

Under the European Union's ENPARD (European Neighborhood Programme for Agriculture and Rural Development)
Initiative in Egypt



EUROPEAN UNION – JOINT RURAL DEVELOPMENT PROGRAMME (EU-JRDP)

Capitalisation 5: Increasing the Resilience Capacity of Pastoralists of North West Coastal Zone of Egypt

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Funded by the European Union



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Acronyms and Abbreviations

ADBS	Association of Development of Barki Sheep
AEA	Agriculture Extension Agents
AGS	Agristudio Consultancy firm
AICS	Italian Agency for Development Cooperation
APRI	Animal Production Research Institute
ARC	Agricultural research Centre
CBOs	Community-Based Organizations
CEDARE	Centre for Environment and Development for the Arab Region and Europe
DRC	Desert Research Centre
EAFRD	European Agricultural Fund for Rural Development
EGP	Egyptian Pound
EIAS	Environmental Impact Assessment Study
ENPARD	European Neighbourhood Programme for Agriculture & Rural Development
ENPI	European Neighbourhood and Partnership Instrument
EU	European Union
EUD	European Union Delegation, Egypt
FAO	Food and Agriculture Organisation
FFS	Field Farmers Schools
GAP	Good Agricultural Practices
GI	Geographical Indication
IGA	Income Generating Activities
IPP	Integrated Production and Protection practices
JRDP	Joint Rural Development Programme
M	Million
M&E	Monitoring and Evaluation
MADAD	Matrouh Association for Desert Agriculture Development
MALR	Ministry of Agriculture and Land Reclamation
MFAIC	Italian Ministry of Foreign Affairs and International Cooperation
MoIC	Ministry of International Cooperation
MoLD	Ministry of Local Development
MWRI	Ministry of Water Resources and Irrigation
N	Nitrogen

NGO	Non-Government Organisation
NP	Nitrogen Phosphorus
NPN	Non-Protein Nitrogen
NRM	Natural Resource Management
NWCW	North West Coastal Zone of Egypt
NWCZ	North West Coastal Zone
OFs	Organic Fertilisers
PCC	Project Coordination Committee (APRI)
PMU	Programme Management Unit
PRA	Participatory Rural Appraisal
SAMSIMIFA	Sustainable Agricultural Mechanization System Improvement in Minya and Fa-youm
SDCMR	Sustainable Development Center for Matrouh Resources
SEDNWCE	Social Economic Development of North West Coast of Egypt
SFA	Small Farmers' Association
SFOs	Small Farmer Organizations
TSS	Total Soluble Solids
WFA	Women Farmers' Association

<i>Feddan</i>	<i>0.42 Ha</i>
<i>Wadi</i>	<i>Hydrographic basin formed by the seasonal rainwater floods</i>
<i>Tonnes</i>	<i>Metric tons</i>
<i>t</i>	<i>Tonnes</i>
<i>Fed</i>	<i>Feddan</i>

Executive summary

The European Union – Joint Rural Development Programme (EU-JRDP) is an “area-based” initiative taking place in three governorates, namely Matrouh, Minya and Fayoum and implemented by the Italian Ministry of Foreign Affairs and Cooperation and Development, through the Italian Embassy in Egypt with the technical assistance of the Italian Agency for Cooperation (AICS). The said action is funded by the European Union (€ 21.9 M) under the European Neighbourhood Programme for Agriculture and Rural Development (ENPARD) and co-funded in parallel by the AICS (€ 11.0 M) through: i) the “Sustainable Agricultural Mechanization System Improvement in Minya and Fayoum Governorates” (SAMSIMIFA) and ii) the “Social Economic Development of North West Coast of Egypt (SEDNWCE) in Matrouh. The main Egyptian Authorities are the MALR (Lead Ministry), the MWRI and MoLD. The Ministry of International Cooperation is the National Coordinator.

In Matrouh Governorate, EU-JRDP, during the period 2016-2020, financed two actions (total EU contribution € 1.3 M) in connection with FAO (increasing sustainable agricultural production and livestock) and APRI (GAPs for the livestock sector). The final goal was to increase the resilience of Barki sheep and goats to drought conditions and to generate income to the benefit of Bedouin communities. Both interventions were implemented in the North West Coastal Zone (NWCZ) of Matrouh governorate in the rain-fed area from Fuka in the East to El Salloum in the West. The targeted areas were four districts, namely Ras El Hekma, Marsa Matrouh, Negila and Sidi Barrani.

Both actions addressed the main constraints facing Barki goats and sheep population such as low productivity of local breeds, improper breeding and management practices, continuous degradation of rangelands, high feeding costs, insufficiency of veterinarian and extension services.

Both actions have proved to have successful tangible results on the ground as an effect of the disseminated GAPs (e.g., dissemination of heat tolerant Barki rams, dissemination of improved Barki goats), the vaccination campaigns and veterinary services, the fattening techniques, and the trainings provided to pastoralists.

To capitalise the action titled “*Utilization of Improved Adapted Barki sheep and goats and livestock GAP for improving vulnerability resilience and livelihood of local communities in the rain-fed area of Matrouh*” implemented by APRI and the livestock component within the action “*Water harvesting and Good Agriculture Practices (GAPs) for Improved Livelihood and Increased Sustained Production in Matrouh Rain-fed Agricultural areas*” implemented by FAO, two axes of interventions cutting across both actions were identified. These are:

- First axis – increasing resilience of Barki sheep and goats to drought conditions and generation of income to the benefit of Bedouin communities.
- Second axis - increasing feed resources availability for Barki sheep and goats.

The results of the study/conclusions are listed here below:

- *First axis: increasing resilience of Barki sheep and goats to drought conditions and generation of income to the benefit of Bedouin communities.*

The selection and dissemination of heat tolerant Barki rams contributed to: i) adapt local breeds to drought and high temperature (all interviewed pastoralists are satisfied with the resilience increase), ii) improve the growth rates (+ 31%) and iii) reduce the fattening period of lambs (-38%). The value per head of Barki sheep increased by 50% and the average number of flock’s heads increased by 3%.

The results of the cross breeding with Damascus Bucks were so much impressive and had strong economic impact on the livelihood of the pastoralists. The local goat breeds are nowadays more resistant to drought and high temperature and the value of the first crossbreds produced by each distributed Damascus buck exceeds the value of those produced by Barki bucks by nearly 25% annually.

The increased milk production generated income for those women that processed the milk into cheese. The participating women saved family expenditure on milk products and obtained safe food product for family use. The exhibitions organised by APRI were good opportunities for the Bedouin ladies to present their processed products.

The pastoralists are satisfied from the trainings and other veterinary services they received.

- *Second axis - increasing feed resources availability for Barki sheep and goats.*

The introduced technologies are the best available technologies for the rain fed areas and are all supposed to have a positive impact on the environment (because of the prevailing practices of burning barley straw and crop residuals) and to provide good and cheap source of animal feed.

Despite the above, 9% only of the interviewed breeders (3 out of 35) are practicing chemical treatments, ii) 4% only of the interviewed breeders (1 out of 35) are practicing both mechanical (threshing all types of available residuals) and chemical treatments; iii) 4% only of the interviewed breeders (1 out of 35) are practicing mechanical treatments only). Only 6% of interviewed pastoralists received acacia seedlings.

Most of the interviewed breeders were not satisfied of both mechanical and chemical treatments of agricultural residues and of the barley hydro grass technology. It is also too early to evaluate the impact of acacias' seedlings on animals' feedings.

In conclusion, the hydro grasses and the mechanical and chemical treatments were not paying off especially with pastoralists that have large size of herds while the planted acacia's trees are still too young to produce feeds for animals.

The main recommendations per each axis of intervention are listed here below:

First axis: increasing resilience of Barki sheep and goats to drought conditions and generation of income to the benefit of Bedouin communities.

To scale out the practices promoted by APRI (e.g., dissemination of heat tolerant Barki rams and cross breeding with Damascus Bucks) provided that i) there is a continuous Governmental support for a sustainable improvement of Barki sheep strain, ii) marketing tools of dairy products made by women are enhanced and iii) marketing strategies for GIs products are promoted in parallel.

To promote GIs from the livestock sectors (e.g., Barki sheep products and goat cheese) to preserve traditional knowledge and local practices.

To scale up the mandate of ADBS that is i) indispensable for registering livestock products under GIs and ii) and must play an important role to support breeder and follow up with different activities after project (e.g., organizing the best ram competition and Barki sheep fairs).

To scale up the empowerment of Bedouin women through ad-hoc livestock value chains development for selected GIs products.

To promote household animals rearing including the poultry development initiative promoted by FAO to the benefit of women groups.

To support continuous vaccination campaigns and veterinary services to pastoralists and to plan these services at early stage.

To increase the trainings in animal production and marketing and in veterinary health care.

To open doors for exportation which will immensely increase pastoralists' economic resilience especially for this type of sheep that is well known and preferred in the surrounding countries.

Second axis - increasing feed resources availability for Barki sheep and goats.

To scale out the pasture seedlings (e.g., acacias) distribution practices developed by FAO and to increase the number of beneficiaries of acacias seedlings.

To increase the trainings in animal feedings. The trainings shall include an assessment of the value of shrubs as folder.

To familiarise the pastoralists with mechanical and chemical treatments and better explain to the reasons behind these treatments.

To provide hydro grasses units to feed household animals, especially lambs/kids and milking goats. Barley hydro grass technology shall be promoted among women and for rearing limited number of herds only.

To reinforce research activities improving the vegetative cover/increasing grazing capacity in the inland grazing strips (rangeland) of the NWCZ.

To introduce new fodder crops highly adapted to rain-fed environment (e.g., desmodiums).

Background information

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Both actions addressed the main constraints facing Barki goats and sheep population such as low productivity of local breeds, improper breeding and management practices, continuous degradation of rangelands¹, high feeding costs, insufficiency of veterinarian and extension services.

Both actions have proved to have successful tangible results on the ground as an effect of the disseminated GAPs (e.g., dissemination of heat tolerant Barki rams, dissemination of improved Barki goats), the vaccination campaigns and veterinary services, the fattening techniques, and the trainings provided to pastoralists.

The selection and dissemination of heat tolerant Barki rams, as well as the dissemination of improved Barki goats crossed with adapted Damascus bucks and the vaccination of 52,596 heads of small ruminants had the most important impact on the ground.

The selection and dissemination of heat tolerant Barki rams contributed to: i) adapt local breeds to drought and high temperature, ii) improve the growth rates of the animals and iii) reduce the fattening period of lambs.

The local goat breeds are nowadays more resistant to drought and high temperature and the value of the first crossbreds produced by each distributed Damascus buck exceeds the value of those produced by Barki buck by nearly 25% annually.

Another significant long-term impact is the positive change in the attitude of governmental agencies. This change was represented in the support provided by Matrouh governorate to the Association of Development of Barki Sheep (ADBS). ADBS is expected to play an important role to support breeder and follow up with different activities after project (e.g. organizing the best ram competition and Barki sheep fairs).

¹ The exposure of the NWCZ to frequent droughts especially since 1995, resulted in sever decrease in the rangeland capacity, and consequently lower income for most of the Bedouins communities. The assessment of land use and land cover changes in the NWCZ prepared by FAO in 2019 indicated that during the last two decades, the zone suffered from a long drought of sixteen years (1995-2011), which has impacted heavily on all aspects of life in the region, such as the decrease of the livestock numbers because of vegetation degradation, the decrease of the productivity in the agriculture sector and the migration of population from *wadis* to cities.

Scope and objectives of the study

The Operational Capitalization Study is aiming at:

- Selecting best practices that proved to improve sustainability.
- Providing solutions for implementing similar projects in the future.
- Capitalizing experiences and knowledge for implementation of similar projects in the future.
- Addressing a list of lessons learned (positive and negative).
- Recommending actions to be undertaken in the future which will serve to improve the sustainability.

This Operational Capitalisation represents therefore a formalised way to document, analyse and archive, best practices, lessons learned and recommendations and to make use of them when drafting similar projects.

The final goal of this Operational Capitalisation study is therefore to improve future project sustainability at policy, regulatory, legislative, and environmental levels.

This Operational Capitalisation study shall be provided to competent governmental entities as well as to interested development partners.

Axes of intervention

To capitalise the action titled “*Utilization of Improved Adapted Barki sheep and goats and livestock GAP for improving vulnerability resilience and livelihood of local communities in the rain-fed area of Matrouh*” implemented by APRI and the livestock component within the action “*Water harvesting and Good Agriculture Practices (GAPs) for Improved Livelihood and Increased Sustained Production in Matrouh Rain-fed Agricultural areas*” implemented by FAO, two axes of interventions cutting across both actions were identified. These are:

- First axis – increasing resilience of Barki sheep and goats to drought conditions and generation of income to the benefit of Bedouin communities.
- Second axis - increasing feed resources availability for Barki sheep and goats.

First Axis - increasing resilience of Barki sheep and goats to drought conditions and generation of income to the benefit of Bedouin communities.

Definitions

- Barki sheep: named after Barqa in Libya which was the origin country of this type of sheep. Barki sheep is well adapted to the hot and dry conditions of Matrouh and is known for his tasty meat.
- Selection and dissemination of Barki rams: it is based on i) the assessment of rams with the breeders and selection of best animals, ii) raising and testing the selected rams (assessment of growth performance, body measurement, adaptation to heat stress - by exposing the rams to solar radiation and taking measurements before and after exposure, iii) dissemination among the breeders and evaluating the reproductive performance.
- Crossing with Damascus bucks: to buy locally selected Damascus bucks of Cyprus origin and dissemination to the breeders. Follow up the performance of the crossed Damascus bucks’ kids by analysing the reproductive, growth rates and milk productivity.
- NWCZ: North West Coastal Zone (Matrouh Governorate) is an area from Fouka in the East to El-Salloum in the West, for a depth of 40 km from the coastline.

- Scale out and scale up: Scale out means “scaling horizontally” the results that proved to be successful to cover wider geographical areas for greater outreach at micro-level (e.g., gradual rollout of activities in similar areas). Scale up means “scaling vertically” the successful concepts to cover broader impact through improved institutionalization, legislation, policies, development plans, improving the business environment.
- Geographical Indications (GIs) “determine the origin of a commodity in an area primarily due to its geographical origin and enjoy a good reputation and quality gained from the prevailing climatic conditions in that region” (ITDA). GIs include i) PDO: Protected Designation of Origin and ii) PGI: Protected Geographical Indication.

Implemented works

In connection with the first axis (*increasing resilience of Barki sheep and goats to drought conditions and generation of income to the benefit of Bedouin communities*):

APRI:

- Selected and disseminated highly performed Barki rams and introduced early fattening techniques.
- Improved the productivity of Barki goats through crossing with adapted Damascus bucks and distributed the obtained breeds to pastoralists.
- Carried out vaccination and training campaigns.
- Provided to women dairy processing equipment to produce goat cheese.

FAO:

- Contributed to scale out the achievements of APRI (e.g. Damascus bucks and goats’ distribution, provision of veterinary services and vaccination campaigns).
- Provided training in veterinary services and vaccination activities.

Second axis – increasing of feed resources availability for Barki sheep and goats

Definitions

- Mechanical treatment: to use mechanical choppers to chop crop residues (e.g., barley and wheat straw, olives and figs trees trimmings and fodder shrubs) to make them more palatable as animal feed and improve their digestibility.
- Chemical treatment: to add to chopped crop residues, feed additive from molasses “MoFeed”, Non-Protein Nitrogen (NPN), minerals and vitamins, to enrich the nutritional value of the poor roughage.
- Barley hydro grasses; fast hydroponically grown fodder from barley seeds.
- Scale out and scale up: Scale out means “scaling horizontally” the results that proved to be successful to cover wider geographical areas for greater outreach at micro-level (e.g., gradual rollout of activities in similar areas). Scale up means “scaling vertically” the successful concepts to cover broader impact through improved institutionalization, legislation, policies, development plans, improving the business environment.
- Existing feed resources: with the shortage of feeds in the summer, the breeders feed their animals with barley straw and other crop residual despite its low nutritive values.
- Improving local feed resources: this includes: i) mechanical treatment of agricultural residues through threshing all types of available residuals, ii) chemical treatment of roughages with MoFeed liquid (molasses, urea and premix) to enrich its nutritive value; ii) introduction of barley hydro grass technology for supplementary green fodder.

- Inland grazing (rangeland) strip: it lies between 15 and 50 km from the seashore. Annual rainfall is from 50-100 mm; grazing predominates, with some cropping. The Inland grazing constitutes 22% of total lands.
- Inland mixed production grazing/cropping (barley) strip: area located between 5-15 km from the coastal strips). Annual rainfall is from 100-150 mm, grazing and barley cultivation predominates. It constitutes 5% of the total lands.
- Coastal cultivation strip: it lies between the seashore to 10 km. Annual rainfall is about 150 mm; cultivation of orchards and vegetables predominates, especially in deltas of wadis. The inhabitants are settled. It constitutes 5% of the total lands.
- Wadi: it represents the bed or valley of a stream that is usually dry except during the rainy season.

Implemented works

In connection with the second axis (*increasing feed resources availability for Barki sheep and goats*):

APRI:

- Helped 339 pastoralists (about 6,000 people) to have an alternative fodder and to guarantee chop feed for the sheep through gridding crop residues (e.g., barley straws, plant residuals) and adding nutrients and vitamins to the chopped crop residuals. In details:
 - ✓ Choppers were introduced to grind fruit tree pruning residues and barley straws. The choppers were delivered to the ADDBS for the utilisation its members. The feed obtained were treated with additives produced at Matrouh animal farm.
 - ✓ Local feed resources were reinforced through treatment with NPN, molasses and enzymes (MoFeed). APRI i) distributed directly to breeders 5 tonnes of MoFeed liquid for treatment of about 100 tonnes of barley straw, ii) provided 12 tonnes of MoFeed liquid to the Matrouh animal farm for selling purposes.
- Distributed hydro grasses' equipment to pastoralists to produce additional green feed as supplementary fodder by using barley seeds. Each hydro grass unit produces 140 Kg of green feed which is enough to feed seven goats (or 20 lambs/kids) for 10 days. Hydro grasses units were also provided to women for feeding household animals, especially lambs/kids and milking goats.

FAO:

- Contributed to scale out² the achievements of APRI (e.g. distribution of feed concentrates).
- Improved the vegetative cover/increased grazing capacity by establishing demonstration fields in the "Inland grazing (rangeland) strips of Matrouh Governorate". In total 6,000 seedling of acacias seedlings were distributed to pastoralists.

² Scale out means "scaling horizontally" the results that proved to be successful to cover wider geographical areas for greater outreach at micro-level (e.g. gradual rollout of activities in similar areas).

Methodology of the Study and Data Analyses

The Capitalisation was carried out as follows:

- Analysis of annual reports and final evaluation reports (FAO, APRI),
- Analysis of ad-hoc studies carried out by FAO³ and baselines carried out by APRI and FAO.
- Surveys carried out by EU-JRDP's staff and consultants. The surveys were carried out with 35 beneficiaries (24 APRI and 11 FAO) in July-September 2020 (AGS's surveys) and October 2020 (EU-JRDP's survey⁴) of which: 5 in Ras El Hekma, 7 in Marsa Matrouh, 11 in Negalla and 12 in Barrani.
- Group discussions conducted by the Capitalisation's consultant with 20 stakeholders in September 2020 in Matrouh⁵.
- Analysis of workshops reports and presentations.

Results of the study/conclusions: driving forces for each axis of intervention

First Axis - increasing of resilience of Barki sheep and goats to drought conditions and the generation of income to the benefit of Bedouin communities

Results

Results from the EU-JRDP's surveys (average results of 35 interviews):

Impact on the number of Barki sheep flock's heads

Number of flocks' heads (Barki sheep)	Number (Before)	Number (After)	% Increase
Average number of flocks' heads per each family of 17.5 members	139	143	+ 3

Impact on the reduction of fattening period on Barki sheep's lambs

Duration of fattening period of Barki sheep's lambs	Days (Before)	Days (After)	% Decrease
Duration of fattening period in days (average number of Barki lambs per pastoralist under early fattening)	180	111	- 38

Impact on the weight of Barki sheep's off-springs

Weight of Barki sheep's off-springs per head	Kg (Before)	Kg (After)	% Increase
Weight of off-springs per head	49	64	+ 31

³ Land use and land cover changes in the North Western coastal zone of Matrouh. (FAO, 2019).

⁴ The surveys were carried out by Ramadan Ali (EU-JRDP).

⁵ Hanan El Guindy, October 2020.

Value per head of Barki sheep

Value of Barki sheep	Before (EGP)	After (EGP)	% increase
Value per head (Barki sheep)	2,000	3,000	+ 50

Degree of satisfaction for resilience's increase in Barki sheep

Degree of satisfaction/resilience increase	Very satisfied (%)	Satisfied to some extent (%)	Not satisfied (%)
Barki sheep resilience's increase	100	0	0

Percentage of beneficiaries that received improved Damascus bucks and Damascus goats

Weight of Damascus goat off-springs per head	Total interviews	Total beneficiaries	%
Number of farmers that received improved Damascus bucks	35	24	69
Number of farmers that received improved Damascus goats	35	20	57

Impact of milk production per goat

Milk production (goats)	Litre (Before)	Litre (After)	% Increase
Average (35 interviews) milk production per goat	1	2	+ 100

Value per head of Damascus goats

Values	Before (EGP)	After (EGP)	% increase
Value per head (goats)	1,320	2,040	+ 55

Percentage of pastoralist that received services on livestock

Pastoralists that received services (%) and type of services	Total interviews	Total beneficiaries	(%)
Veterinary health care	35	30	86
Genetic improvement	35	22	63
Technical assistance (animal production)	35	20	57
Animal feeding support	35	9	25
Milk processing facilities	35	3	9
Technical assistance (marketing)	35	2	6

Future needs in livestock's services expressed by pastoralists (percentage)

Future needs expressed by pastoralists	Total interviews	Total beneficiaries	(%)
Technical assistance (animal production)	35	27	77
Technical assistance (marketing)	35	27	77
Animal feeding support	35	26	74
Veterinary health care	35	22	63
Genetic improvement	35	21	60
Milk processing facilities	35	18	51

Results from the capitalisation mission’s surveys (average of 20 interviews):

Degree of satisfaction of pastoralists for the services received

Degree of satisfaction	Very satisfied %	Satisfied to some extent %	Unsatisfied %
Veterinary services and training	100	0	0
Vaccination	67	33	0
Early fattening	33	50	17

Results from the calculations made by the evaluator of APRI’s initiative⁶:

Barki sheep

- The fattened Barki lambs showed a shortening of the fattening period of two weeks (this meant to reach same marketing weight in 60 days instead of 90). This is mainly due to an average weight increase of 322 g/day (improved fattening) compared with 220 g/day (traditional fattening).
- The vaccinated Barki sheep and the training provided to breeders in disease diagnoses had an impact on the reduction in animal death numbers.
- The price of the selected improved rams has increased by about 60%. At the same time, the value of the flock has increased by nearly 25%.

Barki goats

- The distributed Damascus bucks had a direct impact on obtaining a good, fast-growing product with high prices in the market. One buck produced 85 crossbred offspring/buck on the average. About 80% of the first male crossbred kids were used for fattening, and 20% were raised and/or sold to other breeders.
- The crossbred goats achieved 50% increase of milk production. This excess of milk was processed by women.
- Participating women saved family expenditure on milk products (which is estimated at about 300 EGP/ week) and obtained safe food product.

Conclusions

The selection and dissemination of heat tolerant Barki rams contributed to: i) adapt local breeds to drought and high temperature (all interviewed pastoralists are satisfied with the resilience increase), ii) improve the growth rates (+ 31%) and iii) reduce the fattening period of lambs (-38%). The value per head of Barki sheep increased by 50% and the average number of flock’s heads increased by 3%.

The results of the cross breeding with Damascus Bucks were so much impressive and had strong economic impact on the livelihood of the pastoralists. The local goat breeds are nowadays more resistant to drought and high temperature and the value of the first crossbreds produced by each distributed Damascus buck exceeds the value of those produced by Barki bucks by nearly 25% annually.

The increased milk production generated income for those women that processed the milk into cheese. The participating women saved family expenditure on milk products and obtained safe food product for family use. The exhibitions organised by APRI were good opportunities for the Bedouin ladies to present their processed products.

The pastoralists are satisfied from the trainings and other veterinary services they received.

⁶ Source: APRI external evaluation. Ibrahim Siddik Ali, May 2020.

Second axis – increasing of feed resources availability for Barki sheep and goats

Results

Results from the EU-JRDP questionnaires (average of 35 replies):

Number of beneficiaries adopting mechanical/chemical treatments

Beneficiaries adopting mechanical/chemical treatments	Total interviews	Total beneficiaries	%
Number of farmers using chemical treatments (Mofeed)	35	3	9
Number of farmers using both chemical and mechanical treatments	35	1	4
Number of farmers using mechanical treatments	35	1	3
Total	35	5	16

Beneficiaries satisfaction of mechanical/chemical treatments

Beneficiaries satisfaction of mechanical/chemical treatments	Total interviews	Satisfied %	Unsatisfied %
Number of farmers using chemical treatments	3	75	25
Number of farmers using mechanical treatments	1	100	0
Number of farmers using both mechanical and chemical treatments	1	100	0

Number of beneficiaries adopting hydro grass

Number of beneficiaries adopting hydro grass	Total interviews	Total beneficiaries	%
Number of farmers using hydro grass units	35	9	26

Beneficiaries satisfaction of hydro grass

Beneficiaries satisfaction of hydro grass	Total interviews	Satisfied %	Unsatisfied %
Degree of satisfaction (average 35 replies)	9	75	25

Number of beneficiaries of livestock services

Beneficiaries of livestock services	Total interviews	Total beneficiaries	%
Number of farmers that received vaccination	35	27	77
Number of farmers that received drugs	35	26	75

Number of beneficiaries of acacia seedlings

Number of beneficiaries that received acacia seedlings	Total interviews	Total beneficiaries	%
Number of farmers received acacia	35	2	6

Results from the surveys conducted by the evaluator of APRI's initiative:

- Hydro-grass: 75% of the breeders used hydro grass equipment mainly during in summer, when there is no pasture while the remaining 25% use the equipment regularly throughout the year.

- A limited number of breeders had used the chopper machines for only 1-2 time (s) with very limited amounts of roughages treated (1.1 tonne on average).
- Nearly 50% of the breeders (164 beneficiaries) had used the chemical treatments to enrich the nutritive value of roughages used for feeding animals.
- The reinforced feed resources had a positive effect on those pastoralists who know these shrubs as fodder, especially during dry seasons.

Results from the capitalisation mission surveys (20 interviews):

Degree of satisfaction of the increasing feed resources availability (average of 20 interviews)

Degree of satisfaction	Very satisfied %	Satisfied to some extent %	Unsatisfied %
Mechanical and chemical treatment of agricultural residues ⁷	0	20	80
Introducing barley hydro grass technology	0	20	80

Conclusions

The introduced technologies are the best available technologies for the rain fed areas and are all supposed to have a positive impact on the environment (because of the prevailing practices of burning barley straw and crop residuals) and to provide good and cheap source of animal feed.

Despite the above, 9% only of the interviewed breeders (3 out of 35) are practicing chemical treatments, ii) 4% only of the interviewed breeders (1 out of 35) are practicing both mechanical (threshing all types of available residuals) and chemical treatments; iii) 4% only of the interviewed breeders (1 out of 35) are practicing mechanical treatments only). Only 6% of interviewed pastoralists received acacia seedlings.

Most of the interviewed breeders were not satisfied of both mechanical and chemical treatments of agricultural residues and of the barley hydro grass technology. It is also too early to evaluate the impact of acacias' seedlings on animals' feedings.

In conclusion, the hydro grasses and the mechanical and chemical treatments were not paying off especially with pastoralists that have large size of herds while the planted acacia's trees are still too young to produce feeds for animals.

The main driving forces per each intervention axis

The main driving forces for each axis of intervention (cf. also table 1 in the following page), are summarised here below:

- First axis: Increase resilience of Barki sheep and goats to drought conditions and income generation for Bedouin communities:

Barki sheep

- ✓ The improved Barki sheep flocks are considerably improving rams' health and stamina.
- ✓ The raised prices of the herds offspring of the improved rams had a very positive impact on the livelihood of pastoralists.

Barki goats

- ✓ The results of the cross breeding with Damascus bucks were so much impressive and had strong economic impact on the livelihood of the pastoralists.

⁷ Most of the pastoralists interviewed were not satisfied mainly because they were unable to explain why they applied mechanical and chemical treatments and what was the reason behind these treatments.

- ✓ The increased milk production is generating income and safe milk products to the benefit of Bedouins women.
- Second axis: increase of feed resources availability for Barki sheep and goats
 - ✓ The mechanical and chemical treatments of agricultural residues and the introduction of barley hydro grass technology did not have the expected impact.
 - ✓ The effect of acacia as feed supplements for Barki sheep and goats could not be evaluated since the planted trees did not produce yet feeding resources.

Table 1: Driving forces per each intervention axes

Sector	First Axis - increasing of resilience of Barki sheep and goats to drought conditions and the generation of income to the benefit of Bedouin communities	Second axis – increasing of feed resources availability for Barki sheep and goats
Economic Impact	<p>The improved rams of Barki sheep will certainly improve the livelihood of a larger number of pastoralists as the improvement of flocks will continue to increase gradually over time.</p> <p>Crossbreeding Barki with Damascus bucks will continue to increase the overall conditions of the flocks with additional production of surplus milk to be processed into safe dairy products by local Bedouin women.</p> <p>The improved animal's health is enhancing local economy.</p>	<p>The mechanical and chemical treatments of agricultural residues and the introduction of barley hydro grass technology did not have the expected economic impact.</p>
Social Impact	<p>The enhancement of the species of Barki livestock in Matrouh is accepted culturally.</p> <p>Veterinary services and vaccines have contributed to the pastoralists' serenity since they protected livestock and increased productivity.</p> <p>The income and the nutrition status of concerned women and women' groups and related families will continue to increase.</p> <p>Local community participation increased.</p> <p>Confidence of beneficiaries toward local authorities enhanced.</p>	<p>The mechanical and chemical treatment of agricultural residues and the introduction of barley hydro grass technology differ somehow from the cultural inheritances of the Bedouins and as such was difficult to scale out.</p>
Environmental Impact	<p>The increased Barki sheep resilience is an indispensable source of pastoralist resiliencies in Bedouin communities since the flock is nowadays more resistant to drought conditions.</p>	<p>Planting acacias will have a beneficial effect on the environment but it is too early to document it.</p>

Lessons learned (positives and negatives) per each driving force

Capitalization of lessons learned (positives and negatives) are important to amend legislations and regulatory framework and improve sustainability at policy, regulatory, legislative, and environmental levels.

First axis: increase resilience of Barki sheep and goats to drought conditions and income generation for Bedouin communities

Positive lessons learnt (positive issues coming up):

- The dissemination of heat tolerant Barki rams and cross breeding with Damascus Bucks is in line with the culture of the Bedouins and represents an opportunity to increase the economic impact at local level.
- The trainings were instrumental to learn how to select animals on basis of endurance to heat and to improve the adoption rate among pastoralists.
- The establishment of association among pastoralists (e.g., ADBS) is a guarantee of sustainability and is instrumental for the promotion of GIs.

Negative lessons learnt (what did not go as expected):

- Veterinary service and vaccination campaigns are indispensable components to the success of the whole initiative of livestock improvement and created awareness among pastoralists. These services were not planned in the project proposals but were provided later by Governmental institutions.

Second axis – increase of feed resources availability for Barki sheep and goats

Positive lessons learnt (positive issues coming up):

- The barley hydro grass is more appropriate for rearing household animals since the production of feed resources obtained from hydro grasses is never enough for large flocks.
- The introduction of mechanical and chemical treatments shall be accompanied by in depth trainings for better explaining the reasons behind it.

Negative lessons learnt (what did not go as expected):

- The implementation steps of mechanical and chemical treatments are not easy to understand, to follow and to apply for the regular breeders.
- The vitamins and minerals are not easily available for breeders and if available, accurate knowledge of percentage is crucial for success.
- The enhancement of crop-livestock integration in forms that support and foster complementarity between specialized livelihood-system was not planned.
- The sustainable intensification of resource utilization in pastoral development has received little attention.

Recommendations for scaling up

General recommendations:

- Project duration for future initiatives in the livestock sector in the dry lands shall have a duration of minimum five years.

First axis: increase resilience of Barki sheep and goats to drought conditions and income generation for Bedouin communities

Specific recommendations:

- To scale out the practices promoted by APRI (e.g., dissemination of heat tolerant Barki rams and cross breeding with Damascus Bucks) provided that i) there is a continuous Governmental support for a sustainable improvement of Barki sheep strain, ii) marketing tools of dairy products made by women are enhanced and iii) marketing strategies for GIs products are promoted in parallel.
- To promote GIs from the livestock sectors (e.g., Barki sheep products and goat cheese) to preserve traditional knowledge and local practices.
- To scale up the mandate of ADBS that is i) indispensable for registering livestock products under GIs and ii) and must play an important role to support breeder and follow up with different activities after project (e.g., organizing the best ram competition and Barki sheep fairs).
- To scale up the empowerment of Bedouin women through ad-hoc livestock value chains development for selected GIs products.
- To promote household animals rearing including the poultry development initiative promoted by FAO to the benefit of women groups.
- To support continuous vaccination campaigns and veterinary services to pastoralists and to plan these services at early stage.
- To increase the trainings in animal production and marketing and in veterinary health care.
- To open doors for exportation which will immensely increase pastoralists' economic resilience especially for this type of sheep that is well known and preferred in the surrounding countries.

Second axis – increase of feed resources availability for Barki sheep and goats

Specific recommendations:

- To scale out the pasture seedlings (e.g., acacias) distribution practices developed by FAO and to increase the number of beneficiaries of acacias seedlings.
- To increase the trainings in animal feedings. The trainings shall include an assessment of the value of shrubs as fodder.
- To familiarise the pastoralists with mechanical and chemical treatments and better explain to the reasons behind these treatments.
- To provide hydro grasses units to feed household animals, especially lambs/kids and milking goats. Barley hydro grass technology shall be promoted among women and for rearing limited number of herds only.
- To reinforce research activities improving the vegetative cover/increasing grazing capacity in the inland grazing strips (rangeland) of the NWCZ.
- To introduce new fodder crops highly adapted to rain-fed environment (e.g., desmodiums).

