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INFRASTRUCTURE FOR FOOD MARKETING:

SOME INVESTMENT ISSUES

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Prepared by:

Brian W. Berman, Consultant
Economics & Policy Division
Agriculture & Rural Development Department

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Brian W. Berman[1/]

1.0 INTRODUCTION

1.1 The companion paper has presented the broad picture of food marketing systems, and this paper proceeds from there to a presentation of some of the problems that are likely to be encountered when considering projects to support these marketing systems.

1.2 Because of the central position of grains as the most important marketed food staple, I will deal mostly with grain marketing systems. I have highlighted some considerations in marketing of perishable foods in a short section at the end of this paper.

1.3 The Bank has made loans and credits in the past for grain storage projects both to the private and public sectors, for on-farm storage, and for fruit and vegetable export marketing, all of which have in some way supported the marketing and distribution systems of farm food production. Similarly rural roads projects have as their rationale induction of increased food production and improved market access in the zone of influence of these roads. Some projects also provided infrastructure for food imports in grain deficit countries. Most of these projects have focussed on some segment of the food distribution system, rather than attempting a broader subsectoral approach. In most cases this approach was quite justified because the projects tackled some major investment needs. The broader subsectoral context is usually missing because the project definition of "storage" or "processing" has been adopted. Possibly a contributory factor too, has been the dearth of reliable data, or an analysis framework for subsectoral data.

1.4 A broader subsector approach would encompass all the activities from harvest to the consumer. It would take into account the various roles of private sector traders, and the government created grain marketing boards, grain authorities, food corporations (all of which will be referred to here as grain parastatals), and the cooperatives. The price regime (and especially the types of grain price controls and the levels of these controlled prices), the transport infrastructure the communications system, and price information systems, would also be considered for their impact on the effectiveness of price setting, and efficient grain flows.

1.5 The advantage to viewing grain distribution projects in their subsectoral context is that the interdependencies in the system can be taken into account. This is important because the degree of interdependendence will determine the mutual impact of the other parts of the system and the proposed investment, regulatory or pricing decisions. There are arguments for and against applying this type of systems

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1/ Former Bank staff member (AEP). This paper was prepared while the author was a consultant in AGREP. The author wishes to acknowledge the assistance of C. Lewis and the comments of both he and G. Donaldson on an earlier draft.

approach to these projects. Especially in the context of the realities of a lending program time frame, these views must be carefully assessed. Extensive data, and relatively complex analysis is necessary to provide the subsectoral context, or systems analysis approach. Perhaps the touchstone could be "Would investment (or other) decisions be changed if additional information grined through the systems approach was available?" In this paper I will attempt to assess where it is, or is not, prudent to collect additional data and analyze it in a systems framework, in place of taking a more narrowly focussed approach to projects.

2.0 PROJECT INITIATION

2.1 Normally, the following justifications for placing a grain distribution project in the Bank's lending program are presented:

- reduction in grain losses
- lack of capacity in storage, processing, distributive infrastructure
- growing deficits in the operating results of the grain parastatal

Usually, some broad macroeconomic indicators are available to back up such justifications.

2.2 From the Bank's perspective, a major incentive to tackle grain distribution projects is to provide an operational entry point to addressing the issues of grain price levels, and the subsidies associated with parastatal grain distribution. Often the parastatals operated at a financial loss, due both to the inadequacy of the operating margins allowed by the government set farmgate and urban price levels, and the parastatals own inefficiencies. Projects aimed at improving the parastatals efficiency are seen as the first step in a strategy of addressing grain pricing and subsidy issues.

2.3 This is in fact the reverse of an effective project oriented strategy. Pricing policies should, ideally be adjusted prior to any project lending. Realistically this is not possible. Instead the worst case assumption should be adopted: projects normally have to be appraised and implemented with no change in the pricing levels. To do this requires a cost and risk minimizing strategy for project design.

2.4 For production oriented agricultural projects, and rural infrastructure, such as feeder roads, the question of the price regime has not been considered as central to project design, or indeed to ultimate project viability (in contrast to the more macroeconomic concerns of the impact of continued or increasing subsidies some of which may be exacerbated by a proposed project). The participants in these production projects have benefited in spite of the price regime, because of the opportunity provided to increase subsistence level output, the flexibility to switch into and out of cash crops as the price regimes change, and to operate on the black market when necessary. Thus

the risk of involvement in production projects where prices are adverse is mitigated by the farmers' resourcefulness. This does not mean that the desired level of output will be achieved, but rather that the beneficiaries, by and large, will not be adversely affected through their participation. Regretably, even this latter limited objective is in jeopardy in marketing and distribution projects under distorted price regimes.

2.5 Demand for and supply of marketing services is dependent on price levels. If marketing margins are inadequate no services will be provided to those areas that cannot be accommodated within the margin. As under- and over-serviced areas emerge in response to the controlled price levels, so too will the demand for infrastructure investment. Attempting to relieve apparent infrastructure bottlenecks through marketing investments, may well simply cement the distortions into permanent structures. If therefore the ultimate intention of these marketing projects is to correct price levels, the very act of building infrastructure may work against the program objectives. Faced with only very macro level data and uncertainties about price just how can a project be put together? This paper will attempt to outline as risk free an approach as is possible. This approach generally is disappointing in lending program terms because it demands relatively limited levels of initial investment with an intensive institutional focus to build a data base for a future systematic investment program.

2.6 The transition from macro-indicators to strategy and project formulation is hampered by a lack of data. Within a normal project cycle time frame it will not be possible to obtain such data, and especially so because grain distribution systems are dynamic and have complex matrix type interactions. The operationally relevant questions that must be faced are:

- Is there a way to prepare and justify a relatively riskfree initiating project on the basis of only rudimentary data?
- How can a data base be established for future subsector and project work?
- What form of analysis framework would be necessary to identify, design and justify future projects?

In other words, is there some defensible way of initially investing in this subsector, thereby alleviating some immediate short term problems, while setting the stage (and not preempting it) for a future systematic investment program based on a reasoned subsector strategy?

3.0 THE EXISTING DATA BASE

3.1 Why should data base problems be any different for distributive system investments, than say for production investments? In most countries

the data collection systems are operating to measure grain production, and a number of conventions, estimators and trend indicators have become accepted as tools for strategy and policy decision making related to production investments, imports and exports.

3.2 In most countries estimators are normally available for production and consumption, including sometimes heroic efforts at projections for the future. Thus an indicator of import or export trends is available. It is more unusual to find any acceptable indicators for either the amount demanded or supplied through market channels. Levels of grain procured by the public sector and occasionally estimators of the public sector's share of the total market are available, usually from other indirect estimates of total marketed grain. Available capacity for storage, processing and distribution is normally partially available, but capacity utilization measures should be treated as a suspect.

3.3 This available data is of little use in governments' policy formulation for distributive investments,and a relevant 'statistical infrastructure' for food distribution questions has yet to be built up. In some countries, some data exists. It is quite "static" in nature, and relationships between volume flows, market demand, prices, system capacity, etc. cannot be inferred from this data. In addition, the absence of data on private sector activities is a major factor in reducing the significance of any available data set. Production data uses sample frames to estimate farmer yields. But for the distributive system, sampling of private enterprise would be difficult because of their unwillingness to reveal their levels of trade (often for good reasons). Only the grosses of macroindicators for the private sector can be derived from secondary sources.

3.4 To define an investment program using the available data is normally possible when the problem is obvious and large (e.g. severly strained port import capacity, lack of rural storage in comparison to total market surplus) and expected to become more severe with projected growth in marketable surplus. However, relating the expected increase in metric tons of grain to actual capacity increases needed is difficult and very "ball-park". Nevertheless, where numbers are large, and there is sufficient margin for safety, an initial investment program can be identified, without the necessity of extensive sector or preparatory work. The limiting conditions for this initiating investment are outlined in the next section.

4.0 THE INITIATING INVESTMENT

4.1 Two approaches would typify initiating investments

- infrastructure for the parastatal grain authority
- a credit line for private sector investment in storage and processing.

In a situation where the data base does not allow for confident assessemnt of the infrastructural and parastatal investment needs, the private sector approach is easier to justify using the macroindicators. This is especially so because over-investment is prevented by the regulating mechanisms inherent in a credit program: private investors normally are prudent in assessing the market, and do not risk their capital in over-investment.

4.2 The private sector credit line approach has some limitations too. The first is that it is directly responsive to current (distorted) price levels, and will allocate its resources on this distorted basis. If large credit lines are proposed, there is a risk of seriously distorting overall investment patterns in the same way as parastatal investments would in the absence of a systematic investment strategy.

4.3 Another limitation to the private sector approach is that the investor tends to follow the grain production trends rather than anticipate them, and for sound reasons. Thus, most credit line utilization would be for expansion of existing capacity in already serviced areas. New or increasing production areas would experience a processing capacity lag that may result in depressed prices. It would be interesting to calculate the cost difference to the economy between the alternative of temporarily depressed prices and temporarily underutilized capacity.

4.4 Under a number of the current price control regimes it is not profitable for the private sector to invest in custom storage (storage-for-hire) and storage built under credit programs is usually captive to a processing facility. If, therefore, storage is identified as a major constraint, and pricing policies cannot be changed to make custom storage profitable, only a public sector investment approach can be adopted. Private sector investment in transport, and working capital for stocks have not usually been addressed in past credit line projects, and although this would be desirable it is not very easy to include in formal credit programs because of collateral consideration (assets - trucks and stock - and owner are very moveable and not easy to attach!).

4.4 Infrastructure investment for the parastatal is more difficult to assess. Because the parastatal is not a profit maximizer, and often not a cost-minimizer either, investment proposals are based on demanded levels of service. The first question to confront a project mission is "why is the capacity needed?" This soon translates into questioning the assumed market share of the parastatal. Because of the fact that this is an initiating project, this question is difficult to assess without more data collection. An operationally useful rule of thumb is:

- Under initiating project conditions, incremental capacity should be limited to the level necessary to maintain the parastatal's current average market share, but not to increase it.

4.5 However, even a limited parastatal investment program in an initiating project runs the risk of misallocating resources. Reducing this risk requires knowledge of the outcome of the systems analysis of the parastatals investment requirements. In the absence of this analysis a risk averse initiating project could be guided by the following:

- Avoid new construction, concentrate on storage loss reductions and pipeline efficiency through rehabilitation of existing plant and needed information systems.

- Initiate manpower development for design skills for new storage and distribution investments as well as requisite planning and supervision skills.

- Design and institute improved inventory control, cost control and distribution scheduling systems, and the concomitant manpower training.

4.6 If the project has a short enough implementation time horizon (and no more than three years should be considered for initiating projects), then any investments can be limited to filling immediate obvious needs, while additional data gathering and planning is undertaken to establish an investment master plan. However, interpreting obvious presents some difficulties. Some examples are given below.

4.7 A number of investments are proposed for countries that have experienced recent large increases in production. All usable storage space is filled, and excess grain is being stored in schools, other public buildings, and in the fields. Large losses result, and the proposal is an emergency building program for more storage. Operative rules of thumb are:

- If the storage shortfall is related to an acknowledged bumper crop, only temporary storage (e.g. plinth and tarpaulin type) should be considered.

- If the storage shortfall is related to 'normal' crop levels, assess if there are any structural reasons (price, bad access roads, lack of trucks etc.) at those locations to account for the large unmarketed surplus, and invest in alleviating those constraints.

- If a true storage shortfall is identified, priority should be given to rehabilitation and efficiency improvement in existing storage, with new construction concentrated at transport terminal points.

4.8 Often the parastatal will wish to increase the capacity of the transport system between the production and consumption areas. This would relieve storage constraints in the production areas, by transferring surplus to consumption area storage during harvest season. (This

also implies increased consumption area storage). The rule of thumb here is:

- It is normally more cost effective to increase production area storage capacity than to increase railroad capacity, (and often also truck fleet capacity): or, storage to flatten transportation demand peaks is more cost effective than increasing transport capacity to level out those peaks.

4.9 Requests for an increase in consumption area storage are the most likely to need modification after a systemwide examination, because of the interaction of storage and transport capacity. Therefore, the following rule of thumb is recommended:

- The most cost effective consumption storage level is that which allows for a steady inflow delivery stream matching the steady consumption demand, modified by considerations of batch size and delivery schedules, and the need for a buffer to cushion delivery delays. Large consumption area storage is generally less cost effective than production area storage because of higher urban land cost, and urban wage levels than in the production areas.

This rule of thumb must be modified if physical conditions (e.g. impassable roads) for the transfer of stocks makes it impossible to provide a steady delivery stream.

4.10 For grain imports for urban consumption, two investment decisions are normally required: size of port facilities, and types of grain handling equipment.

- If port storage is more costly than other urban storage, it may be cost effective to (i) periodically evacuate dockside facilities and place the grain in other urban stores instead of increasing port storage, (ii) invest in increased evacuation capacity (e.g. trucks and rail).

and

- Bulk handling for evacuating ships is probably justified, but bagging at the terminal is initially more cost effective than early introduction of bulk transfer systems. Ability to modify later to bulk transfer would be an advantage.

4.11 For requests to increase captive (i.e. owned by the parastatal) processing capacity, in a system where the private sector is also maintaining the commercial activity level, the following is recommended:

- It is more cost effective to promote private sector capacity, with custom processing on behalf of the parastatal, than to build additional public sector capacity.

However, for those systems with little or no private sector processing capacity, location of parastatal processing capacity is dependent on transport cost comparisons between processed and unprocessed grains, and storage characteristics of processed grains.

- The determinant of processing capacity at the chosen location would be the steady state demand level of that location. Steady capacity utilization across the entire crop cycle is preferable to a low capacity installation with post harvest peak loading.

This rule of thumb implies ancillary investments in storage capacity and delivery systems.

4.12 For a request to provide storage capacity specifically for security reserve stocks (i.e. stocks of grain as insurance against shortfalls in production) the following rule of thumb normally implies rejection of the request unless the rule can be disproven:

- It costs less to import and handle grains for an unforeseen shortfall in production than it does to operate a security reserve stock.

The cause of "unforeseen shortfalls" are normally found to be a lack of information for timely determination of import requirements, (and therefore timing of import orders), logistics capabilities and stock management. As the information needed to design an effective grain security program is normally not available at this initiating project stage it is more cost effective to build up the information system, and continue the imports program than to build stockholding capacity.

4.13 The rules of thumb given above are designed to minimize the impact of incorrect decisions under conditions of poor data and a distorted price regime. Alternative investments would require additional unavailable information to prove they are more cost effective. It is expected that additional subsector analysis would provide investment guidelines based on cost effectiveness criteria, that take into account the following:

- the impact of changing price levels on the total system
- future market share of private and public sector
- interaction between the location and capacity of storage, processing and distributive infrastructure
- types of materials handling systems.

Absence of data implies that it would be difficult to quantify the benefits of the initiating project investments. Indeed, if the "without project" case can be defined it implies the existence of data that would allow for a more systematic analysis of other investment alternatives. As this is not the case, both the "with" and "without project" quantification have to be built on judgement and sample data and cannot

be expected to be very precise, or provide much confidence in the thoroughness of the analysis. In addition it must be recognized that this sample data would however be insufficient to provide a credible basis for a more systemwide analysis of alternative extensive new investments.

5.0 UNDERPINNINGS OF SUBSECTOR INVESTMENT STRATEGY

5.1 Having provided a breather of say two years between the initiating project and the next set of decisions on subsector strategy, a systematic data collection exercise should be undertaken. For countries with a dominance of the public sector in the grain trade, the type of data necessary for Bank type analysis of investment strategy is equally useful for local policy makers. Therefore, the data collection exercise should be conceived as serving both purposes, with the emphasis on local decision making, and be incorporated into the ongoing work program of the parastatal, the Statistical Bureau, the Ministry of Agriculture, etc.

5.2 A set of data can be systematically gathered that the parastatal grain authority and the government should use for grain distribution management. This would provide primary indicators of the demands on and performance of the system. This data set cannot be expected to be available by the time the first follow-on project has to be prepared. The value of this type of primary indicator would be at the time that the system is almost at full capacity, and investments are tending to the truly marginal. At that time detailed data analysis could be very cost effective. The design and implementation of such data collection and analysis should commence with the initiating project, with the expectation that usable data would be available only after about the fourth or fifth year. At the same time, systematic collection of "secondary source" data to serve specific planning and investment decisions should be initiated. This section defines the broad types and uses of this latter data set.

5.3 Grain distribution system investments must take into account the annual variability of grain supplies, changing urban demand pattern, variable rural demand patterns, annual changes in urban/rural terms of trade, absolute income levels, crop yields (especially other non-grain cash crops) and so on. To measure the impact of these factors on investment strategy and provide investment justification the following types of information are necessary:

- Supply and demand projections by region taking into account changing urban populations
- Projected market surplus and market demand (i.e. demand by non-producers)
- Seasonal and crop specific private sector and parastatal market shares

- Capacity inventory of storage and processing, both private and public sector

- Assessment of rail, road, barge and port seasonal capacity available for grain

- Estimates of efficiency of utilization of all infrastructure related to grain

- Time series analysis of grain storage losses by type of storage

- Analysis of variance of grain production trend data, and associated market surplus levels

- Quantification of grain supply changes due to exceptional weather and other types of "disasters" and "windfalls."

- Sampling of costs of grain procurement, storage, processing and distribution by location, over time and distance, for private and public sector

- The country's performance in the grain import and export markets.

- Analysis of the grain price regime and grain price controls.

This data would provide the basis for identifying investment needs by region, and analyzing the alternative strategies possible especially where location and transportation options are interrelated.

5.4 For those systems where the private sector is to play a role, any investment alternatives in the public sector can be expected to have an impact on the private sector's continuing operation. This in turn would influence the private sector's response to any project initiatives (e.g. credit) to encourage additional investment. The price regime too would influence this. For any interventions in the private sector the following information would be necessary as input to designing a private sector strategy.

- role of private sector in each level of market and distribution chain.

- relationships between various participants (family and social obligations, credit linkages, contractual obligations etc.)

- enterprise profitability (including byproducts sale etc.)

5.5 In addition the "investment climate" needs to be assessed - through a compilation of the government official pronouncements on the role of the private and public sectors in grain, as well as an analysis of the financial impact on the private sector of various government

policy decisions, and regulatory actions of the parastatal grain authority. This compilation should be compared to the private sector's actual investment as well as operating decisions. If possible their private assessment would also be valuable, but can be expected to paint an unfavorable picture if price controls are in place.

5.8 The data requirements as outlined above would enable the project preparation and appraisal teams to approach project design and evaluation using a systems framework. This approach would take into account the impact of investments and interventions on other parts of the distribution systems. Some of the issues that would confront a preparation or appraisal mission for projects are discussed in the following section.

6.0 THE SYSTEMS APPROACH TO PROJECT DESIGN

6.1 Investment Needs and Price Policy

The macro-indicator approach provided an overall definition of the investment needs for initiating projects. What could be done differently in a more systematic approach? Detailed data will allow for regionalized investment identification. Perhaps more importantly data would be available to allow the issue of the level of market shares of the parastatal and the private sector to be analyzed by the mission.

6.2 Often the parastatal's market share has been set by a policy decision. However, the controlled pricing regime may make the parastatal participate in the market more than it had intended because of a partial withdrawal of the private sector in selected markets. Should a project tackle the pricing policy, or the shortfall in parastatal infrastructure resulting from these policies? The question of the impact of controlled prices on the grain market is key to the design of any intervention in the food distribution system. This is especially so where both the parastatal and private sector are involved in the market.

6.3 The question is also fundamental to overall economic policy and it cannot be addressed just in the context of grain distribution projects. Discussion of these issues at the time of economic and sector work review, or during consideration of structural adjustment lending, would seem to be the appropriate forum. Government grain pricing and subsidy decisions imply certain distortions and any investment program in distributive infrastructure will reflect these distortions (and by definition therefore are suboptimal). Thus it is important that the Bank and Government reach agreement on this question so that for projects beyond the initiating one discussed earlier, the limits of policy questions and therefore the acceptability of suboptimal investments, is defined and agreed in advance.

6.4 Storage and Distribution: The next most often encountered questions are those of capacity and location of new storage. The suggested systems data approach would use the data especially gathered to identify cost minimizing alternative systems. For example, in the production area, alternatives would be a series of small village level stores, a system of sub-regional stores or a large store at the regional center. Economics of scale of the storage, expected distances of delivery to and from the stores, and economies of transport lot size would be used to assess which of these storage alternatives provided the least cost solution. A region with extensive redistribution of locally stored grain for local consumption would have a solution responsive to smaller local delivery lot sizes. A region serving as a supplier to other regions would have storage size and location decisions almost determined by the economies of transport. Similarly, a region served by rail would have economies of transport lot size requiring larger lots than a trucking system. These economies would in turn favor large storage installations, and probably faster materials handling operations. Locations would be determined by line of rail. The truck dependent system on the other hand would be more dispersed, with storage at locations that minimize the cost of delivery to storage and consumption points.

6.5 Another example of the dependency of storage decisions on transport infrastructure is that of the length of time that grain should be kept in the production areas before being transferred to consumption areas. This decision also impacts on the size of consumption area storage. In countries where rural storage is less costly than urban storage, minimum stockholdings in the urban areas would be expected. Determining the size of urban stocks would depend on the economies and timelags in deliveries from rural areas.

6.6 Often governments plan for large urban food storage, and relatively fast removal of grains from rural to urban storage. From what has been outlined above this would appear not to be a cost minimizing approach. However, use of scarce rail and trucking resources, impassability of rural roads at certain times of the year, and similar factors need to be taken into account in assessing the balance between rural and urban storage, and distribution infrastructure. The systems analysis framework would allow the mission to evaluate the government proposal for stockholding patterns, against the cost minimizing solution, or any modification thereto for protection from delivery disruption, etc. The difference in cost between the government proposal and the alternative the mission views as optimal is the cost of the government's urban stockholding decison. Often this decision on urban grain stock levels is a political one, related to prevention of food shortages (especially so called "artificial" ones created by the private sector) and any resulting urban unrest.

6.7 Storage Technology: Two questions normally confront missions on storage technology:

- the appropriate storage design (construction materials, ventilation etc.)

- the choice between bulk and bag.

The first is related to grain preservation questions, and the second can be generalized into all the questions related to materials handling, efficiencies of scale, and interface with the distribution system.

6.8 I will not go into questions of storage design for loss prevention, as each microclimate has its own special characteristics. However, unless some local adaptive research has been undertaken during the initiating project stage, or by some other agency, introduction of an existing design may only be the second best solution. Local storage is only as effective in loss reduction as the local storage management capabilities. Any storage investment should be accompanied by manpower training and the introduction of a quality control and supervision system.

6.9 The choice of bag or bulk storage is complex. Two major reasons are given for proposing bulk storage

- lower storage losses

- lower transport costs in bulk

Two types of bulk storage are available: flatbed and silo. Choices between these two are determined by site conditions, land prices and the level of turnover. The level of turnover is determined by the role of the storage facility at that point in the distribution chain. High turnover locations normally favor silos, while low turnover areas could utilize bulk flatbed or bag storage.

6.10 Objections are often voiced that bulk storage facilities displace labor because of mechanized materials handling. The storage technologists argue that mechanical handling is necessary to achieve fast and efficient turnaround time for ships, or unit trains, and even trucks. If the benefits of this fast turnaround are truly captured by the economy it may compensate for the labor displacement effects.

6.11 For port bulk handling it seems that these benefits are captured in less port congestion, faster turnaround and lower demurage Often, however, the rail system, as an example, is so cumbersome that the impact of improved train turnaround is dissipated by inefficiencies elsewhere in the system. It is worthwhile to consider seeking for bulk storage designs that effectively combine the use of labor and mechanical handling in a mix that captures most of the benefits from both bulk handling and low cost labor usage.

6.12 The choice of bulk over bag must also take into account the storage facilities in other parts of the system, and the point at which transfer into bag takes place. Missions often must face the decision of how to phase in a bulk system to an existing bag system. Questions relate to the transition period where bulk and bag handling will both exist. Because of the interactions of storage and transport systems, and the likelihood that at some time grain in the bulk system may be needed in the bag system, and vice versa, only a systems approach could quantify the costs and benefits of the various alternatives. However, moving to bulk handling is no panacea for overall rail traffic or distribution problems. Efficient rail management including modern information systems is a prerequisite for moving to bulk.

6.13 Processing: Aside from increases in capacity to handle increased volumes of grain in the market system, investments are often recommended to replace obsolete processing facilities. This obsolescence is measured primarily in terms of grain losses, but nowadays some attention should also be paid to fuel efficiency. Two issues will therefore face a mission:

- capacity and location of processing facilities
- choice of processing technology

The capacity and location decision for processing will be influenced by all the systems-type factors that are operative for storage decisions. In addition, the transportation cost differential between unprocessed and processed grains, the cost of storage of processed grain and its shelf life, economies of scale in processing, and delivery times, must be included in determining capacity and location decisions through the cost minimizing approach.

6.14 Choice of technology predicated on improved extraction rates (i.e. reduced grain losses) should also be assessed in terms of a number of systems related aspects. Processing efficiency depends on grain quality, which in turn is dependent on all the steps in the distribution system from farm to the processing facility. If any one of these steps adversely affects grain quality, the introduction of improved technology at the processing end will have only small (if any) benefits. Often to actually capture the expected benefits the introduction of a new processing technology requires investment a some early point in the distribution chain (for example, grain dryers). An assessment of the feasibility of such an investment usually requires an examination of the systems implications.

6.15 As an example, in the case of rice dryers adopting the system approach highlighted a number of factors. The cost of drying is borne by the farmer or primary trader. The price structure is often sufficiently noncompetitive that any benefits from both quantity and quality improvement are not passed down the chain to the farmer. Thus there is no incentive to use a dryer, and therefore no advantage in introducing the new technology, until the noncompetitiveness of the price structure is altered. Such system reforms are sufficiently removed from the immediate technically motivated decision about new rice mill and designs, as not to be in any way influenced by them.

Regretably in recent years policy makers have been persuaded of the need to "modernize" the rice mills, but there has been no realization of the necessity to make changes in other parts of the system to ensure that the economy does actually benefit from this modernization.

6.16 The case of rice dryers and rice milling technology above provides an example of another aspect of the systems approach. By looking at the whole system structural aspects can be identified that appear initially to be beyond the reach of that particular investment being considered, but which could directly influence the effectiveness of those investments. Awareness of these system relationships would allow for a more effective subsectoral intervention strategy.

7.0 PERISHABLES

7.1 For perishables, fast delivery to consumers is the primary requirement of a marketing system. This is the major difference from a grain system which is designed to store, and deliver to the consumer on demand. The perishables system is driven by supply.

7.2 Only certain relatively affluent countries can afford the costs of cold storage of essentially seasonal products. In some countries where fish and meat are now considered as the primary protein source, governments have been willing to subsidize cold storage facilities. The wisdom of this has not yet been questioned, but should be prior to extensive lending in this area: even more so in those countries advocating cold storage of locally produced fruits and vegetables for local consumption. Concepts of food substitution by season seem to have given way to satisfying possibly very expensive consumer preferences, through subsidy.

7.3 For most perishables, however, the traditional marketing channels are still operating. Very little parastatal activity is currently evident, although some countries are being tempted to consider it because of large differences between farmgate and consumer prices. New investments should concentrate on cost reductions in the private sector distributive system mostly through new and improved rural roads, new, better located market places, and improved market information systems.

7.4 Decisions on location of market places, their size and regulation of the system under which they operate can also be analyzed through systems approach. Location should minimize transport costs and therefore the relationship of the location to both the supply transport grid, and to the retailers is important. The urban setting (e.g. traffic congestion, land values, complementary enterprise locations, the market place as a social institution, etc.) must also be taken into account in determining market location.

7.5 Perishable markets operations because of their traditional nature, have developed complex interpersonal relationships. Problems of competitiveness, regulation, large number of intermediaries, and informal credit abound. This differs from the grain market only because in most countries grain parastatals have been operating for sufficiently

long a time to have effectively displaced the once similar grain markets, with "modernized" private sector merchants.

7.6 If there is a strong desire to "modernize" the perishables marketing system, the first rule of thumb is: don't go the route of the parastatal. Perishable products, normally demand entrepreneurial price decisions as market conditions change by the hour. It is likely that no parastatal can be managed to provide that type of response to market conditions and therefore the introduction of parastatals will increase inefficiencies in the market system.

7.7 Interventions in the perishables markets must take into account the system of social linkages existing between farmers, traders, wholesale and retail traders. Transport cost reductions, improved market information, improved alternative employment (to removed marginal/social welfare operators), would be effective in increasing market efficiency. However, only increased competition will ensure that cost savings are passed back to the supplier and forward to the consumer. Introduction of marketing credit, even forward contracting by producer cooperatives might increase competitiveness. However, an effective method of increasing competition in these traditionally resiliant systems has not yet been found.

8. CONCLUSION

In conclusion, I wish to reiterate the original set of operational questions.

(a) Is there a way to prepare and justify a relatively risk free initiating project on the basis of rudimentary data? This paper has provided some guiding rules of thumb, but points out that quantifiable justification may have to be based on some sample data and judgement.

(b) How can a data base be established for future subsector and project work?

This paper identifies long term primary data collection objectives, as well as secondary indicators, and suggests that the data collection become a part of normal government and parastatal operations.

(c) What form of analysis framework would be necessary to identify, design and justify future projects?

This paper suggests that for all follow-on projects, and especially those where new infrastructure is tending to provide marginal capacity, that a total systems analysis framework be used. The paper has pointed out some of the inter-relationships of the components of the grain system, and how each influences decisions in the other.

The analytic tools to provide this framework are available in generalized form, but a package direct applicability to the special problems encountered in grain marketing systems, still has to be developed. There are no intuitively obvious solutions or investments for these complex systems.