



ICRC



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## **Innovative Wheat Harvest Machine**



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## **Developing a harvest machine to collect and sort wheat grains directly from the field in Gaza**

Wheat is an important crop for the farmers of Gaza strip (GS), for centuries ago farmers used to cultivate wheat. Wheat provides many benefits; the good quality of grains are used for bakery, the small grains are used to feed chickens and pigeons, the straw is used to feed the farm animals, shepherds bring their sheep to feed on all what was left on the field, here the farmers gain a closed cycle system since, sheep manure and farm animals manure will fertilize the soil.

It is better for wheat crop to be grown on open and wide area of land, GS has a very intensive population mainly in the western part, therefore, most of the wheat is grown on the eastern border area part of GS, this is the 1<sup>st</sup> reason, the 2<sup>nd</sup> reason is that wheat is grown as a rain fed crop since this eastern border area is suffering from water scarcity.

The eastern border area of GS is supposed to produce the food basket to meet the food requirements of the so fast increasing population of GS. The existence of wheat plains near the eastern restricted area, makes it unsecure and unstable area, for this last reason there is an urgent need for finishing wheat harvesting within shorter time.

Wheat harvest season normally starts in (GS) by the beginning of June. Due to the hot weather and for fear of access restrictions on this area the farmers need to finish harvesting as fast as possible, traditionally the wheat farmers used to recruit their neighbor, relatives to help them during the harvest season, nowadays most of the farmer hire workers even though there is a shortage of laborers during wheat harvest season.

The ICRC supported in 2019 twenty eight innovative projects, Shady Al-Farra is a farmer and is one of the beneficiaries of these innovative projects, Al- Farra innovation was to develop wheat harvesting machine, he and his father, with help of local metal workshop, succeeded in developing a wheat harvest machine, the new harvest machine has made the life and work of the wheat farmers easier and faster, reducing the harvest time, as mentioned before, is considered a critical point in the sensitive eastern border area of GS because of a volatile security situation, the harvesting work which used to take days or weeks to finish one wheat farm; is now easily done in few hours by this developed machine. Reducing the harvest cost is another important benefit; while the traditional manual harvesting costs up to NIS 300 for one donum, now by the developed harvesting machine the cost for one donum is only NIS 120

## **Stages of traditional wheat harvest**

In the past all the harvesting stages were done manually by man labor and by the help of local farm animals, later on some tractor-drawn machines were introduced into GS, those machines normally are centrally located on one place besides the wheat shocks pile, workers will feed the machine with the wheat shocks, the machines got the movement by being attached to the main rotating shaft of the tractor, each of these machines is able to do one job; threshing machine will separate the grains from the wheat heads, shredding machine will cut the wheat stems into fine straw. This method of harvesting is still used up to now, traditional wheat harvest and post-harvest steps can be described in the following points: -

- 1- manual reaping of the wheat stalks, using sickles,
- 2- binding the wheat stalks into shocks,
- 3- collecting the shocks in one big pile,
- 4- Two workers will feed the threshing machine with shocks,
- 5- the stalks are beaten to separate the wheat grains from the stalks,
- 6- the grains will be sieved, waved, winnowed, to separate the chaff
- 7- the clean grains are packed in sacks and moved to the stores,
- 8- fine straw out of sieving is collected in special sacks since it is considered as better-quality straw for livestock,
- 9- wheat stems will be cut into fine straw by another machine, the straw will be packed in sacks and moved to the storage room,

some modern combine machines were imported, but they are not enough to harvest all the wheat crop area of GS, combine machine collect the wheat heads and making threshing, winnowing separating the wheat grains, the grains will be loaded into lorry tanks and transported to the flour mills. The coarse wheat stems will be left on the ground to be bundled into straw bales by another machine, the farmer may store the straw as coarse straw bales or the coarse straw bales will be grounded later on by another machine to fine straw.

## **Features of the developed innovative machine**

The Innovative machine developed by the innovative farmer Al- Farra is able to do many harvest processes at the same time, reap the wheat stems, thresh the wheat heads, winnow the grains, cut the straw into small pieces, then the fine straw (hay) moved to the new installed back-straw bag.

The last process which seemed to be the new innovative achievement is cutting the straw into small pieces at the same harvest process, the quality of hay produced out of the machine ready and convenient to feed the livestock.

Generally, the work of this innovative machine can be summarized in the following points: -

- Wheat stems are reaped by a rotating reel, cut by cutter bar, the reel and the cutter bar width is 5 meters, this will minimize the time needed to finish one donum to just 10 or 15 minutes,
- The wheat stems can very easily cut at 10 cm above the ground, this guarantees a higher percent recovery of straw with least grain losses,
- Threshing drum will separate the grains out of the wheat heads,
- The grains are moved to the sieving unit, winnowed then moved up to the main grain tank, the grain tank has 4 tons capacity (enough for 10 donums or one hectare),
- The straw will be moved to the straw cutter to be shredded into fine pieces,
- The fine straw is collected in the back-straw bag (enough to harvest two donums),
- When the grain and straw tanks are full, the driver stops to empty the grains and hay separately on a plastic sheet,
- The grains and the fine straw will be manually packaged into special sacks to be moved to the storage rooms.

## Positive points

- this harvesting machine is assembled in GS by available local resources, this will facilitate maintenance and improvements,
- Wheat harvest takes less time,
- Less effort,
- Lower costs,
- Safer access for farmers and harvesters in sensitive area
- Less crop loss,
- Better quality,

## Negative points

Some negative points are recorded during the machine work,

- Small wheat grains are not easy to be purified from the chaff and the fine straw particles, when air fan waving the seeds during the sieving process, if the air flow pressure increased this will make the small grains move to the straw bag, and if the air flow pressure decreased the wheat grains will be mixed with small straw particles, this problem exists only when the wheat heads are weak due to low soil fertility and during low precipitation seasons. The farmers declared that grain purity is not so critical point since they can use it to feed farm animals.
- Plastic bags fly from the municipal garbage into the wheat fields is another problem, the farmers should clean their fields before the machine starts to harvest,
- When the wheat field is not well leveled the reaper will not be able to cut the wheat stalks at the same height, this problem can be solved during the soil preparation phase.

- Existing of some trees on the field makes it difficult to reap the stalks around the tree.
- Another point is that the harvesting machine will replace part of the workers used to find job opportunities during the wheat harvest season, however, there are very few workers accept to do this risky job at the border area.