THE IMPORTANCE OF LOGISTICS IN AGRICULTURAL FARMS. THE SUPPORT OFFERED BY LAND IMPROVEMENT WORKS TO ENSURE ITS OPTIMAL FUNCTIONALITY

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RESEARCH ARTICLE

Abstract

The paper presents the importance of logistics in the management of agricultural activity, both in the field and in repair workshops, how an investment in logistics ultimately means an expense that generates savings, fewer losses and not in lastly, more care towards the environment, these contributing both to the efficiency of the activity and to the increase of the profit.

The paper begins with a short history to create an overview of the general situation in the field and presents the importance of logistics in carrying out agricultural works on a farm and organizing maintenance and repair activities of land improvement infrastructure (canals, dams, pumping stations , exploitation roads, etc.), respectively the use of appropriate equipment and materials for these works.

Also, some of the machines used for the construction and maintenance of the main elements that support logistics are subject to attention, with examples, as well as cases of their intervention with the respective results.

Keywords: management, rain drainage, retention, infiltration, sustainable.

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INTRODUCTION

1. General consideration

"Logistics is about having the right thing, in the right place, at the right time" Logistics World

Old words: "logiste", "logisteo", "logista", terms used in ancient Rome, probably the Latin Romans being the first to realize the importance of organizing a platform to ensure the smooth running of an activity, reflect the importance of logistics from ancient times Of course, they invented and used these terms, in support of the war effort, but, if we look at things in a certain way, war can mean fighting in any field with physical non-materialized "enemies": time, inefficiency, climatic phenomena and others .

The change of the political regime in Romania, which occurred through the Revolution of 1989, produced, as expected, major changes in agriculture as well, on all levels: as a property system, organization, commercial exchanges, agrarian policy. Being two diametrically opposed systems, the transition from the old one (communist, based on State property), to the new one (capitalist, based on private property), it was a difficult and long one, something that affected agricultural performance. From an organization of agricultural land into subdivisions comprising large, compact, quasi-autonomous areas (production cooperatives), to the fragmentation of these areas through re-appropriation. 40 years of works and investments in land improvements designed, executed and coordinated by state structures have created systems desiccation and drainage that returned thousands of hectares of arable land to agriculture. Unfortunately, after 1990 these investments were drastically reduced, those structures being reorganized in a way that proved to be defective over time. The decrease in funds for the maintenance of the irrigation systems drainage and the equipment park also contributed to the impossibility of their functional maintenance.

The technical modernization of agricultural machinery, irrigation systems and new design principles are only part of the effort to optimize agricultural activity. To implement all this, it is necessary to amend and agree certain regulations and legislative norms, for to be able to carry out certain physical changes in the field, on the access road infrastructure and the drainage and irrigation systems.

Unfortunately, the part of the legislation concerning everything that means the modernization of agriculture has not changed to keep up with the current situation. At least, in terms of logistics (roads, canals, hydrotechnical constructions), we are still working with the legislation from the years 1960, one that

prevents its development and modernization On top of all this, the effects of global warming, the new vision of European agrarian policy, the conflict in Ukraine, represent more difficulties than in recent years.

The increasing demand for agricultural products, both for direct consumption and for industry, in the conditions where the population of the globe is always growing and the quality requirements are increasing, on the one hand, and on the other hand, all this must to be fulfilled with the reduction of fossil fuel consumption and reduction of CO2 emissions, with the change of mentality in the use of chemical substances on the soil, respect for biodiversity and others. In order to fulfill the objectives and maintain the profitability of the Agricultural activity, more and more farmers are looking to find solutions to avoid or at least reduce losses, and logistics management is one of the keys. This boosts and shows the importance of land improvement works, as a support for modern agriculture.

Whether we are talking about access roads, bridges, embankments, irrigation/drainage channels or aggregates/equipment necessary for agricultural activity, it is imperative to build a unique strategy of functionality that includes them in a block and ensures their maximum efficiency. For agriculture, a vital field, as important as it is difficult, the organization in the smallest detail of each contributory segment is essential to achieve the final objective: obtaining the largest possible agricultural production, of superior quality, with cost prices smaller and sustainable, as well, and logistics is even extremely important.

Even if (in the ideal way), all segments would work and run optimally (soil, land condition, precipitation, seed, work technology, qualified operators, etc.), without a good logistics management, it cannot be guaranteed the full success of an agricultural year.

MATERIAL AND METHOD

2. Presentation of constitutive elements, approaches to building/repairing/restoring transport facilities

2.1 Constituent elements

In order to be able to "have the right object, in the right place, at the right time", it is necessary to first of all have the support network well established, regardless of whether it is water for irrigation or that of drying-, machines, goods, people, which means that both the exploitation roads and the canals and gutters must be able to function at the designed parameters.

2.1.1 Drainage channels and ditches

In the desire to return land to agriculture and to keep it able to produce, sustained efforts were made in some areas to systematize, dry and improve the soil. Within them, as an efficient and sustainable method, were designed and built vast drainage systems, including tertiary, secondary and main collection channels, hydrotechnical constructions.

In agriculture practiced in low-lying areas, good drainage is a sine qua non obligation for the collection and transport of excess water, hence the importance of the canal systems used for this purpose. The Romanian technical terminology usually uses the word "drainage" (proper for the works of removing excess water from swamps, to transform them into land suitable for agriculture or construction) and when describing the action of removing excess water through surface drainage, through open channels, but this is not an impediment to understanding the role and the importance of these hydrotechnical constructions.

Large-scale systematization, drainage, drainage and irrigation works were carried out between 1960-1990 in Romania. Until 1990, the overwhelming majority of the agricultural area belonged to the State. Following the political changes that occurred after the Revolution of December 1989, respectively the transition from the communist to the democratic-capitalist system, there were radical changes in several areas, including that of land improvements, the organization of institutions with competence in the maintenance and construction of drainage, drainage and irrigation systems also underwent changes, some with a harmful effect for their proper functioning and development.

Likewise, the legal change in the ownership of Agricultural lands, which occurred after the 1990s, by returning them to the rightful owners, also had negative elements, materialized by ignoring the importance of the existing canals and drainage systems on the respective properties, which soon led to clogging and the appearance of puddles, salty soils and the impossibility of functioning within the parameters of some sections of the respective drainage system.

The lack of funds, the dismemberment of the large State companies that had as their object of activity maintenance works of the drainage systems, into smaller companies that failed to sustain themselves financially, legislative

loopholes and other objective reasons, led to the destruction of an important part of drainage and irrigation systems by their clogging, surging and infestation caused by vegetation (Fig. 1, a, b, c).

The same thing happened with the hydrotechnical constructions that serve these systems (Fig. 2, a, b, c).

a b c

Figure 1. **Channels clogged and invaded by vegetation** - Photo Marin Ilca

a b

Figure 2. **Vandalized hydrotechnical constructions: a&b hydrotechnical steering node: c. pumping station** - Photo Marin Ilca

Drainage, transport channels and gutters require periodic interventions in order to be ready at any time to perform the entrusted mission: to ensure the discharge of excess water from precipitation. The most frequent maintenance work is the cleaning of the spontaneous vegetation, both from the safety area of the canal and inside it (small base and slopes). This is done with specific machines, attached to a tractor or excavator, as well as with special machines, deedicated (Fig.3).

Figure 3. **Vegetation cleaning with the chopper on the arm** - Photo Marin Ilca

In the case of canals that have not been maintained for several years, in addition to the presence of grassy plants, various species of shrubs and trees appear and thrive, which make it even more difficult to clean these canals, increasing labor costs (time, fuel, machine wear, etc.). in which their trunk exceeds a certain thickness (through natural growth), this complicates things even more, as it is necessary to mark them and cut them by specialized companies approved by the zonal forest bypass, according to the regulations in force (Fig. 4).

a. b. c.

Figure 4. **Choppers on the arm:a.&b.for excavator:c. for tractor**-Photo Marin Ilca

Another important work is unclogging works. The execution of a drainage channel, regardless of its category (main, tertiary, secondary, emissary, etc.), is done precisely respecting the designed geometric specifications: large base, small base, slope inclination, bottom level channel, drainage slope The clogging leads to a decrease in the efficiency of the respective channel in the best case and to inoperability in the worst case and is determined by several natural and atrophic factors.

Among the natural factors that lead to the clogging of the canal section, we list the following:

• Alluvium transported by water
• Spontaneous vegetation grown in the channel profile
• Slope breaks due to the type of soil in the profile
• Burrows dug in slopes by wild animals (especially foxes and badgers)

The most common atrophic factors in practice are the following:

• The execution of agricultural works for the preparation of the soil up to the edge of the slope, not respecting the safety zone imposed by the rank of the respective channel
• Using canals as "bins" for various waste
• Faulty, inoperable racks

• Knowingly destroying drainage channels by farmers in order to "recover" the land area occupied by them
• "Fixing" the problems caused by puddles by digging ditches to drain the water from the plot, which inevitably lead to the entrainment of the soil with the discharged water
• Non-execution of works to remove puddles on large areas, which ultimately lead to swamping and the appearance and development of vegetation specific to areas with excess water.

The maintenance of drainage channels is the kind of work that is carried out continuously, the syncopes creating the aggravation of the problems, the complication of the work or, in some cases, the need to reprofile them, which generates additional costs, the increase of the execution time and of course, a greater negative impact on the environment through the high consumption of fossil fuel.

The ditches are canals with a small section, used in particular to protect mining roads and their purpose is to discharge excess water from them. because, naturally, there is a tendency to penetrate with the machinery on the plot adjacent to the road, when it is unsuitable due to puddles, pits or large differences in level created by repeated passes with agricultural machinery during or immediately after the rains.

For a good and correct execution of these ditches, profiled buckets or special machines are used that can execute an excavation with a predetermined profile. From practice, it has been observed that a ditch with a trapezoidal section with a large base of 90-100cm, a small base of 18-20cm and an inclination of the slope of 30 degrees is optimal for the road drainage service, both from the point of view of discharging excess water, and from the point of view of maintenance and durability over time.

a. b. c.

Figure 5.**a) machine for digging trenches, b) Re-punter, c) bucket for digging trenches** - Photo by Marin Ilca

To trace and facilitate the execution of the ditch with the rotary tiller (fig. 5.a), it is recommended to use the rebounder from (fig. 5.b) in advance. As for towing, the digger is paired with a tractor equipped with a variator. The forward speed is adjusted depending on the physical elements of the soil, the work is carried out through several passes, until the desired depth is reached.

Figure 6. **Digging ditches using the profiled bucket** - Photo Marin Ilca

Of course, it would be ideal for the plot on which the ditch is dug to be leveled, in order to be able to control the direction of the water flow and maintain a profile with a constant geometry.

2.1.2 Exploitation roads and intubated bridges

Like the agricultural lands burdened by large differences in height arranged randomly that lead to the appearance of puddles, roads are subject to erosion, axis modification and swamping in the same way (Fig.7).

Figure 7. **Eroded mining roads** - Photo Marin Ilca

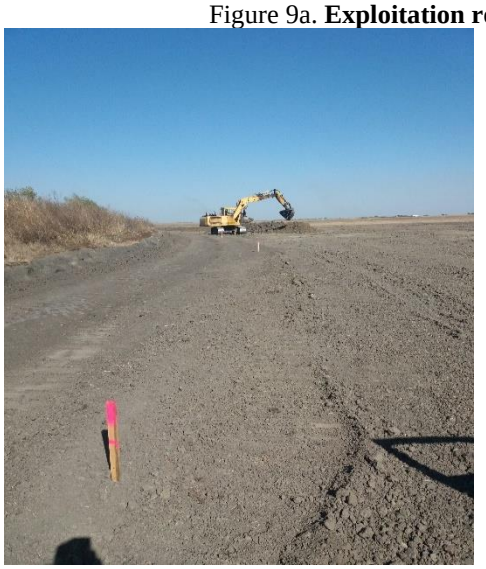
The exploitation roads provide access to the soles and are mostly dirt roads, which is why they are exposed all the time to erosion due (again) to natural and atrophic factors.

The maintenance of mining roads has a permanent character, they must always be able to ensure the machines access to the exploited soils, to the channels (to keep them under observation and interventions) and to any objective of interest, included in the circuit of the farm.

Figure 8. **Exploitation road maintenance with a leveling blade, in the construction site of I.F.** - Photo by Marin Ilca

The flatness, slope and structure of the exploitation roads suffer changes mainly due to the movement of heavy machinery, especially in periods when the rains are more present, regardless of the season, they damage the access road through the formation of beech trees, swampy surfaces and deviations from their designed route (Fig. 9).

Figure 9a. **Exploitation road destroyed by dams** - Photo Marin Ilca



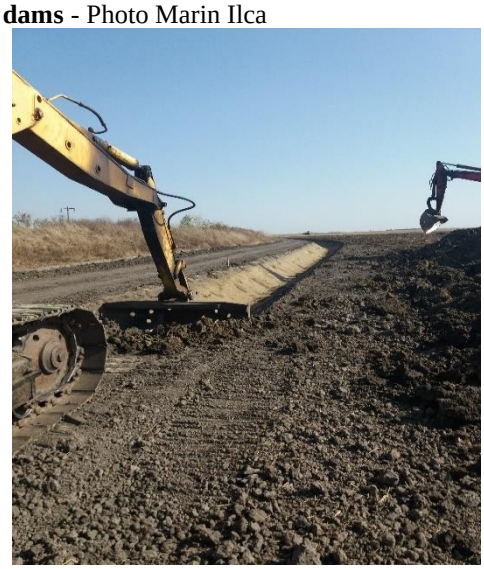


Figure 9b. **Road and gutter reconstruction** - Photo by Marin Ilca

Figure 10. **Exploitation road and ditch - maintenance** - Photo Marin Ilca

Regarding the road structure, special attention must be paid to bridges, constructions that connect the banks of the canals, supporting the land communication path and ensuring the continuity of the path over them, regardless of the nature of the materials from which they are built or the construction type (tubular, boxed, with or without drums, from prefabricated concrete or corrugated pipe, etc.). Due to the phenomenon of merging of agricultural lands by medium and large farms and implicitly due to the change in the agrotechnical configuration, the predominant use of machines with a much larger gauge than those for which the mining roads and bridges were designed 30-50 years ago years have required some changes in their design and execution to make them functional and efficient.

In practice, a series of undesirable situations can be encountered that determine their removal from protected use, the inoperability of these constructions or the endangering of the circulation, requiring immediate intervention for remediation and re-connection in the circuit under safety conditions.

The main disruptive factors are:

• incorrect execution of the installation of the intubated passage (Fig. 13)

• using materials inappropriate for the type of crossing

• wear of component materials (Fig. 13)

• erosion through the action of natural factors (water, wind, frost, thaw, etc.), (Fig. 12).

• improper exploitation (Fig11)

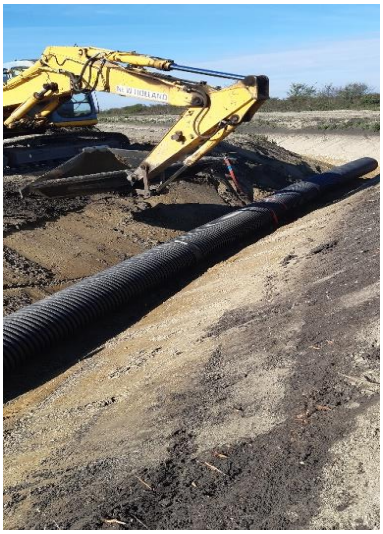
• technical wear and tear due to overloading due to the increase in the size of modern agricultural machinery

Figure 11. **Concrete tympanum detached from the bridge superstructure** - Photo by Marin Ilca

Figure 12. You can see **the erosion produced by the floods at the base of the foot of the bridge** - Photo Marin Ilca

Figure 13. **Corroborative factors that led to the destruction of the intubated passage (incorrect assembly and material wear)**- Photo by Marin

Bridge maintenance works mainly consist of:
• Work to replace worn, damaged or unsuitable tubes due to the change in gauge (fig. 14 a)
• Widening works (fig. 14 b)
• Unclogging works (by pressure water infusion or mechanically)
• Consolidation works (Fig, 14 c)
• Repairs



a.

b.

c.

Fig. 14 **Maintenance work on bridges and tubed crossings** - Photo Marin Ilca

2.1.3 **Mechanical maintenance component**

For both large and medium and small farms, an important component in the modern economy and management is the provision and organization of mechanical maintenance within the organization. defects from various causes can generate important losses if they are not detected in time and if, of course, measures are not taken. The existence of an own repair workshop (even if we are talking about minor repairs or "first aid intervention"), served by trained operators, can save a large part of the two big essential components: Time and Money. Investing in the professional training of operators achieve, over time, both capital savings and employee empowerment and loyalty.

Another important factor in reducing the time spent repairing machinery is the availability to have a minimum of parts and consumables available. Also, firm contracts with service companies specialized in major repairs (repairs of electrical, hydraulic and mechanical systems).

RESULTS AND DISCUSSIONS

The paper deals with general problems related to the insurance and organization of logistics in an agricultural farm, but they are the fruit of activity, observations, practice and personal research over a period of over ten

years, at four different farms, with cultivated areas between 1000 and 14000 ha Regardless of whether we are talking about small, medium or large farms, individual farmers or agricultural associations, logistics, by its essence, has a determining importance in terms of effective economic management.

All four studied farms encountered the same problems (impassable exploitation roads, destroyed piped floors, clogged drainage channels) which generated substantial costs with spare parts, damages from puddles on the plots, the increase in the execution time of the agricultural works (including transport of cuttings, seeds and agricultural products, difficult access to plots with large machines due to narrow sidewalks).

As these deficiencies were solved through specific works, and the respective expenses decreased significantly. All these farms carried out the repair works, replacement of pipes, pavements, land leveling and rehabilitation of exploitation roads under their own direction, for this it being necessary to complete the equipment park with equipment specific to these works: towable graders, excavators, bulldozers, scrappers, a part also purchasing guidance systems (laser and GPS), all of which are later used for maintenance.

CONCLUSIONS

A good logistics organization ensures farmers an uninterrupted technological flow from external causes, or at least, the minimization of their negative effects.

Especially in the case of a modern approach to agriculture, regardless of whether the work system is biological or conventional, logistics is that link in the unitary assembly that can make the difference between a good or a bad development of the technological stages.

A good management of logistics determines the reduction of the time allocated to an agrotechnical process, financial economy, the reduction of carbon emissions, the streamlining of specific activities, the creation of a calmer work climate, with beneficial socio-professional implications for the farm.

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