

Business model brief



RESEARCH PROGRAM ON Livestock



MOBILE SEED CLEANING AND TREATMENT UNIT improves forage seed quality and quantity and presents a successful business model for farmer cooperatives

Photo: ICARDA/Udo Rüdiger

KEY MESSAGES

- The International Centre for Agricultural Research in the Dry Areas (ICARDA), in partnership with national partners in Tunisia, have developed a mobile seed cleaning and treatment unit for the forage seed sector that will improve the quality of seeds and increase forage seed production.
- The unit removes small or damaged seeds and treats the quality seeds with pesticides and fungicides to protect them from diseases.
- Four farmer cooperatives in Tunisia have used the mobile unit, which adds a valuable service and is a means to generate additional income.
- The unit significantly improves the efficiency of seed cleaning and drastically reduces the workload for women and children who are typically tasked with cleaning the seeds manually.

SUMMARY

Manufactured in Tunisia, a motorized mobile seed cleaning and treatment unit has been designed to improve the seed quality of various forage crops, including barley, faba beans and vetch. Improved seed quality directly impacts forage crop production as only the healthy, whole seeds are selected and then treated with fungicides to protect them from diseases.

A prototype of the seed cleaning and treatment unit was developed with a local manufacturer, and four units were provided to medium-sized farmers' cooperatives in North-West Tunisia, whose members pay for the service.

Due to its mobility, many farmers have benefited from the units on their own farms' premises. The motorized unit saves time and reduces workload, particularly for rural women and children who are typically in charge of cleaning seeds.

Photos: Seeds cleaned by the mobile seed cleaning unit are exceptionally clean.



This work was developed by the feeds and forages flagship of the CGIAR Research Program on Livestock, which is supported by contributors to the CGIAR Trust Fund. <https://www.cgiar.org/funders/>



INTRODUCTION

Agricultural systems in low and middle-income countries, such as those in north Africa, are often characterized by low levels of mechanization. This hampers productivity and sustainability and prevents the full potential of both the crop and livestock sectors from being realized. Machinery available in local markets is often unaffordable and is typically imported from industrial countries where larger farm systems are common. As a result, small and medium-sized farmers remain unable to upgrade and modernize their operations.

Through its work on crop-livestock integration, feeds and forages researchers from ICARDA under the CGIAR Research Program on Livestock, together with national partners in Tunisia, have developed machinery, such as the mobile seed cleaning unit, which are suited to small farming systems and aimed at boosting efficiency.

Forage seed production, like barley, faba beans, vetch or alfalfa, is predominantly undertaken by large seed-producing cooperatives that subcontract individual farmers. However, this supply does not meet the demand for quality forage seeds in the country. As a result, and to save costs, many farmers prefer using their own farm produced seeds but the quality is generally low as they



Traditionally in Tunisia, women clean the seeds manually. Photo: Zied Idoudi, ICARDA

are typically cleaned manually. The final product, which results from time-consuming and cumbersome labour, may still contain some unproductive seed material, such as broken or small seeds and plant waste. Moreover, seeds that have not been treated with fungicides are at risk of being attacked and destroyed by pests and diseases. Using poor-quality, untreated farm seeds result in low and poor-quality forage yields, ultimately affecting the performance of livestock and farmers' income.

By introducing the mobile, motorized seed cleaning unit, thousands of small-scale farmers will benefit as their seed quality will improve.

BUSINESS DEVELOPMENT FOR FORAGE SEED PRODUCTION

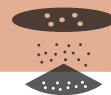
WHAT MAKES THE MOBILE SEED CLEANING MACHINE INNOVATIVE



The research team adapted the seed cleaning machine to the needs of farmers, adding wheels so it can be transported directly to farmers.



The mobile seed cleaning unit has different sized sieves, so it can clean a variety of seed sizes (i.e. barley, wheat, faba beans, vetch).



The unit is managed by a farmer cooperative to provide services to their members and generate income for the cooperative.



To tackle the poor quality and insufficient quantity of forage seeds in Tunisia and to develop businesses for farmers around forage seed production, CGIAR researchers piloted the use of the innovative, locally produced seed cleaning and treatment unit.

The business idea was well suited and had a far-reaching impact for small or medium sized farmer cooperatives. In collaboration with ICARDA and national partners, a local manufacturer in Tunisia designed and developed a prototype of the mobile seed cleaning unit, which costs 12,500 Tunisian dinars (TND) (USD 4,350) and has the capacity to clean about 800 kg/hour depending on the type of seeds.

Four farmer cooperatives each received a unit, directly benefitting over 1,000 small-scale farmers. The cooperatives were selected based on their interest and need for the machine,



and had to contribute 10% toward the total cost of a machine (TND 1,250 or USD 435) to foster a sense of ownership and investment. The project assisted these cooperatives by monitoring and coaching them on using the unit in the most economically sustainable way.

The first training on the machine was held in October 2019 and then the manufacturer visited the four cooperatives during July and August 2020 to make any necessary adjustments and carry out maintenance to ensure the proper functioning of the machine.

In December 2020, a workshop was arranged with representatives of all four cooperatives to exchange information, experiences, and ideas about opportunities, constraints, and business development around this machinery.

Seeds before cleaning (left) and cleaned seeds (right). Photo ICARDA/Udo Rudiger

CHALLENGES

The initial version of the unit didn't provide specific sieves for different seeds. This meant that smaller sized seeds, such as vetch seeds, were not properly cleaned. However, sieves with different-sized holes were eventually provided.

A total of 11 sieves (2-3 per cooperative) were co-financed. As cooperatives are increasingly satisfied with the technology, ownership has increased, and the project subsidy was reduced to 50% of the sieve prices. One additional sieve costs a total of TND800 (US\$300).

The farmers also identified another challenge, the continuous lifting of uncleaned seeds - weighing between 30 and 50 kg - to the entering funnel at the top of the machine, which is about two meters high. It is not possible for one person to repetitively do this on their own, so additional labour is required, making the operation more costly.

The solution was the development of a 'conveyor screw', which was designed to transport uncleaned seeds from the ground level to the entering funnel. The conveyor screw reduces the heavy workload for the employee, saves time and increases production per hour. It is expected that the conveyor screw will double the capacity of how much seed can be cleaned daily.



Conveyor screw for seed transportation to the entering funnel of the seed cleaning unit. Photo: Udo Rudiger, ICARDA

The manufacturer of the mobile units developed a prototype of such a conveyor screw. Three of the four cooperatives were interested in this addition to the units. The price per conveyor screw is TND4,300 (USD 1,600), of which the three interested cooperatives each contributed 50%. It is anticipated that effectiveness and efficiency will be significantly improved in the next cleaning season (July to December 2021).



Different sized sieves for various sizes of forage seeds. Photo: Udo Rudiger ICARDA

ALMOST 700 TONS OF SEEDS CLEANED

The cooperatives each used the seed cleaning and treatment unit between October 2019 and November 2020. The table below shows how use of the units grew in terms of seeds cleaned, money earned and number of users.

The difference between the level of benefit per cooperative depends, amongst other things, on the cooperative's marketing strategy. Some maximized the benefit to invest in other technologies and offer more services, like Ettaouan. Others, like Melyen, aimed to satisfy the needs of their members at low costs and attract more members. El Felah did a combined strategy. In 2019 they offered many services (like transport of the machine)

free of charge, leading to a loss in 2019. In 2020, however, they changed the strategy and obtained the highest benefit per ton of cleaned/treated seeds of TND 25/ton, followed by Ettaouen with TND 24/ton.

Cooperative Ettaouen, which used the machine to improve almost 150 tons of seeds in 2019 and 480 tons in 2020, is considering purchasing a second machine to meet growing demand. One unit will be placed permanently at the cooperative's site, while the other will be used as a mobile machine to move from farmer to farmer. Hence, a second person will be employed temporarily during the seed treatment period (July to December).

Cooperative	OCTOBER 2019					NOVEMBER 2020			
	Number of users (farmers)	Seeds cleaned (tons)	Seeds cleaned and treated (tons)	Cleaning/Treatment price (TND/ton)	Total benefit (TND, after costs)	Number of users (farmers)	Seeds cleaned and treated (tons)	Total benefit (TND)	Number of users
El Amen	320	24.2	0	35	315	12	38.4	575	21
El Felah	200	4.7	42.6	10 / 80	-13	20	60.8	1,520	33
Ettaouen	350	14.6	131.1	20 / 70	1,467	95	480	11,520	220
Melyen	150	22.5	0	20 / 50	225	11	111.7	3,594	25
Total	1,020	66	173.7	NA	1,994	138	690.9	17,209	299

CONCLUSION: IMPLICATIONS AND RECOMMENDATIONS

After only two seasons, the seed cleaning and treatment unit showed that it improves forage seeds for many farmers and serves as an additional revenue stream for farmer cooperatives. From the onset, the project partnered with Tunisia's livestock agency, the *Office de l'élevage et des pâturages* (OEP), a public institution in charge of promoting forage crops in Tunisia. The results of this initiative impressed the OEP to such an extent that it has included this technology in a project proposal submitted to the World Bank.

The technology has the potential to be scaled to other countries in the region, but a scaling strategy will need to be developed to make this machinery and its benefits available, affordable and accessible to the right users.

Partners

This research was implemented and coordinated by the International Center for Agricultural Research in the Dry Areas (ICARDA). The project partnered with the private metal manufacturing enterprise, Société Arfaoui Taher, Atelier de construction Métallique, in Beja, Tunisia, which constructed and adapted the machine and undertook repairs and maintenance.

National partners included the OEP (Office de l'élevage et des pâturages) for the training of the cooperatives, as well as Tunisia's National Agricultural Research Institute (Institut National de la Recherche Agronomique en Tunisie, INRAT) and the National Institute of Field Crops (Institut National des Grands Cultures, INGC) which selected the cooperatives, and the Regional Department for Agricultural Development (Commissariat Régional de Développement Agricole, CRDA) which scaled the technology.



Learn more

Aymen, F., Idoudi, Z., Rudiger, U. and Rekik, M. 2020. Collaboration between ICARDA projects and linkages to IFAD investment portfolio for enhancing seeds quality and forage production through entrepreneurship and farmers associations. Some examples from ICARDA activities in Tunisia. Lebanon: International Center for Agricultural Research in the Dry Areas (ICARDA) <https://repo.mel.cgiar.org/handle/20.500.11766/11134>

International Center for Agricultural Research in the Dry Areas (ICARDA). 2020. ICARDA develops mobile seed treatment unit prototype with Tunisian partners. Tunisia: ICARDA. (Available from <https://reliefweb.int/report/tunisia/icarda-develops-mobile-seed-treatment-unit-prototype-tunisian-partners>)

Rudiger, U. 2020. Report on small mobile seed treatment units for cooperatives in Tunisia - <https://hdl.handle.net/20.500.11766/12323>

Rudiger, U. 2020. Feeds and forages workshop with beneficiaries. <https://dx.doi.org/20.500.11766/12556>

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The business model described in this brief is part of a basket of solutions that can help support livestock producers to raise efficiencies and productivity. While there is opportunity for more research, the mobile seed cleaning and treatment machine can be considered a candidate model for scaling and be adapted into an integrated model for sustainable intensification of livestock production for smallholder farmers.