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THE DESIGN OF MECHANIZATION TECHNOLOGY FOR ALFALFA CULTURE IN THE GOTHATEA HUNEDOARA AREA

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Abstract: The mechanization of fodder production is of major importance for agricultural production in general and for the field of animal husbandry in particular. Among the mechanized works for the production of fodder, harvesting works occupy a special place, both due to the role that fodder plays in animal nutrition, as well as due to the particularities related to quality. Harvesting must be done at the optimal time and in the shortest possible time, in order to maintain the quality of the fodder and keep the losses at a low level. Obtaining high-quality harvests, at the lowest possible costs, can only be achieved through the application of specific, perfected technologies, which allow a superior utilization of both natural resources and inputs. The main objective in harvesting, preparing and preserving alfalfa in the form of hay is to create a final product with a food value as close as possible to the initial green fodder. The quantity and quality of hay obtained from alfalfa depends to a large extent on a number of factors, namely: - the production and initial floristic composition of the fodder (when mowing); - harvest season (harvest phenophase); - duration of the hay harvesting and preparation period; - the method of harvesting, preparing and preserving hay; - the quality and degree of mechanized execution of the harvesting and preparation of fodder in the form of hay.

• Introduction

Natural resources play a very important role in agriculture. Farmers depend on these resources (land, water, energy, etc.) to grow plants and provide them to families and communities. Man's need to consume varied food, rich and close in protein structure to his own needs, have made animal production a continuous concern for him, who is forced to provide his animals with the necessary feed. In order to provide these fodder, in addition to the extensive areas with meadows, large areas of land in the category of arable land are needed, where concentrated fodder and large amounts of hay are obtained. Lucerne is cultivated in Romania on an area of over 400,000 hectares, in hilly and plain areas, due to the high production of green mass and the superior quality of the hay. The contribution of alfalfa to the production of fodder necessary for the development of animal husbandry is of particular importance, because a fodder with a good floristic composition, with a complete nutritional value, having a balanced composition in protein, vitamins, salts and other substances constitutes the basic food of ruminants. Solving the future problems of agriculture involves the use of high-yield tractors, as well as complex aggregates capable of solving the large volume of mechanized works on time and with increased efficiency. Alfalfa is highly valued due to its multiple uses as a fodder plant. Having a large production capacity and good longevity. It is also resistant to frost and drought but responds very well to irrigation. It has a high yielding capacity, under exceptional growing conditions it can be harvested 5-6 times a year. Alfalfa can be used as green fodder, semi-hay, silage (mixed with grasses), hay meal, granules or briquettes as well as in the preparation of combined fodder. Alfalfa is also a basic component of temporary meadows used by mowing. In the biological culture system, alfalfa hay occupies an essential role in the cattle feeding system.

• **Material and method** The studies in this paper were carried out in the specific conditions of the Mureș Gorge. The territory under study belongs to Gothatea locality, Gurasada commune, Hunedoara county. The study concerns the culture of alfalfa. The area cultivated with alfalfa was 4 ha. The predecessor plant was wheat. The perennial alfalfa crop was harvested for a period of 5 years, from 2018 to 2022. Each year, 4 scythes were harvested from the respective area. The harvest was collected in the form of bales. The main mechanized works and materials used in alfalfa cultivation technology were the following:

- Basic fertilization was carried out before sowing with complex fertilizers 16.16.16 in the amount of 200 kg/ha. In the vegetation, 150 kg/ha of ammonium nitrate were administered every year. The works were carried out with the universal tractor U-445 in aggregate with the machine for administering solid mineral fertilizers Amazone 300. The plowing work was carried out with the plowing unit consisting of the U-650 M universal tractor and the PP 4-30 mounted plow. Land preparation was carried out in two passes with the aggregate consisting of the U-650 tractor + GD-3,2 disk harrow.
- Sowing was done with the SUP-29M seeder in aggregate with the U-650M tractor. The norm was 28 kg of alfalfa seed per hectare.
- Alfalfa was harvested with the following aggregates:- mowing: Pottinger CAT 185 rotary mower + U-650 M tractor;- raked: Vicon Acrobat 510 mechanical rake + U-445 tractor;- baled: PPF baling press + U-650 M tractor;- bale transport: U-650 M tractor + tractor trailer. Two types of tractors were used to carry out the mechanized work on the alfalfa crop: the U-445 tractor and the U-650M tractor. Mowers are machines designed for cutting grassy fodder plants that remain on the stubble in the form of a continuous furrow, with a width smaller than the working width of the machine. The mowers differ from each other according to the type of cutting device, the working width and the way of coupling to the power source.

• Results and discussions

Fertilization works for the alfalfa crop were:- Basic fertilization with complex NPK fertilizers (16:16:16) – 200 kg/ha;- Fertilization in vegetation with nitrolimestone – 100 kg/ha. A basic fertilization and 3 fertilizations in vegetation (in years II, III and IV) were carried out. The aggregate consisting of the U-445 tractor + the Amazone 300 fertilizing machine was used for the fertilization works. The machine is of the carried type and driven by cardan transmission from the tractor's power take-off. The capacity of the fertilizer hopper is 300 liters. Adjusting the fertilizer rate is done by adjusting the opening of the fertilizer dispenser slots and by changing the working speed. The working speed when fertilized was 8 km/h, the working width was 12 m, the diesel consumption was 3 liters/ha, the fertilized area was 2 ha/hour. . The plowing depth was 22 cm, the working speed was 6 km/hour, the diesel consumption was 22 liters/ha and the surface shows in an hour 0.5 hectares. The working speed was 8 km/h, the working capacity was 1.6 ha/h and the fuel consumption was 8 litres/ha. . The sowing work was carried out at a speed of 8 km/h, the diesel consumption was 6 liters per hectare and the daily rate was 8 hectares per day.. The actuation of the two rotating drums is done by transmission with trapezoidal belts. The width of the mowed furrow is 1.8 m. . The mechanical raking works were carried out at a speed of 8 km/h, the diesel consumed was 3 liters per hectare.

• Conclusions

- From the analysis of studies carried out on lucerne culture, in the Gothatea area, Hunedoara county, carried out over a period of 4 years, the following conclusions can be drawn.
- Lucenna, being a perennial crop, has proven to be a profitable crop with good profit per hectare.
- The average production harvested from one hectare of alfalfa was 8 tons of alfalfa bales in one year, respectively 32 tons of hay per hectare in 4 years.
- The total investment was 5890 lei/ha, of which: 4126 lei mechanized works and 1764 lei materials. It means that the production price was:
- $5890 \text{ lei} / 32 \text{ tons} = 184 \text{ lei/ton}$.
- Taking into account that a bale has a mass of around 25 kg, one ton of hay has 40 bales. So the production price for a bale of alfalfa hay was approximately:
- $184 \text{ lei} / 40 \text{ bales} = 4.6 \text{ lei/bale}$.
- Alfalfa hay is sold at prices between 8-12 lei per bale, i.e. between 320-480 lei/ton of hay. The profit obtained from one ton of hay is 136-296 lei/ton. Compared to the production price, the profit obtained varies between 74% - 161%.
- From the analysis of expenses for mechanized works, it can be seen that the largest share is due to expenses with diesel fuel, with a weight of 48% ($1964/4126 = 0.48$). Some of these expenses can be reduced if, instead of used tractors, tractors with supercharged engines that have lower fuel consumption are used.
- The alfalfa harvest season is a decisive technological factor, influencing the level and quality of harvests, on the one hand, and on the other, the longevity of the crop. As such, a large, constant and long production can only be obtained by respecting the biological requirements of the plant.
- Obtaining high productions per hectare and with low expenses requires strict compliance with culture technologies by using agricultural aggregates as complex as possible and with the highest possible yield.