SUNFLOWER MECHANICAL HARVESTING IN ROMANIA

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The investigations carried out at the Research Institute for Agricultural Mechanization were directed towards the adaptation of the cereal combine-harvester C-12 for sunflower harvesting.

For this purpose the constructive and functional parameters of the following three sunflower harvesting attachments were determined :

— the RFS attachment with passive lifters and great real diameter ;

— the EFS attachment with passive lifters and small reel diameter ;

— the RI attachment with active sections, commonly used for sunflower and maize.

The *RFS attachment* (fig. 1) consists of the passive lifters (1), the three-armed reel of great diameter (2) and the crop dividers (3). The lifters are mounted on the cereal platform instead of the fingers of the cutter bar. The reel is mounted instead of the eccentric real utilized in small grain cereals and the crop superlifted divider is also mounted instead of that for cereals.

The self-propelled combine with this attachment and with the adequate sieves manufactured by "Semănătoarea" works. is utilized for the direct combining of sunflowers.

The *EFS attachment* (fig. 2) unlike the previous one, has the reel (2) of a smaller diameter, with 5 arms and a shield in its upper part.

The *RI attachment* (fig. 3) is made up of the cutter bar (1) the chains with fingers (2), the working sections (3), the plant lifters (4), the feeders (5) and the seed-saver (6).

Unlike the RFS and EFS attachments, the RI attachment presents the moving chain with fingers (2) which insures the plant raising, their maintenance during cutting and their introduction into the combine in better conditions, in a continuous process. The working sections (3) are mounted on the cereal platform after detaching the reel. The same attachment can also be used for the integral maize harvesting, changing the speed regime and the feeder blades (5).

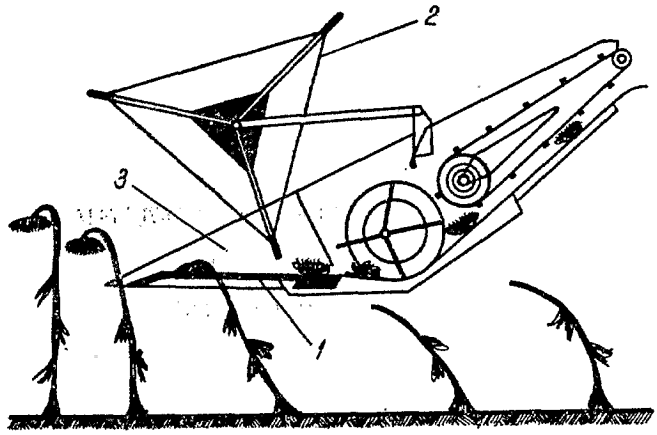

Fig. 1 — The RFS attachment.

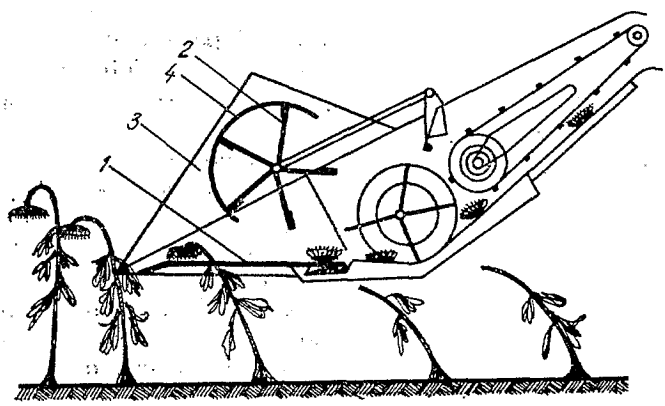

Fig. 2 — The EFS attachment.

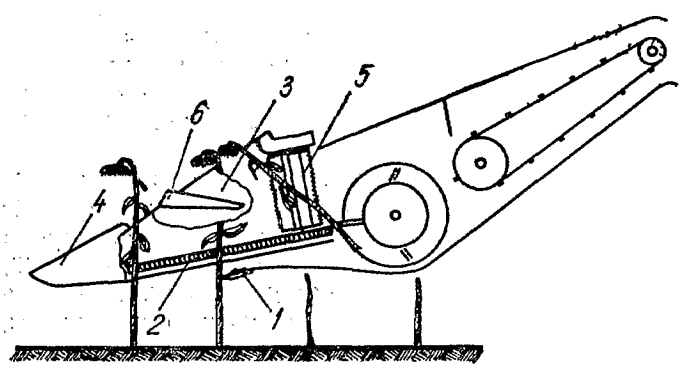

Fig. 3 — The RI attachment.

The main technical features of sunflower harvesting attachments are shown in table 1.

The combine equipped with one of the three attachments is moving along the plant rows. It cuts the plants at the needed height (20—108 cm),

Table 1

Important features of sunflower harvesting attachments

Specification	MU	RFS	EFS	RI
Working width	mm	4200	4200	3200—4200
Maximum cutting height	mm	1080	1080	1000
No. of plant lifters	pieces	13	13	4—5
Reel diameter	mm	1000	600	—
No. of reel arms	pieces	3	5	—
Attachment weight	kg	330	330	570
Upper sieve at 1-st cleaning	—	Peterson	Peterson	Peterson
Lower sieve with enlarged holes at 1-st cleaning	mm	Ø14:16:18	Ø14:16:18	Ø14:16:18
Upper sieve at the 2 nd cleaning	mm	Ø14:16:18: :20:22	Ø14:16:18: :20:22	Ø14:16:18: :20:22

directs the heads to the drum, threshes them, separates the seeds from the vegetable parts and collects them in the grain tank. The uncut stalks are hashed and spread on the ground by a subsequent operation.

Testing results. The experiments with sunflower harvesting attachments were performed with sunflower variety Record (I) and the single hybrid Romsun HS-52 (II). The crop characteristics are summarized in table 2.

Table 2

Sunflower crop characteristics

Characteristics	MU	I Record	II Romsun HS—52
Average yield — seeds	kg/ha	2500	3400
— stems	kg/ha	6600	6100
Seed moisture content	%	12.4	14.3
Plant population	pl/ha	44,000	50,000
Mean height of plants	cm	240	150
Head diameter	cm	12—20	16—30
Lodged plants	%	2	2

The working indices achieved by the combine are given in table 3.

From table 3 it appears that the three types of attachments manufactured in Romania for the C-12 combine, may be used for sunflower harvesting with seed losses ranging from 1.6 to 3.8%, with

Table 3

Working indices of the C-12 combine equipped with different types of attachments

Specifications	MU	RFS		EFS		RI	
		I	II	I	II	I	II
Loss of free grains on the ground	%	0.9	0.6	0.85	0.65	0.7	0.6
Loss of grains in non harvested heads	%	2.6	3.2	1.8	1.5	1.2	1.0
Total losses	%	3.5	3.8	2.65	2.15	1.9	1.6
Broken seeds	%	2.5—3	2.5—3	2.5—3	2.5—3	2.5—3	2.5—3
Seed purity	%	min. 97.6	min. 97.6	min. 97.6	min. 97.6	min. 97.6	min. 97.6
Combine output	t/ha	2.2—2.5	2.2—2.5	2.0—2.3	2.0—2.3	2.3—2.7	2.3—2.7

maximum 3% broken seeds, and at least 97.6% seed purity and a combine output of 2.2—2.7 t/ha. The best results were registered with the RI attachment with active sections, seed losses being in this case 1.6—1.9% and the purity 97.6%. This is due to the fact that the working sections, provided with lifters with active chains and with homogenizers raise better the lodged plants, insure their maintenance during cutting and allow the introduction of the heads in the combine without losses. The RFS and EFS attachments with passive lifters operate with higher losses, particularly in crops with lodged and bent plants. The combine output of 2.2—2.7 t/ha is considered satisfactory. From figure 4 it appears that in the case of sunflower crops with many lodged or bent plants, the seed losses are kept within acceptable limits only when working with the RI attachment with active sections.

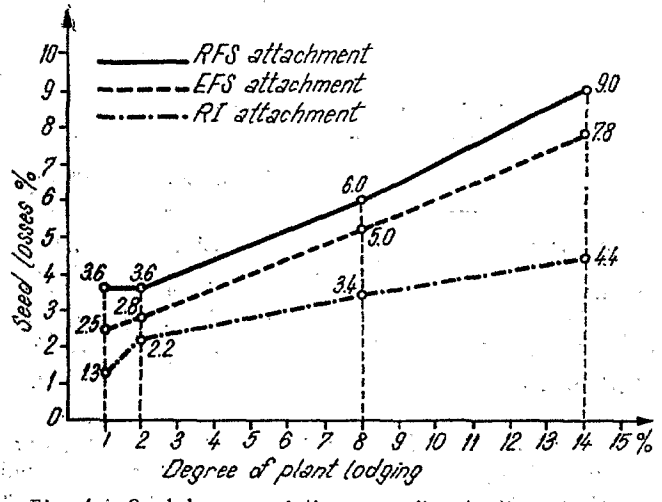

Fig. 4 — Seed losses variation according to the intensiy of plant lodging.

CONCLUSIONS

As a result of the experiments carried out with the three types of sunflower harvesting attachments manufactured in Romania, the following conclusions may be drawn :

1. The C-12 self-propelled cereal combine-harvester equipped with one of the three attachments can be used with good results in sunflower crop harvesting. The combine harvesting output is of 20—25 t/day.

2. The RFS and EFS attachments with passive lifters, are lighter, less expensive, simpler and easier to mount on the cereal platform of the combine, but they operate with higher losses, particulary in crops with lodged or bent plants.

3. The RI attachment with active sections is heavier and more expensive, but insures the harvesting of sunflower crops with more reduced seed losses-about 50% of those recorded in the RFS and EFS attachments, which covers by far the higher costs. This attachment can also be used with minimum adaptations in maize harvesting.

4. The C-12 combine equipped with the adequate sieves and corectly adjusted is successfully employed in sunflower harvesting, the combine being moreover available in August and September, when this crop is harvested.