

## IMPROVING PHYSICAL DISTRIBUTION SYSTEMS FOR FOODS IN DEVELOPING COUNTRIES <sup>1/</sup>

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### 1. INTRODUCTION

Throughout time, mankind has strived to forestall the fulfillment of Malthus' predictions. To face the challenge of an ever-increasing population, man has historically concentrated resources on the expansion of food output, and achievements in this area are remarkable to say the least. Nonetheless, it is clear that the ultimate goal of obtaining a balance between food availability and human needs is still far from being accomplished. Large portions of the world populations are still plagued by inadequate levels of protein and energy intake, and the outlook is one of a widening gap between food needs and provisions.

More recently, it has been argued that the stress on the traditional approach of fomenting increases in food output has been responsible for the neglect of research in aspects ancillary to production, which could possibly provide comparable, if not better, results (10). The fact that the task of fulfilling food needs is not completed at the moment of harvest seems to have been somehow overlooked in much research dealing with the so called world food problem.

Between the farm fields and the consumer, food goes through a lengthy process of creation of form, place and time utility, and the opportunities for inefficiencies in the many functions and activities performed in this process are formidable.

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Developing nations, undergoing processes of rapid structural change, find often in food distribution a number of major barriers to the provision of adequate food supplies. The transition from subsistence to market orientation is not always a smooth one, and most often marketing institutions and infrastructure do not follow simultaneous adjustment paths to the processes of overall economic and social change.

As a result, most of the achievements in food production may not have the desired impact on the improvement of socioeconomic conditions. Inefficiencies in food distribution are generally responsible for reductions in food availability and for higher consumer prices at the retail level. Producer returns may also be reduced by ineffective marketing, and their growing decisions are affected as well by the high risks resulting from unreliable means of distribution. The net effect is a self-perpetuating vicious circle, whereby all participants in the food system remain adversely affected unless some form of corrective stimulus is induced in the system.

The definition of the appropriate stimuli is not a Straight Forward mission. It requires Thorough knowledge of existing marketing processes and it calls for the devising of solutions from within the indigenous perspective of the market area being studied. Levels of performance being sought should reflect both the characteristics and expectations of food systems participants, and the mere transplant of solutions from areas with different traits will not suffice, as many ill-fated projects can demonstrate.

As a good example of the inadequacy of the «transplant approach» to marketing reform, it is worth mentioning the case of small coffee growers in a Central American country.

The government of this country, worried about the primitive methods of coffee bean handling adopted by small farmers, instituted a program of distribution of standardized jute fiber sacks, usually adopted in most export operations. Hopes were that in this way losses and bruising damage would be minimized. But the consequence were not so. The sacks were used as blankets, carpets, shack ceiling reinforcements, and many purposes other than the intended ones. Most farmers kept using their traditional straw baskets to transport their coffee, and they were thankful for warmer winter nights and more pleasant houses (2). Apparently, what was not recognized in this program was that losses and damage were probably not high enough to affect any one grower individually. It seems then that more effective assembly, minimizing the movement of coffee in the less adequate containers, would plausibly have been a much better alternative. Long term extension programs could then be designed to stimulate the adoption of innovative handling methods.

The event above well illustrates the need for a proper perspective in proposing solutions to distribution problems. This is particularly true when increased efficiency is largely associated with the introduction of innovative ways to perform physical distribution functions. In such occasions, proposed solutions by participants is substantial. It then becomes clear that a reform program should be the outcome of a systematic planning process. Objectives for the food system should be set as a basis for action, and an accomplishment path can thus be defined through proper diagnosis and analysis.

## 2. PERFORMANCE GOALS FOR FOOD MARKETING IN DEVELOPING COUNTRIES

### 2.1. *Goals and objectives in the evaluation of marketing performance*

As most research in the area has demonstrated, attitudes towards marketing

in developing nations are generally negative. Policy-makers, by and large, fail to recognize the relevance of the functions performed between farm fields and the consumer, and their perceptions of what should be the goals for food marketing are strongly biased by these views.

As such, it is generally understood that marketing is at most a necessary evil and the ideal system is that which reduces intermediaries to a minimum.

Food marketing policies designed under such views have repeatedly proven unsuccessful under many different conditions. Excessive controls and taxes on middlemen must often create the environment for widespread corruption and disincentive to improvements in operations. Forced reduction of the role of intermediaries in food trade has induced problems which range from food shortages to social unrest (11).

Needless to say, the recognition of a proper role for food marketing is a definite need prior to the design of any policy affecting the sector. Policy-makers should set out clearly what is to be expected from the marketing system, trying to tie up these aims with general development objectives. In this regard, few would disagree with Professor Shaffer's widely cited set of goals for marketing development work (8).

A related issue to the definition of goals and objectives is the question of performance evaluation in food marketing. When goals have been set and one proceeds to examine the existing system in search of possible shortcomings, it is implicit that performance standards will be necessary as a frame of reference. One is then confronted by the need to specify a set of performance dimensions and the proper way to go about measuring them.

Some of the most widely applied performance dimensions in marketing research are measures of price spread between farm and retail. By looking at the relative magnitude of these margins researchers attempt to assess their adequacy with respect to previously specified goals.

Although marketing spreads may provide useful insights, they can easily be misunderstood if examined without proper account for the level of services performed in the marketing process (5). Especially in developing areas where information on the cost structure of marketing operations is by and large scarce, proper utilization of marketing margins data is often difficult, and misuse is widespread.

Oftentimes, alternative performance dimensions may be more appropriate. Input-output measures, in particular, are frequently adopted to evaluate processes where improvements may be brought about by operational and technical change.

These measures are of particular relevance in the analysis of physical distribution systems. Functions such as transportation, storage and handling constitute areas where operational and technical efficiency analyses may generate valuable information for the design of improvement reforms.

Among the various measures utilized in the evaluation of physical distribution systems, an aspect which has been receiving increasing attention in the recent past is the level of physical losses of commodities as they move through the marketing channel. Since the level of losses can be generally viewed as a reflection of the degree of efficiency in the performance of physical distribution functions, an examination of the why, where and how of food losses, will likely provide a valuable input in the process of identifying and overcoming barriers to more efficient food marketing. Furthermore, assessments of the nature and extent of food losses have the additional benefit of providing elements to diagnose aspects other than the efficiency of physical distribution functions. As research in this area has repeatedly shown, both exchange and facilitating functions in marketing

play an important role in the creation of a proper environment for losses to occur, and this fact reinforces the appropriateness of food losses as a performance dimension in marketing research.

## *2.2. Economic considerations of food losses as a performance dimension*

At a time when large portions of the world population still suffer from hunger and malnutrition, it is ironical that substantial amounts of food resources are continuously wasted on a worldwide basis. The estimates of the level of physical losses of foods in developing areas are staggering. Conservative figures from the FAO suggest that 10 to 20% of the basic grain crops produced in these areas are wasted, and the numbers are even higher for more perishable foods such as vegetables, fish and dairy products (3).

Perhaps as a consequence of the rapid growth of urban populations, low income nations in the process of industrialization are particularly affected by spoilage and waste in food marketing. Demand pressures have posed strong burdens on archaic marketing facilities and institutions in many of these areas. The lag of the marketing modernization process, often arising from the biased attitudes of policy-makers, perpetuates a system that cannot respond to the increased demand signals without substantial inefficiencies. Foods, therefore, lose weight, quality and nutritional value before they finally reach retail outlets.

The consequences of marketing losses on the participants of the food system are manifold. Consumers, producers and middlemen, alike all stand to be negatively affected by the problem. Furthermore, food resources which are wasted have direct implications on economic performance from an aggregated viewpoint.

Consumers, in particular, will be affected by purchases of less nutritional and less quality foods, and also by the payment of higher prices as a consequence of reduced supplies. The nutritional and quality aspects, although relevant, are often disregarded in research of this problem area given the inherent difficulties of measurement and evaluation. A consensus as to the adequate methods to undertake such types of analysis is yet to be reached, and most research efforts are concentrated on the price side of the issue. Since marketing losses will ultimately represent a direct reduction on food supplies, retail prices in their absence will be lower than otherwise. Higher food prices resulting from this shift on the supply function will likely result in even poorer diets for the less privileged consumer, who will be forced to substitute more expensive, protein rich foods for others with less nutritional value. On the other hand, as more income is spent on food purchases, the demand for nonfoods will also be adversely affected. If lower food prices can be achieved by a minimization of waste in the food system, we can plausibly expect improved diets and expanded demand for nonfoods. As the Latin American experience of Michigan State University has shown, a decrease in food prices in Colombia would not only increase the amount of food consumed. More importantly, it was estimated that the increase on nonfood expenditures would be as high as 30% for the lowest income groups (4). Similar economic conditions in most developing areas suggest that the effects of reduced food prices in these areas would be alike. The dynamic implications of such a demand push on the nonfood sector are obvious.

The consequences of food losses on producers are also known to be adverse. By and large, food losses will mean lower returns to producers, with consequent disincentives to efforts towards expansion of output. Risk and uncertainty arising from an unreliable marketing system have a clear impact on producer decisions. Growers may know from experience that a portion of their output will be wasted

before being either consumed or marketed, and this expectation of a loss level would discourage any rational farmer to expand his output beyond the perceived level of the systems capacity of absorption. Another adverse consequence of food losses arises from the producers' need to rush the marketing of their output as a hedge to potential waste which might occur if sales were distributed over time. The inadequacy of marketing infrastructure in most low income countries usually requires that producers market their output under these rush conditions, and the net effect is a «flooding» of the market, which brings farmer returns to minimum levels. Loss expectations at further stages in the food chain also have a share of adversity on farmer returns. The generally greater market power of middlemen enables these participants to adjust prices paid to farmers so as to make up for expected leakages in the system. Thus, for these reasons, lower prices paid to growers are a clear source of disincentive to expansion of farm output.

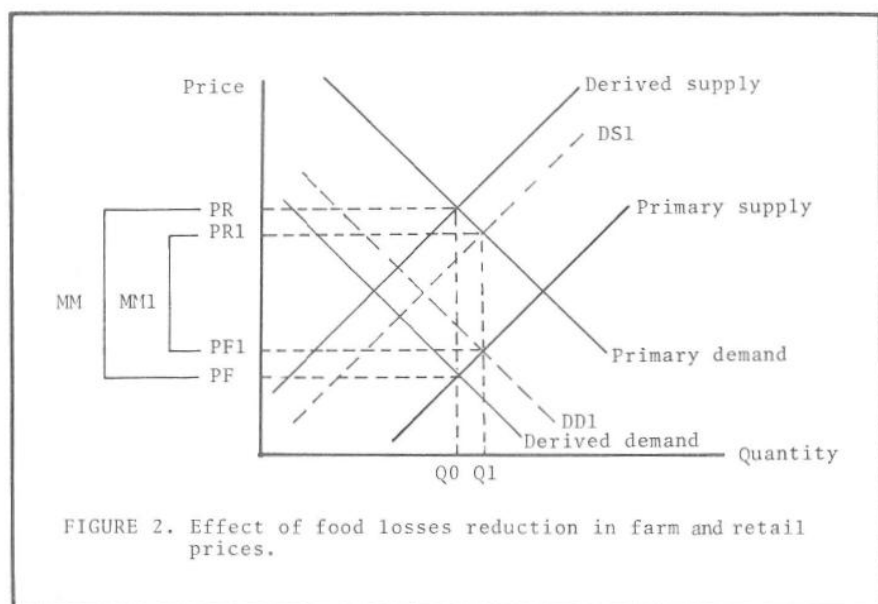
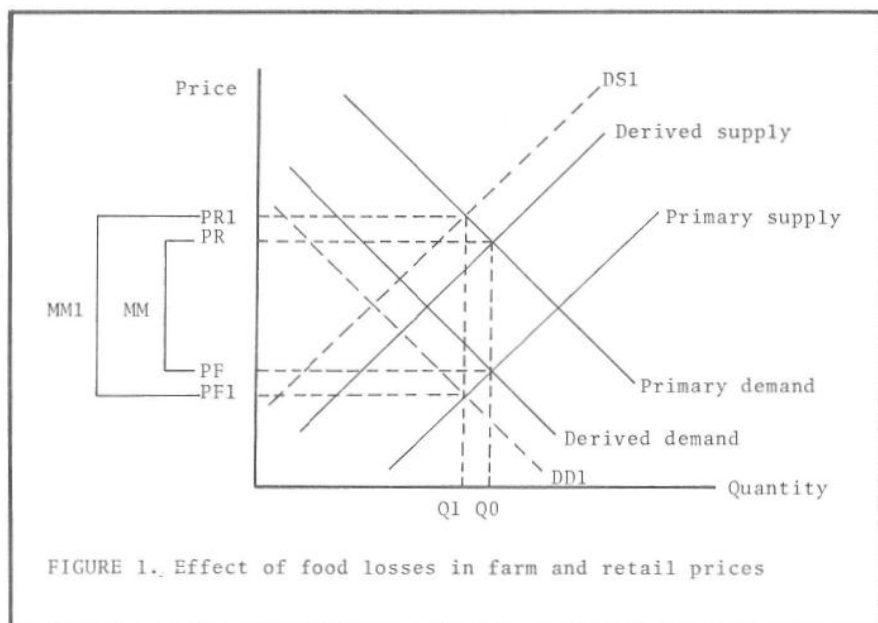
Marketing firms are affected by food losses in ways which are as adverse as are those for the remaining participants in the food system. Losses are an additional cost element in the performance of marketing functions, and thus will mean lower profit margins for marketers. Given that improvements in the operations of these firms are generally financed by equity capital or credit from private sources, reduced profit levels will constitute an important barrier to more effective performance. This effect is especially important in developing areas where pricing policies are, in general, designed to maintain consumer prices at low levels. Forced to bear the costs of the wasted product, marketers will engage in practices such as those discussed in the preceding paragraph as they strive to attain adequate profits.

In addition to the benefits accruing to middlemen, overcoming the problems which lead to wastage of foods in the performance of marketing functions will also induce lower retail prices and higher farmer returns by a direct reduction of marketing margins. This can be easily seen in the diagrams below, reproduced from SILVA (9). In Figure 1 is shown the effect of food losses on retail and farm prices. Farm prices are determined by the intersection of the primary supply and derived demand curves, while retail prices are arrived at when derived supply intersects the primary demand curve. A marketing margin is defined as the difference between retail and farm prices, and it expresses the value added to the farm product through marketing inputs.

If we accept the proposition that food losses in the marketing process represent a direct increase in marketing costs, then as unitary marketing costs are increased, derived demand and derived supply are decreased to the levels DD1 and DS1 in the diagram. Retail prices go up to PR1 and farm prices go down to PF1. As a consequence, the initial marketing margin MM would increase to MM1.

A reduction in losses would have the opposite effect. The lower marketing costs would shift the derived supply curve to the right, and a lower retail price PR1 would be established (Figure 2). Consequently, derived demand would be shifted upwards, and a higher farm price PF1 would be determined, thereby bringing the initial margin MM to the lower level MM1. Obviously, the magnitude of change will be determined by the elasticities of the relevant functions.

To the economy as a whole, food losses represent a direct reduction in gross domestic product. They may also represent a serious drainage in the reserves of foreign exchange, whenever imports become necessary to offset food deficits brought about by waste in the marketing system. As an example of this relevant aspect, the FAO estimates that a reduction of 50% in losses of food grains in



developing countries by 1985 would result in total savings in imports of approximately 7.5 billion dollars (3).

It becomes evident from the foregoing that proper examination of the conditions leading to the occurrence of food losses will provide an excellent frame of reference for marketing development work. The diversity of aspects involved on

the issue suggests that the level of losses can be viewed as a performance dimension which is both sufficiently broad to account for the interdependence of marketing functions, and also narrow enough to measure efficiency on the smaller levels of aggregation.

Therefore, it is believed that for the purposes of identifying the problems involved in physically moving foods through the marketing channel, research on the assessment of the nature and extent of food losses will yield the necessary elements for analyses to be undertaken. Such a process is discussed in more detail in the next section.

### 3. A FRAMEWORK FOR THE IDENTIFICATION OF PHYSICAL DISTRIBUTION PROBLEMS IN THE FOOD SYSTEM

As it was pointed out earlier in this report, research on food marketing in developing areas has not received as much attention as the production counterpart. In consequence, knowledge of market processes in low income nations is generally inadequate and exceptions in this regard are very few. In order to fill this information gap, workable approaches to research must be devised and implemented, for it is only through a thorough diagnosis of existing processes that problems can be identified.

Problems in physical distribution of foods are obviously present in most developing areas. Evidence in this respect has been shown in some of the few comprehensive studies on food marketing on LDC's. Further evidence can be found in research oriented to specific functions, such as storage or transportation.

On-farm storage of foods is an aspect of physical distribution which has received substantial attention from researchers, mostly from areas other than marketing. Post-harvest physiologists and agricultural engineers, in particular, have accumulated a great amount of information on storage practices, especially for African countries. From their experience, we can learn that this starting point on the food chain is the area which perhaps presents the greatest potential for inefficiencies, particularly in regions where marketable surplus is relatively small.

Storage facilities on small farm economies are usually built with whatever material is available at little or no monetary cost, oftentimes following age old traditions. It is not unusual for a farmer to have portions of his stored crop eaten by birds and rodents, or infested by insects, and a passive attitude in this respect frequently prevails. Programs carried out by international institutions have been successful, to a certain extent, in demonstrating that simple solutions may be much more valuable than radical change. In many areas, simple changes such as having farmers build storage huts away from the ground with funnel type rat guards on the supporting structure have led to much better efficiency levels. With respect to more market oriented societies, inefficiencies are also likely to be taking place and such aspects, must be assessed in the research process.

Problems in the assembly function arise mostly from a lack of geographical specialization in production and from a lack of adequate facilities. The inefficiencies in this function are also intertwined with aspects of transportation and handling. Farmers must often travel large distances to the closer assembly points, and when truckers perform assembly functions, their service is not always reliable. In the «Zona da Mata» region of South Central Brazil, for instance, it is not unusual for small dairy farmers to be left unattended by truckers for reasons



which range from engine breakdowns to impassable roads in the rainy season.

Handling and packaging practices are another source of problem in physical distribution. Inadequate methods and inappropriate containers are commonplace in food marketing in LDC's. Even though most participants in the system fail to recognize the inadequacy of their practices, the inefficiencies arising from them are enormous. Tomato assemblers in northeast Brazil, for example, use straw baskets without any type of cover to transport the product from farm to market. These baskets are piled up and all their upper rows are literally smashed in the process. Losses are substantial under these circumstances and opportunities for improvements are clearly present. Needless to say, the adoption of corrective measures will be dictated by the perceptions of costs and benefits.

Inefficiencies in the transportation function are mostly rooted on the inadequacy of infrastructure. Problems arising from the unavailability of a network of feeder roads and from the lack of maintenance of the available roads are many. OWEN (6) in a comprehensive analysis of rural transportation in India, has shown that yields for farmers with better access to market were substantially higher than for the more isolated producers who could not obtain agricultural inputs at feasible costs. Furthermore, his analysis demonstrated that areas where lucrative perishable crops could be grown for market were not utilized for these purposes because of the absence of reliable means to move produce to town on a frequent basis. Additional problems in transportation are also a product of a generalized urban bias in transportation investment; and, in many cases, of excessive attention to the export sector.

Problems such as the ones discussed above, must be identified in the process of fomenting improvements in the physical distribution of food resources. A tentative approach to such an identification is proposed in the following discussion.

Research to identify shortcomings in physical distribution (PD) systems is methodologically well-developed for analyses at the individual firm level. The field of business logistics has dramatically evolved in the recent past, but applications from a macro perspective are yet to be more explicitly addressed. Nonetheless, the «total cost approach» in logistical management, whereby performance of the functions is evaluated for the whole P.D. system, rather than individually, is a concept which can be borrowed from this field and fitted to our purposes. As such, it is believed that research to diagnose P.D. systems should account for the interdependence between all functions performed in the process.

Efficiency for the total system will be measured by the level of food losses being incurred vis-a-vis the costs of reducing this level to an acceptable level. The measure must be relative, for it is known that in most systems the cost of reducing food losses below the current level is prohibitive. SCHERMERHORN (7) has reported that, in the United States, at least 35 percent of the lettuce marketed can be lost before virtual elimination of losses can be accomplished through costly air transportation. Hence, it should be understood that a mere descriptive measure will do very little, as far as the provision of useful information is concerned.

The research process should begin by an evaluation of existing information on market processes. Interviews with knowledgeable personnel at the various government agencies pertinent to food marketing issues have been shown to yield valuable inputs in studies with related purposes. These informal talks will generate a preliminary basis for the delimitation of the study area, the selection of relevant commodities to be emphasized, the determination of key participants in the system to be interviewed and other related research needs.



The information basis obtained in this way will be complemented by a first hand observation of the marketing process. The product flow may be followed throughout the channel so that functions can be identified and key areas for product sampling can be determined. Sampling will become necessary to assess the extent of losses, and methodology in this respect has already been developed by the FAO and other international institutions. This observation process will further benefit from the obtention of the participants perceptions as to what are the problems and what it takes to correct them.

Having determined these basic elements, the assessment of performance can be undertaken within the proposed frame of reference. Physical losses will be measured for the different functions in the system and further analyses will indicate the costs of alternative means to increase efficiency in this respect.

It is clear that the issues involved in such a research process are much broader than the simple aspects addressed above. However, it would be beyond the purposes of this report to discuss the particularities of the process in length. The important point is the utilization of marketing losses of foods as a performance dimension. Whenever the levels are found unjustified from a total cost/benefit standpoint, intervention to induce change will be warranted. Furthermore, inefficiencies in exchange and facilitating functions may also be identified in the research process, and alternatives to improve performance in this regard may be proposed, in the information analysis process.

#### 4. TOWARDS IMPROVED PHYSICAL DISTRIBUTION IN THE FOOD SYSTEM

When sufficient knowledge on the nature of the problems affecting P.D. systems is obtained, alternative instruments to promote improved performance can be defined through proper evaluation and analysis. Prescribed action will likely encompass the inducement of changes of both an institutional and technological nature.

Technological change involves the introduction of improved methods to perform P.D. functions as well as investments to provide basic marketing infrastructure or upgrade the existing one. Institutional changes comprise improvements in existing organizational forms of exchange and in facilitating functions such as grading, marketing information, controls and regulations and others.

Most often a reform program will include both the «hardware» and «software» kinds of intervention, and a necessary concern is with the problem of resistance to change. Some technological changes, for instance, will not be effective unless adopted by all participants in the system. Institutional changes on the other hand, may face barriers from both a political and cultural standpoint. Such aspects must be recognized so that adequate strategies to overcome resistance can be designed.

The role of marketing extension in providing information on the consequences of the proposed programs is, therefore, of extreme importance. Participants must be provided with the means to assess the costs and benefits of the proposed alternatives.

The effects of improved physical distribution in the food system are essentially dynamic. Apart from the direct benefits brought about in the form of better economic returns, participants will gain from more effective marketing coordination and reduced risk and uncertainty.

More importantly, the attainment of more adequate food supplies through an

optimized marketing system will contribute greatly to the improvement of overall socio-economic conditions for the populations of developing nations.

## 5. SUMMARY

This paper discusses the role of improved physical distribution systems in fostering better food marketing performance in low income economies. It examines the problems involved in moving food products throughout marketing channels and proposes a tentative framework for the design and inducement of improvement reforms.

Physical distribution (P.D.) is here understood as an umbrella term encompassing the vast range of activities and functions performed in the physical movement of foods from producers to consumers. A P.D. system, therefore, comprises the functions of on-farm storage, assembly, handling, packaging, transportation and warehousing, and it explicitly recognizes the interdependence among all of these components.

The report places emphasis on one specific dimension of food marketing performance — the level of marketing losses. It is argued that marketing losses of foods, when viewed from a proper perspective, can be interpreted as a reflection of marketing conditions in the area of concern. As such, the identification of causes and conditions leading to food losses is likely to provide elements for broader programs of corrective action which will certainly exert substantial synergistic impacts in the overall performance of the system.

## 6. RESUMO

Este estudo discute o papel exercido por sistemas eficientes da distribuição física no processo de melhoria do desempenho da comercialização de alimentos e economias de baixa renda. Os problemas relativos à movimentação de alimentos através dos canais de comercialização são revistos e uma abordagem conceitual para o planejamento e execução de ações corretivas é proposta.

O termo «distribuição física» é adotado num sentido mais amplo, abrangendo o vasto grupo de atividades e funções relacionadas na movimentação de alimentos dos produtores aos consumidores. Assim, um sistema de distribuição física abrange as funções de estocagem na fazenda, reunião, manuseio, embalagem, acondicionamento, transporte e armazenamento final, reconhecendo explicitamente a interdependência dessas funções.

O artigo enfatiza uma dimensão específica no desempenho da comercialização — o nível de perdas nesse processo. Argumenta-se que o volume de perdas, quando analisado adequadamente, pode ser interpretado como reflexo das condições de comercialização na área analisada. Dessa forma, a identificação das causas e condições que levam à ocorrência de perdas poderá fornecer elementos para programas de ação corretiva que, certamente, exercerão impactos sinérgicos substanciais no desempenho global do sistema.

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