wase Carlic Un-Shio **Total**	47 47 47 **141**
Kijebe	Nazarova Ahlinaz Davud	0.10	Okitsu Wase Carlic Un-Shio **Total**	24 24 24 **72**
Ojakaran	Hemdemov Şahin Eldar	0.30	Okitsu Wase Carlic Un-Shio **Total**	71 71 71 **213**
Kijebe	İsayev İsa Alakbar	0.10	Okitsu Wase Carlic Un-Shio **Total**	24 24 24 **72**
Kijebe	Hidayatova Narqile	0.30	Okitsu Wase Carlic Un-Shio **Total**	70 70 70 **210**
Tengerud	Şammed Kelbiyev	0.60	Okitsu Wase = 122 Carlic = 122 Un- Shio = 122 Meyer:78 Kutdiken: 78 **Total**	122 122 122 78 78 **522**
Total		**2.20**	**Grand Total**	**1650**

A collaborative hub was formed through the creation of an Astara Citrus Producer Group. The group was connected via a WhatsApp platform which includes experts from the Regional Research Station, SADC staff, expert from sapling producer company and project experts. The platform enables a two-way exchange of information between producers and experts and the project team.

7. SUPPORT TO APPLE AND POTATO PRODUCER GROUPS IN LERIK AND YARDIMLI TO OBTAIN MACHINERY AND EQUIPMENT

The grant project of EU4LANKARAN which is implemented by UNDP held a call for proposals in June 2024. The project team provided support to the Potato Producer Groups in Lerik and Yardimli and the Apple Producer Group in Lerik to apply for grants up to 230,00 euros. This was for much needed agricultural machinery and equipment which is scarce in these two mountain districts and not affordable for small farmers. There is also a long weight for the few tractors in the district. Farmers are still using horses for ploughing and harvesting and even for this they have to wait for their turn. Lack of machinery and equipment is one of the key challenges cited by farmers and SADC officials alike. The lack of machinery and equipment leads to several issues for farmers in this mountainous terrain. These include the:

- need to engage more labor with larger financial outlays
- delay in planting due to the lack of tractors and equipment to prepare the land
- inability to provide agro-technical care as required
- arable lands lying unused as there are stones that need to be removed first

All the three groups are handicapped by the lack of machinery and equipment needed for all stages of production. This includes clearing the land, preparing it for planting, efficient and use of agrochemicals as needed and harvesting. This could also reduce time, costs and make more lands usable.

The Lerik Potato Producer Group and the Yardimli Potato Producer Group were supported for applying for the following equipment:

- tractor
- hoeing equipment
- ploughing equipment
- fertilizer spreading equipment,
- agrochemical spraying unit,
- Two row planting and harvesting equipment.
- stone clearing equipment.

With the guidance provided the two groups competed successfully and won two grants worth 161,334 AZN or 84, 976 euros each.
The Lerik Apple Producer group was also supported in the same manner to apply for machinery and equipment worth 100,957 AZN or 53,175 euros and is waiting the results of the third call.

8. IMPACT

The impact of these demo orchards and plots are already being felt in the region. The introduction of the first intensive apple demo orchards in Lerik district has stimulated great interest among farmers to increase apple production. The orchards get a regular stream of curious farmers. This along with the trainings and study visits undertaken by the farmers is to quite the Deputy of the District Executive Authority “creating a revolution in the district”. Farmers are awaiting eagerly to see the results from the potato and tomato demo orchards and to identify new varieties that they can cultivate.

The groups are also starting to act as collaborative hubs. These will be reinforced by the Collaboration Awareness Campaign being undertaken in the region. They will also come together for trainings and study visits.

9. NEXT STEPS

Several follow up steps are planned. These include:

1. Full programme of training for the members on agrotechnical care of crops.
2. Study visits to see innovations and smart technology.
3. Collaboration Awareness Campaign for improving collaboration both horizontal as well as vertical across the value chain.
4. Digital literacy training including introduction to useful apps and websites for information gathering and marketing of produce.
5. Training in Integrated Pest Management and Good Agriculture Practices as per international standards
6. Creation and sharing of database of extension service providers both current and potential in each district.
7. Training of leading farmers as frontline extension workers
8. Branding and marketing of produce
9. Increasing market access both in the domestic and international markets