CORRELATING THE MAIN INDICATORS OF THE SUPPLY PLAN WITH THE INDICATORS OF THE SALES PLAN IN A VETERINARY PHARMACY

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Abstract: *It is well known that to achieve the rationality of the specific indicators in the supply plan, one must correlate them with the specific indicators of the delivery (sales) plan, reflecting the market demands and expectations directly and objectively. This is an essential condition to perform an efficient commercial activity. This paper exemplifies how to determine the stock size allowing the mentioned correlation in a veterinary pharmacy, considering the expenses it generates. These are included in the cost of products or services, influencing decisively the profitability of the company.*

Key words*: supply management, stocks, supply plan indicators, sales plan indicators, commercial activity.*

INTRODUCTION

The main objective when developing supply plans and programs is to cover (ensure) completely the required volume and structure of material resources, timing strictly delivery and demand, finding suppliers who practice advantageous selling prices and are reliable in delivery, resulting in a minimal cost of purchase, transport and storage. Failing this objective causes unjustified intangibles, as stocks beyond pre-normative (slow moving stocks or without movement), penury or lack of stock - situations that disrupt the normal activity and the projected economic-financial objectives.

It is necessary to determine the main indicators that define the content of the supply plan and programs, starting from a sales plan, rigorously based; the economic and mathematical modeling of the supply - storage process has to eliminate all influences generating additional uneconomical expenses. Such an approach is exemplified in this paper, determining, for a veterinary pharmacy, the stock size for an optimal correlation between the indicators of the supply plan and those specific to the delivery (sales) plan.

MATERIALS AND METHODS

Among the main factors *influencing the level of supply stocks*, we may mention [5]:

■ *The frequency of deliveries* from suppliers should take into account: the nature of demand, the time of consumption, the production periodicity, the allotments from the supplier. The strategy of organizing deliveries by the supplier should be known by customers for a better organization.

■ There are two types of *strategies* the supplier may use:

- the alternative delivery, resulting in larger stocks for the customers, for longer periods;

- the simultaneous delivery, acting inversely, requiring a more complex and comprehensive sale organization.

■ *The minimum quantity that may be ordered* is usually established by the manufacturer; it discourages the requesters of small quantities that would have to make large stocks if they ordered the imposed level.

■ *The transport capacity* correlated with the distance.

■ *The physicochemical properties* limit the storage period of short guarantee or easily degradable resources.

■ *The existing storage capacity* limits the maximum quantity that can be stored at a given time.

■ *The period of order-supply* conditions the safety stock formation.

■ *The costs of launching the purchase order.*

■ *The frequency of production from manufacturers* - the minimum interval to provide resources from a direct source.

■ *The location of stocks of material resources* influences the amount of stocks in consumption centers, as stocks for internal transportation.

The specialized literature [4] estimates that the factors influencing the stock formation in a veterinary pharmacy act differently, depending on the insurance - supply - storage - preservation, nature and destination of the respective product. The common feature of these factors is that their action materializes in expenses and losses, included in the cost of products, works or services, that influence their size and hence the company's profitability. Therefore the economic - mathematical modeling of the specific processes by correlating the indicators of the supply plan and programs with those specific to the sales plan must eliminate the wasteful spending influences, so that the result would show a minimal effort (minimal cost) with the storage processes.

RESULTS AND DISCUSSIONS

A pre-defining stage for the defining **nomenclature** of products to be purchased during the plan period is mandatory when substantiating the supply plan. The ***main product categories*** in the portfolio of a veterinary pharmacy are classified and defined as:

- The *veterinary products* are products, medicines, disinfectants, rodenticides, insecticides, products to care for the animals.

- The *biological products for veterinary use* are produced by the veterinary medicine to induce passive immunity.

- A *veterinary medicine* represents any mixture of chemical compounds or vegetal products packed in a pharmaceutical form, which administered to an animal, aims to prevent, relieve or cure a condition, regardless of its nature.

- *Disinfectants* are substances or chemicals used against infectious germs.

- *Rodenticides* are toxic chemicals used to destroy harmful rodents, carrying catching diseases.

- *Insecticides* are chemicals that destroy harmful insects.

- The *fodder additives* are a group of ingredients added in certain proportions in the mixed forage, in order to boost livestock production rate, lower the specific consumption, combat certain diseases, and correct its taste and smell.

- *Animal care products* such as food, accessories, bedding, toys, cosmetics.

For all product categories included in the nomenclature of a veterinary pharmacy, the ***rationalization of the indicators specific to the supply plan and programs*** must be ***correlated with those specific to the delivery (sales) plan***, as a direct reflection of market demands and expectations [2]. Therefore ***substantiating the sales plan in all working points served by the regional veterinary deposit is prior to the supply plan and programs***.

The main ***indicators defining the contents of the sales plan and programs*** of a veterinary pharmacy are [1]:

- sales volume – $\boldsymbol{V_V}$;
- stocks at end of the plan period – $\boldsymbol{S_{sf}}$;
- preliminary stock at the beginning of the plan – $\boldsymbol{S_{pi}}$.

The calculation method differs depending on the nature of the products (specialized or general purpose), the predicted stability of consumption, the policy adopted in making and holding of stocks etc.

Generally, the ***sales volume (V_V)*** of a veterinary pharmacy is determined by extrapolating the market demands related to previous reporting periods, possibly corrected with the predicted influences of some factors which are expected to suffer significant changes between the two reference periods. Special attention should be paid to the optimal sizing of the **sales stock**, that gives the size of the **stock indicator at the end of the plan period** (S_{sf}).

Among the **sizing methods of sale stock** established in the specialized literature [7], the ***operational research methods*** are recommended for the veterinary pharmacies; they identify the optimal combination of different categories of expenses associated with the delivery process and the respective storage. Thus, when taking into account the expenses of restock (C_l) and the costs of product storage in the delivery deposit (C_s), the total cost function is:

$$C = \frac{V_V}{n} \cdot C_l + \frac{n}{2} \cdot \theta \cdot C_S$$

If the cost function has to reach the minimum level (canceling its first derivative), the following determining relations result:

- sales stock / optimal lot: $S_V^* = n^* = \sqrt{\frac{2 \cdot V_V \cdot C_l}{\theta \cdot C_S}}$

- optimal frequency of deliveries: $y^* = \frac{V_V}{n^*} = \sqrt{\frac{V_V \cdot \theta \cdot C_S}{2 \cdot C_l}}$

- optimal interval between two deliveries: $I^* = \frac{\theta}{y^*} = \sqrt{\frac{2 \cdot \theta \cdot C_l}{V_V \cdot C_S}}$

For example, analyzing the substantiation for the *anti-dermatosis, soothing, antipruritic and anti-allergic shampoo "Allermyl Glyco - 200 ml"* with an expected sales volume of 950 pieces next year, we consider the launching costs for a restock order of 72 RON / order and the storage costs of 0.86 RON / day, resulting:

$$\boldsymbol{n^* = S_V^* = \sqrt{\frac{2 \cdot V_V \cdot C_l}{\theta \cdot C_S}} = \sqrt{\frac{2 \cdot 950 \cdot 72}{360 \cdot 0.86}} \cong 21} \text{ pc.}$$

$$\boldsymbol{y^* = \frac{V_V}{n^*} = \frac{950}{21} \cong 45} \text{ restocking the sales deposit}$$

$$\boldsymbol{I^* = \frac{\theta}{y^*} = \frac{360}{45} = 8} \text{ days}$$

Rationalizing sales for a veterinary pharmacy [6], by optimizing the commercial process in the delivery deposit should not ignore the optimal size of the **safety stock (S_S)**; the ***method IMPACT (Inventory Management Program and Control Techniques)*** [5] may be used, according to which:

$$S_S = K \cdot MAD \quad \text{, where:}$$

- K – the safety coefficient expressing the delivery potentiality;
- MAD – the average absolute deviation of monthly delivery demands from the average monthly demand: $MAD = \frac{\sum_{i=1}^{n} \left| r_i - \bar{r} \right|}{n}$, where $\bar{r}$ = average demand: $\bar{r} = \frac{\sum_{i=1}^{n} r_i}{n}$

For the analyzed product - *Shampoo "Allermyl Glyco - 200 ml*" – the monthly delivery demands for the last year are presented in Table 1, and the coefficient of delivery potentiality is 1.2.

Table 1

Month	1	2	3	4	5	6	7	8	9	10	11	12
Demand (r_i) [pc.]	81	78	70	85	73	78	65	95	82	70	67	92

It follows that the recommended safety stock to be set up for the plan year is **9 pc.,** because:

$$\bar{r} = \frac{\sum_{i=1} r_i}{n} = \frac{81+78+70+85+73+78+65+95+82+70+67+92}{12} = 78 \text{ pc.}$$

$$MAD = \frac{|81-78|+|78-78|+|70-78|+.....+|67-78|+|92-78|}{12} = 7.5 \text{ pc.}$$

$$S_S = K \cdot MAD = 1.2 \cdot 7.5 = 9 \text{pc.}$$

For other groups of products sold by the veterinary pharmacy, with higher seasonality of demand, we recommend the ***method of deviation or average deviation***, according to which:

$$S_S = \bar{D} \cdot vmz \quad \text{, where:}$$

- $\bar{D}$ - the average deviation range between two successive deposit restocks, considering only the positive deviations (delays):

$$\bar{D} = \frac{\sum_{i=1}^{n} D_{efi}^{+}}{n} \text{ (for equal lots) / } \bar{D} = \frac{\sum_{i=1}^{n} D_{efi}^{+} \cdot Q_{efi}}{\sum_{i=1}^{n} Q_{efi}} \text{ (for different lots)}$$

$$D_{efi}^{+} = I_{efi} - \bar{I} \quad \text{, in which:}$$

$$\bar{I} = \frac{\sum_{i=1}^{n} I_{efi}}{n} \text{ (for equal lots) / } \bar{I} = \frac{\sum_{i=1}^{n} I_{efi} \cdot Q_{efi}}{\sum_{i=1}^{n} Q_{efi}} \text{ (for different lots)}$$

vmz - daily average sale: $vmz = \frac{V_V}{N_{zl}}$

For example, in case of the *anti-parasitic shampoo "Antipoux-Van - 200 ml"* the calendar and quantitative product inputs in the pharmacy deposit varied during the last 6 months of last year, as presented in Table 2, and the total annual sales are estimated at 1,280 pcs.; the unit operates 320 days per year.

Table 2

Period from the previous delivery (I_{efi}) - days -	15	17	16	14	13
Actual quantity (Q_{efi}) - pc. -	43	48	40	36	42

The recommended safety stock to be established for this product for the plan year is **5 pcs.,** because:

$$\bar{I} = \frac{15 \cdot 43 + 17 \cdot 48 + 16 \cdot 40 + 14 \cdot 36 + 13 \cdot 42}{43 + 48 + 40 + 36 + 42} \cong 15 \text{ days}$$

$$\bar{D} = \frac{(17 - 15) \cdot 48 + (16 - 15) \cdot 40}{48 + 40} \cong 1.55 \text{ days}$$

$$vmz = \frac{950}{320} \cong 3 \text{ pc. / day}$$

$$S_S = 1.55 \cdot 3 \cong 5 \text{ pc.}$$

Determining the order point is another important aspect in managing a storage deposit of a veterinary pharmacy; it optimizes the specific aspects of sale. The *order point* designates the quantity of finished goods in the sale deposit that initiates a new order to fill the sale stock [3].

$q_c = t_c \cdot vmz$, in which:

t_c - the order time obtained by summing the durations of order, manufacture and restock;

Knowing that the time of order - manufacture - reception for all shampoos is 5 days, the ***order point*** is:

$q_c = 5 \cdot \frac{950}{320} = 15$ **pc.** – for the *anti-parasitic shampoo "Antipoux-Van - 200 ml"*

$q_c = 5 \cdot \frac{1,280}{320} = 20$ **pc.** – for *Shampoo„Allermyl Glyco – 200 ml*"

By completing these fundamental elements of the supply plan with the last estimated indicator - the ***preliminary stock at the beginning of the plan period*** (S_{pi}) – one may determine, for each category of products in the portfolio of a veterinary pharmacy, the amount that will be taken from the regional deposit, during the plan period:

$$Q = V_V + S_{sf} - S_{pi}$$

For the analyzed product – *Shampoo „Allermyl Glyco – 200 ml*" – the **necessary supply** from the delivery deposit is:

$Q = 950 + 21 - 17 = 954$ **pc.** (because it is estimated that at the end of the current year the product stock is 17 pcs., and so: $S_{pi} = 17$ **pc.**)

Once the aspects of substantiating the sales plan and programs for all veterinary pharmacies served by a regional deposit are completed, their managers can substantiate the supply plan and programs.

The necessary supply (N_a), as the main ***indicator in defining the supply plan and programs for materials***, shall be determined after centralizing the estimated delivery applications by all veterinary pharmacies served, for the plan year. On its basis, the deposit **shall draft the supply plan** with the objective, besides providing full and timely needs, of removing the wasteful spending influences.

Planning resource inputs should be done such that the result expresses a minimal effort (minimal cost) associated with the supply-storage process. To **determine the optimal stock size** (the objective of minimizing the costs involved), we recommend the **methods based on operational research**, that consider a number of costs generated by the supply - storage process (the cost of launching a purchase order - C_l, unit storage expenses - C_S) and the economic - mathematical modeling to determine:

- optimal supply lot: $n^* = \sqrt{\frac{2 \cdot N_a \cdot C_l}{\theta \cdot C_S}}$

- optimal frequency of supply: $y^* = \frac{N_a}{n^*} = \sqrt{\frac{N_a \cdot \theta \cdot C_S}{2 \cdot C_l}}$

- optimal interval between two supplies: $I^* = \frac{\theta}{y^*} = \sqrt{\frac{2 \cdot \theta \cdot C_l}{N_a \cdot C_S}}$

- minimum budget for the reporting period: $C_a^* = \sqrt{2 \cdot N_a \cdot C_l \cdot \theta \cdot C_S} + N_a \cdot p$

(θ – reporting period; p – unit price of the product)

Returning to the exemplified product for the indicators defining the content of the sales plan (the *anti-dermatosis, soothing, antipruritic and anti-allergic shampoo "Allermyl Glyco - 200 ml"*), we determined an annual need of 1,155 pieces supplied in the regional deposit, by centralizing the information received from the veterinary pharmacies. This deposit buys the shampoo *"Allermyl Glyco - 200 ml"* from the direct manufacturer at a unit price of 62 Euro / piece. The product will be stored over 5% of the deposit area.

This deposit maintenance generates payroll expenses (2,100 euro / month), with the salaries of two workers (3,400 euro / month), heating costs, electricity and maintenance (600 lei / month), amortization expenses (830 lei / month). In consequence:

$$C_S = \frac{5}{100} \cdot (2{,}100 + 3{,}400 + 600 + 830) \cdot \frac{1}{30 \cdot 1{,}155} = 0.01 \text{ lei/pc./day}$$

In addition, an economist deals with placing the supply orders (his monthly salary is 3,500 lei) and a supply agent (with 2,500 lei monthly salary). The economist works an average of 3 hours and the supply agency works 8 hours to place an order. Add 83 lei / order to the salary expenses those with telephone, mail and supply agent travels to the supplier. Therefore:

$$C_l = \frac{3{,}500}{21 \cdot 8} \cdot 3 + \frac{2{,}500}{21 \cdot 8} \cdot 8 + 83 = 264.5 \text{ lei}$$

To time the inputs, the deposit should determine the optimal values for the supply lot, the supply frequency, the optimal range between two successive restocks and the optimal (minimum) budget required for the plan year, as follows:

- optimal supply lot: $n^* = \sqrt{\frac{2 \cdot Na \cdot C_l}{\theta \cdot C_S}} = \sqrt{\frac{2 \cdot 1{,}155 \cdot 264.5}{360 \cdot 0.01}} \cong 412$ pc.;

- optimal frequency of supplies: $y^* = \frac{N_a}{n^*} = \frac{1{,}155}{412} \cong 3$ restocking deposit;

- optimal interval between two supplies: $I^* = \frac{\theta}{y^*} = \frac{360}{3} = 120$ days;

- minimum cost of supply-storage for „*Shampoo Allermyl Glyco–200 ml*”:

$$C^* = \sqrt{2 \cdot 1{,}155 \cdot 264.5 \cdot 360 \cdot 0.01} + 1{,}155 \cdot 62 = 73{,}093.1 \text{ lei/year.}$$

Proceeding similarly for all categories of product categories in the nomenclature, the veterinary pharmacy will substantiate the supply plan, correlating its indicators with those specific to the sales plan.

CONCLUSIONS

In order to ensure a strict correlation between the indicators that define the content of the *supply plan* and those specific to the *sales plan*, the **regional deposit of veterinary**

products uses the estimated delivery demands from the veterinary pharmacies for the plan year. Based on it, when substantiating the supply plan for materials, the deposit *determines the necessary supply*, as the main indicator of the supply plan, and then *plans the inputs* from the suppliers, so that it generates a minimum effort (cost). The specialized literature provides many economic-mathematical models applicable to achieve this objective. Some of them are illustrated in this paper.

On their turn, the **veterinary pharmacies** determine their *sales volume* - investigating the demands and expectations of the target market (generally by extrapolating the demands of the previous reporting periods, eventually corrected with the predicted influences of some factors that are expected to suffer significant changes between the two periods reference) and *the stock at the end of the plan period* – using the economic-mathematical modeling of the optimum size for the *sale stock* (generally using models based on operational research that facilitates the identification of the optimal combination of different categories of expenses associated with the process, as exemplified in this paper).

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