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ECONOMIC IMPACT ANALYSIS FOR AGROINDUSTRIAL DEVELOPMENT

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ECONOMIC IMPACT ANALYSIS FOR AGROINDUSTRIAL DEVELOPMENT

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for the

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SECTION I

INTRODUCTION

Economic impact analysis is used to estimate the effects that a given agroindustrial enterprise or development program will have on business activity and peoples' incomes in the area where it is to be located. This kind of study sometimes is described as Associated Rate of Return (ARR) analysis because it considers the associated benefits and associated costs of an endeavor rather than the direct benfits and costs which are used for Internal Rate of Return analysis. These associated impacts do not show up in the projected cashflow of the owners of the venture; instead they accrue to those supplying labor and other resources or goods and services to the enterprise, to those distributing the outputs of the enterprise to end users, to those living in the physical and social environment where the enterprise would go, and to those who own land and other property which will become more (or less) valuable after the enterprise is established.

Two general approaches are used to measure the potential economic impact of new investment enterprises in an area. One is a macroeconomic approach based on applicable intrasector and intersector economic multipliers for the impact area. Analytically, the approach is based on input-output models which already exist for the State or region and can generate the multiplier coefficients needed to estimate the impacts of given capital investment in a specific venture. Such coefficients measure long run impacts after the "waves" from the new investment have reverbrated throughout the linked sectors of the economy. Usually such models exist only for larger geographic areas and for more aggregrated industries than may be of interest for site-specific enterprises of a specific kind. Consequently, the projected impacts may be less definitive than desired. Nonetheless, the approach has a good deal of merit, and is widely used by those concerned with economic planning and development.

The alternative approach to measuring potential economic impact is microeconomic in nature. It utilizes engineering budgeting techniques for identifying specific linkages between the venture and its environment, and estimating appropriate unit values for the quantities attached to each such linkage. The linkages are defined by the characteristics of the venture as described by internal feasibility study. The unit values associated with these linkages are defined by conditions in the local economy (available industrial capacity and supporting infrastructure, quality of labor force and rates of unemployment, kinds of adjacent real property, existing social and public services, etc.). This approach measures first-linkage impacts, and identifies the impacts by time period. It does not consider second and higher order linkages (e.g., impacts arising from the spending of higher payroll earnings created by the venture). The procedure parallels that of internal rate of return analysis, relating the projected cashflow of associated benefits and costs to the the capital outlay schedule to determine the Associated Rate of Return (ARR) and Net Present Associated Value (NPAV) for the venture.

The focus in the present manual is on the second approach to economic impact analysis, that of budgeted linkages for the venture applied to corresponding unit values for the local area. The conceptual approach and analytical techniques parallel those for internal feasibility analysis and project evaluation. The present manual is one in the series published by the Food and Feed Grains Institute at Kansas State University under cooperative agreement with the U. S. Agency for International Development. Others in the series include the following:

IRR Feasibility Analysis Program for Use on MS DOS Microcomputers, Release 2. Special Report No. 20, Revised Oct. 1990.

Economic Analysis for Investment Decision-Making: Procedural Guide I, Internal Rate of Return Analysis. Special Report No. 21, Feb. 1989.

Programa para Análisis de Factibilidad Económica para Uso en Mircocomputadores con MS-DOS. Special Report No. 23, Sept. 1989.

Regression Projection Programs with Multiple Options for Use on MS-DOS Microcomputers. A. Master Projections. Special Report No. 24, Oct. 1989.

Regression Projection Programs with Multiple Options for Use on MS-DOS Microcomputers. B. Prorate Projections. Special Report No. 25, Oct. 1989.

Transportation Linear Program for Use on MS-DOS Microcomputers, Release 2. Special Report No. 26, Dec. 1989.

Proforma Financial Analysis Program for Use on MS-DOS Microcomputers, Release 2. Special Report No. 27, Feb. 1990.

The present manual and accompanying electronic spreadsheet are self-contained in that they provide capability to the user for generating the full projected cash-flow of associated benefits and costs for his case.[1] The output generated by the spreadsheet is saved as a print (DOS ASCII) file for use with the IRR software (Special Report No. 20) to compute the Associated Rate of Return and conduct sensitivity analysis for the user's case. The values for the sample case which are included in the present manual and accompanying software match those for the illustrative Panama rice mill case contained in Special Report No. 20 and other manuals in the series.

There are eight sets of worksheet tables in the accompanying spreadsheet for projecting associated benefits and costs. As outlined in Section II, separate work tables are included for (1) construction impacts, (2) input linkage impacts, (3) output linkage impacts, (4) training impacts, (5) employment impacts, (6) property value impacts, (7) environmental impacts, and (8) associated capital outlay and operating costs. Within each set, work tables are included for (a) linked quantities, (b) unit values, and (c) projected impacts. The first two

[1] Alternatively, the copyrighted spreadsheet software of Lotus Corporation of America, LOTUS 123, Release 2, or compatible software can be used to manipulate the impact analysis spreadsheet.

have unprotected cells for direct entry of values for the user's case in place of those for the sample case. The values for the projected impact table in each category are computed by cell formula. The results from these tables are transferred automatically to the projected cashflow matrix for the case.

Organization of the Manual

The information in the present manual is presented in thirteen sections. Discussion of the characteristics of economic analysis in Section II includes general information on data sources and procedures by type of economic impact. The general design and use of the electronic spreadsheet for entry of data and calculation of impacts are described in Section III. The remaining sections provide instructions on using the spreadsheet to identify and value specific impacts, and to calculate the magnitudes of such impacts. Reproductions of the corresponding worksheets are included with each section.

Economic impacts during the design and construction phases of proposed ventures are presented in Section IV. Construction impacts are minimal for ventures which can be completed economically within a few months, but can be substantial for those which require major civil works and/or acquisition and installation of industrial machinery. Impacts come through the various inputs needed for the venture, such as professional services, site preparation, building construction, plant machinery, energy use and services for construction workers.

Economic impacts through input linkages for project operation are included in Section V. All agroindustrial ventures will make significant impacts on producers and suppliers of inputs, but some far more than others. Input linkage impacts will accrue to suppliers of agricultural raw materials, of industrial supplies, of fuel and energy, of office equipment and supplies, and of services and subscriptions needed by the enterprise.

Economic impacts through linkages of project outputs to the marketing system are the focus of Section VI. Output linkage impacts occur at each step of the distribution system as the products flow from the venture to the final user. For a given venture the steps may include assembly, transport, storage, processing and packaging, wholesale marketing, retailing and sub-retailing. Such impacts are relatively great for ventures located several steps from the final user in the marketing system as is the case for most agricultural processing industries. Output linkage impacts usually are much less for ventures located close to the final user in the vertical distribution system, such for those for supplying technical inputs to agricultural producers.

Personnel training impacts are discussed in Section VII. Training impacts occur if the venture requires pre-service or in-service training of the existing labor force in order to be assured of the skills needed to operate the venture. Depending upon the technical complexity of the venture and characteristics of the existing labor force, training may be needed for such functions as buying and receiving, plant operation, packing and shipping, marketing and distribution and/or office operation.

The estimation of employment impacts of proposed new ventures is discussed in Section VIII. The nature and magnitude of such impacts depend upon the size and

nature of the payroll for the venture and the extent of unemployment and underemployment in the area. Employment impacts are larger if the payroll created will be large and the number of jobs replaced minimal. For a given net added payroll, they will be greater where unemployment and underemployment rates are relatively high.

Impacts on property values are discussed in Section IX of the manual. Ventures such as airports and market centers will have major impacts on values of properties located adjacent to the venture or to transportation arteries to the venture. Other ventures may have relatively little impact of this kind. The impacts can be negative as well as positive, and may affect property values of undeveloped land, residential properties, recreational units, motels and restaurants as well as other business and office properties.

Impacts on the environment and related factors are discussed in Section X. Measurement of projected impacts of the venture on health and safety, on recreational opportunity, on physical environment, on time saving, on social infrastructure and services and on civil liberties and security is the focus under this component. Some ventures may have little impact on such factors, but others can have significant impacts on one or more of these environmental concerns.

The procedures for identifying and estimating associated capital outlays and operating costs for the venture are described in Section XI. Classes of possible capital outlays include physical infrastructure, plant facilities and non-recurring costs for research and development. Classes of associated operating costs include supporting services, regulatory services and expenses for facility maintenance, administration and overhead, fuel and energy, supplies and materials, and other items outside the venture itself.

Section XII of the manual describes procedures for summarizing the projected cashflow of associated benefits and costs and measuring the net economic impact of the venture. Material discussed includes use of feasibility analysis software to determine the Associated Rate of Return (ARR) and Net Present Associated Value (NPAV) for the venture. Impact analysis is summarized for the illustrative case of a rice mill in Panama, yielding ARR of 28.7 percent per year and an NPAV of $276,540 when discounted at opportunity cost of 15 percent. Sensitivity analysis is illustrated for the case, testing the impact on the Associated Rate of Return of a 20-percent decrease in employment benefits and of an 8-percent decrease in projected output linkage benefits. The section is concluded by a summary and interpretation of findings of economic impact analysis.

The final section of the manual presents an exercise to review the organization and use of the ASSOCBEN electronic spreadsheet to develop schedules of projected associated benefits and costs from the various sources. The exercise moves systematically through the 25 tables in the spreadsheet file, examining the construction of each table and the cell formulas used to develop the projected cashflow of associated benefits and costs. Finally, it provides opportunity to compute the ARR for the Panama rice mill case, using feasibility analysis software accompanying Special Report 20, cited above.

There are three appendices to the report, all of which list examples of the cell formulas used in the spreadsheet to develop projected associated benefits and costs. Formulas for developing unit values for the different sources of economic impact are in Appendix I. Those for calculating the associated impacts are in Appendix II. Those for transferring the impacts to the projected cash-flow are illustrated in Appendix III.

Installing and Retrieving the ASSOCBEN Spreadsheet

Although compact and self contained, the ASSOCBEN spreadsheet is large and has many cell formulas, so that substantial memory and disk capacity is needed to operate it. Operating the version compiled with Baler (Copyright by Baler Software Corporation, Rolling Meadows, Illinois 60008) requires a hard disk and at least 512 K of memory, but does not require Lotus or any other spreadsheet software; the RUN.EXE, ASSOCBEN.OVR and ASSOCBEN.BKB files use about 525,000 K bytes of space on the hard disk. Operating the .WK1 spreadsheet requires that the user have Lotus or compatible software and 640 K of memory, but does not require a hard disk; the ASSOCBEN.WK1 file uses 316,086 K bytes of disk space.

Installing the Compiled Spreadsheet

The compiled version of the ASSOCBEN spreadsheet is installed to a hard disk drive directly from the ASSOCBEN Master Disk 1. The steps for doing so are:

1. Create an ASSOCBEN directory on the hard disk by logging to the C Drive and typing MD\ASSOCBEN <return>

2. Log to this directory by typing CD\ASSOCBEN <return>

3. Place the ASSOCBEN Master Disk 1 in Drive A (or B) and type COPY A:(or B:) *.* <return>

4. Create a BAT file for direct entry to the spreadsheet from any drive by typing CD\BIN (or CD\DOS, depending upon how the path in your AUTOEXEC.BAT file is specified) <return>, and then use the DOS editor EDLIN to create the file by typing EDLIN ASSOC.BAT <return>. While in EDLIN type I <return> and the following in response to the numbered prompts:
   1.C: <return>
   2.CD\ASSOCBEN <return>
   3.RUN ASSOCBEN <return>
   4.CD\ <return>
   5.<Ctrl> C and then E to save ASSOC.BAT file.

Retrieving the Compiled Spreadsheet

After the ASSOCBEN files have been installed on hard disk and the ASSOC.BAT file created, the ASSOCBEN spreadsheet is accessed from any drive or directory by typing ASSOC <return>. If the BAT file is not created (or the path is not modified in the AUTOEXEC.BAT file), then the file is accessed by logging to the C drive and typing CD\ASSOCBEN <return> RUN ASSOCBEN <return>. Note that it is

not necessary to have Lotus or compatible software to run this version of the spreadsheet.

In order to preserve the master spreadsheet containing the Panama rice mill example, it is a good idea to copy the two original working files, ASSOCBEN.OVR and ASSOCBEN.WKB, to new names in the same subdirectory of the C drive, e.g., ASSOCPAN.OVR and ASSOCPAN.WKB, respectively. This will preserve the ASSOCBEN files for the current venture under analysis. When the files for such venture have been completed, they too can be copied to new names for archive purposes, e.g., ASSOCONE.OVR and ASSOCONE.WKB.

When one is using the ASSOCBEN spreadsheet to enter the numbers for new case, the revised files should be saved from time to time, using the F[ile] S[ave] command. It can be saved under the same name, ASSOCBEN, by typing R[eplace], or under a new name, say ASSOC1ST, by typing **ASSOC1ST** <return>. If it is saved under a new name, that new name needs to be included in the retrieve command when restarting the spreadsheet. Logged into the ASSOCBEN sub- directory, that command is **RUN ASSOCBEN ASSOC1ST** <return>.

The ASSOCBEN Master Disk No. 1 contains two additional files, ASSOCOMP.OVR and ASSOCOMP.WKB. They represent a compressed version of the ASSOCBEN spreadsheet which permits larger sections of the worksheets to be viewed on the screen. Most of the data columns are reduced in width from the standard nine spaces to six spaces. Punctuation is eliminated from the data format, so that larger numbers can be accommodated in the compressed form. If your monitor permits, the line spacing also can be compressed, using the command / V[ideo] S[ize] 4[3-rows] <return>. To bring up the compressed form of the spreadsheet, one logs to the ASSOCBEN subdirectory and types **RUN ASSOCOMP** <return>. It should be noted that worksheets printed with ASSOCOMP will contain abbreviations or omissions in some of the column headings.

Retrieving the .WK1 Spreadsheet Directly

The user who does not use the compiled version of the ASSOCBEN spreadsheet will need Lotus 123 or compatible software to manipulate the spreadsheet. The ASSOCBEN.WK1 spreadsheet of associated benefits and costs was developed using LOTUS 123, Release 2. One needs to have installed and first bring up this or later version of LOTUS, or compatible competitive spreadsheet software package. When the chosen software comes to computer memory, one then designates for file retrieval the drive containing the spreadsheet file, and the file name **ASSOCBEN** (short for Associated Benefits and Costs). Because of the size of the file, retrieval will take several minutes after the retrieval command is given. The file then is manipulated with the standard spreadsheet commands for the LOTUS or other spreadsheet software one is using.

SECTION II

NATURE AND PURPOSE OF ECONOMIC IMPACT ANALYSIS

Economic impact analysis to measure the associated benefits and costs of agribusiness development represents a separate step in total feasibility analysis. The internal rate of return, direct rate of return, economic rate of return and financial rate of return all measure economic feasibility in terms of benefits to those the development is designed to benefit. In contrast, impact analysis measures the "side effects" of the development upon the economic environment into which it is placed. The two kinds of benefits should not be confused. An enterprise which is infeasible to its owners should not be implemented by them, regardless of the potential economic impact, because the side effects will not help to meet the payroll nor to repay the banker. By the same token, the economic impact of a potential new enterprise is the primary concern by those in the area where the "side effects" of the associated benefits and costs will be felt. If the potential favorable economic impact is sufficiently great, the economic community or public will find it advantageous to subsidize the enterprise, so that in the eyes of the owners the infeasible investment becomes feasible. Likewise, if the unfavorable economic impact is sufficiently great, the public will find it advantageous to penalize the enterprise, so that in the eyes of the owners the feasible investment becomes infeasible.

This does not imply that private investors and enterprises have no interest in impact analysis, nor that public planners and officials have no interest in direct feasibility analysis. Representatives of private enterprise who know how to use impact analysis effectively are the ones most likely to succeed in getting and maintaining active public support. Public planners who know how to use direct feasibility analysis effectively are the ones most likely to succeed in motivating private investments in directions that are compatible with public goals. When both internal feasibility and economic impacts are known, the combination of public and private resources can be employed optimally to achieve both public and private goals. Wherever private investment can be directed with minimal public subsidy to achievement of public goals, scarce public resources are saved. Wherever public assistance can be attracted to private ventures, marginally infeasible private investment can become economically attractive.

Nature of Associated Benefits and Costs

Potential associated benefits, both positive and negative, to be incorporated in economic impact analysis include those resulting from (1) linkages in the construction phase, (2) linkages through operational inputs, (3) linkages through outputs of the enterprise, (4) upgraded skill levels through personnel training, (5) employment impacts of the enterprise, (5) impacts on property values, and (6) impacts on factors such as health and safety, recreation, physical environment, time saving, social infrastructure and services, political security, individual opportunity, civil liberties and peace of mind. Linkage effects in the first three categories arise from added incomes stimulated in the related economic sectors from the volume of business created by the enterprise. Training benefits

arise from additional earning power of participants when the training is completed. Employment impacts arise from added employment (positive) and employment replaced (negative) by the enterprise; both are measured in terms of existing levels of unemployment and underemployment in each relevant labor classification. Impacts on property values are measured by comparison of the with project and without project future market values of affected real properties. Impacts on environmental factors are estimated by comparison of with project and without project projections, and valued in terms of human well being.

Associated capital outlay as well as recurring operating costs associated with the development need to be identified and subtracted in order to obtain the associated net benefits of the enterprise. Associated capital outlay includes any investments outside the enterprise which are needed to insure both the direct benefits and the associated benefits credited to the enterprise, whether to be provided by public or by private sources. Examples might include investments in publicly-supported training programs, access roads and other physical infrastructure, and additional institutional development. Associated operating costs include expenses for personnel, materials and other operating expenses outside the development enterprise which accompany the direct or associated benefits credited to the project. Examples of associated operating costs might be salaries and travel expenses for publicly-supported supportive and regulatory personnel, operation and maintenance of added infrastructure and added communications expense in linked public agencies.

In order that they be mutually exclusive, care must be taken to avoid double counting among the associated benefits from different sources, and between the associated benefits and the direct benefits of the enterprise. The same is true of the associated capital outlays and operating costs, and between such costs and the direct outlays and operating costs charged to the enterprise. Likewise, associated benefits or costs which are hard to identify and measure, or are uncertain, should be excluded from the formal impact analysis. The latter effects can be presented in narrative discussion without attempting to quantify them, and the subjective weight to be given them left to those charged with decisions regarding the potential development.

The associated benefits (and costs) credited to a potential enterprise should not include transfer payments in the economy. All "pie cutting" items such as added property tax base, added income taxes, added licenses, dues and fees, and added user charges come into consideration only after an enterprise has been evaluated and found to be viable for implementation. As with the measurement of direct benefits and costs, the objective of impact analysis is to maximize the size of the pie, not to optimize the size of each piece. Once the "tax base" of economic development has been optimized by appropriate selection of private and public investment ventures, the most suitable taxing schemes to support needed public services can be worked out. This latter analysis is a critical part of development planning, but not a part of economic impact analysis for potential agribusiness ventures.

Measurement of Net Economic Impact

Once the projected schedules of associated benefits and associated costs have been developed, they can be related to the schedules of investment outlay for facilities and working capital for the enterprise to compute the **Associated Rate of Return** on total capital investment. The projected outlay schedules for facilities and working capital are the same as those used in the cashflow for determining the Internal (or Direct) Rate of Return for the venture. This is true by definition to insure that the Associated Rate of Return (ARR) and the Internal Rate of Return (IRR) or DRR are directly comparable by computation from the identical investment base. Such procedure also insures that the total impact of the venture, considering both direct and associated impacts, can be determined by adding the ARR to the IRR (or DRR). This total impact is designated as the **Social Rate of Return** (SRR). It can be computed by relating the combined schedules of net direct benefits and net associated benefits to the capital outlay schedule for the project. When they are computed properly from the same capital outlay schedule, the SRR also is given by direct addition of the ARR and the IRR (or ARR), e.g., 20.5% + 14.3% = 34.8% = SRR.

The formulation is useful when evaluating the potential for shifting benefits or costs from the direct category to the associated category, or vice versa, for the venture. Suppose in the above example that IRR of 14.3% is below the opportunity cost of private venture capital, but that the ARR of 20.5% is well above that for the best alternative to the public sector in the area. If by transferring some of the recurring operating cost from the private to the public sector, for example, by subsidy of employee training costs, the venture might be made feasible to private investors, thereby salvaging its SRR of 34.8%. After the subsidy the formula might be something like 18.5% + 16.3% = 34.8%, indicating feasibility to all parties concerned.

Once the projected schedules have been developed, any of several routines or software packages can be used to compute the Associated Rate of Return. The companion Special Report No. 20 with accompanying computer software by the Food and Feed Grains Institute at Kansas State University is well-suited for doing so.[1] The package also has options for conducting sensitivity analysis of the ARR to levels of associated benefits and costs which may vary from those projected for the base case. This is accomplished with the feasibility analysis software by introducing "scaler" multipliers on the appropriate benefit and cost columns of the input data used for the computations.

Construction Impacts

The magnitude of associated benefits during the design and construction phase of an enterprise depends upon (1) the nature and magnitude of linkages to the surrounding economy during this phase, and (2) the capacity of the economic environment to service the added economic activity created by the linkages. The

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[1] Phillips, Richard. IRR Feasibility Analysis Program for Use on MS DOS Microcomputers, Release 2. Special Report No. 20, Food and Feed Grains Institute, Kansas State University, Manhattan, Revised Oct. 1990.

first of these is defined by the kinds and volumes of design and construction inputs required--information which already will have been developed for a venture whose internal feasibility has been studied. The nature and amounts of inputs for professional services, site preparation, building construction, plant equipment purchase and installation, energy, supporting services and other inputs during construction should be known for the venture, and can be tabulated by projected period over the time needed to complete planning and construction.

The capacity of the economic environment to service the added economic activity during construction in each of the linked areas is defined by the environment. In an underdeveloped setting, many of the needed services may have to be developed. At the other extreme, a thriving full-capacity full-employment environment also will require additional investment in order to service the additional demands created by the venture. Between these two extremes, environments with excess operating capacity and some unemployment of qualified personnel can service the needs of the enterprise with little or no additional investment, and produce substantial added income in the process. At each extreme, the associated benefits of the design and construction phase will be determined largely by the profit margin (price paid by the venture minus per unit fixed costs minus per unit variable costs) for the services provided. In contrast, environments with excess capacity will benefit from previous investments and gain both the profit margin and the fixed cost component of the price paid by the venture for the linked service. Thus, where no available capacity exists to provide construction services, the average unit value of associated benefit (AUV) is the price paid by the enterprise (P) minus average total unit cost (ATUC) in the industry supplying the service. The ATUC is average variable unit cost (AVC) plus average fixed unit cost (AFC), so that the unit value formula without available capacity to service the construction phase is AUV = P - AVC - AFC. This formula where available capacity exists to supply the construction phase of the enterprise is AUV = P - AVC.

After the types and quantities of needed construction inputs have been established, and average unit values for associated benefits have been estimated for each input, estimated total associated benefits from design and construction of the enterprise are obtained by summing the products of quantities and unit values. Because the multiplication is done cell by cell for each construction input used in each accounting period, electronic spreadsheets such as LOTUS 123 are ideally suited for the computations.

Input Linkage Impacts

As with those during construction, the magnitudes of associated benefits through linkages of inputs to be used in the operation of the enterprise depend upon (1) the nature and scope of linkages to input suppliers, and (2) the capacity of the economic environment to service the added economic activity created by the input linkages. The first of these is defined by the kinds and volumes of inputs required for enterprise operation--information which already will have been developed in the internal feasibility study. The nature and amounts of inputs of raw materials, production supplies, fuel and energy, office supplies, services and subscriptions, and other inputs to operate the enterprise will have been established for each projected period. Likewise, the real price to be paid for each such input already will have determined.

The capacity of the economic environment to supply the needed inputs to the enterprise depends upon conditions existing in the supplying industries. Supplying industries with excess capacity will benefit from previous investments and gain both the profit margin and the fixed cost component of the price paid by the venture for the linked inputs. In contrast, where no available capacity exists to provide the inputs needed by the enterprise, the average unit value of associated benefit (AUV) is the price paid by the enterprise (P) minus average total unit cost (ATUC = AVC + AFC) in the industry supplying the input. The unit value formula where available capacity exists to supply the inputs to the enterprise is AUV = P - AVC.

When the types and volumes of needed inputs to the enterprise have been established, and average unit values for associated benefits have been estimated for each input, estimated total associated benefits from input linkages are obtained by summing the products of quantities and unit values, a process easily done by formula in an electronic spreadsheet.

Output Linkage Impacts

The magnitude of associated benefits through linkages of outputs by the enterprise depends upon (1) the nature and magnitude of linkages to output marketing agencies, and (2) the capacity of the marketing system to service the added economic activity created by the output linkages. The first of these is defined by the kinds and volumes of outputs produced by the enterprise--information which already will have been developed in the internal feasibility study. Likewise, the projected real price received by the enterprise for each such output already will have established.

The capacity of the existing marketing system to absorb the outputs of the enterprise depends upon conditions existing in the industry. Marketing systems with excess capacity will gain both the profit margin and the fixed cost component of the price markup at each level of product distribution. In contrast, where no available capacity exists to market the additional volumes, the average unit value of associated benefit (AUV) is the price markup (M) minus average total unit cost (ATUC = AVC + AFC) in the marketing industry. The unit value formula where available marketing capacity exists AUV = M - AVC.

When the types and volumes of enterprise outputs have been determined for each projected accounting period, and average unit values for associated benefits have been estimated for each output, estimated total associated benefits from output linkages are obtained by summing the products of quantities and unit values.

Training Impacts

Training impacts occur with enterprises which require specific types and levels of skill not available in the existing labor force, so that training must be undertaken to impart the needed skills. Associated training benefits for such enterprises are measured by the earning power of the persons trained after their training compared to their average earning power prior to training. These benefits may be credited whether the training will be accomplished by pre-service training or by on-the-job training, or some combination of the two. The cost of training should be included either in the direct operating costs or as associated

operating costs for the enterprise, so that calculated training impacts will be net of the costs of training.

The period-by-period training benefit for people trained in each labor classification is applied from the time they will complete the training until they reach normal retirement age. It is credited for all personnel trained for the enterprise, even though many of them may be expected to move on to other employment during their working careers. The numbers of persons trained should include those trained for the construction phase, if any, as well as those trained for enterprise operation. Only those completing the training should be included. Benefits for persons already qualified but now working in lower-paying positions will be reflected through employment effects rather than through training effects.

The calculation of training benefits for a given period is given by the formula:

$$TB = N(Ep - Ew), \text{ where}$$

TB represents the training benefit for the classification in the period, N represents the number of persons expected to complete the training, Ep represents average earnings per worker per period after training, and Ew represents average earnings per worker per period before training. Once calculated for the first period after training is completed, the training benefit is applied over the average working career of those trained. For example, if the expected average age of those completing training is 35 years and normal retirement age is 65 years, then the training is applied over the next 30 years from completion of training (or to the end of the economic horizon for the enterprise, which ever comes first).

Employment Impacts

Employment impacts occur as result of new jobs created by the enterprise and by existing jobs replaced by the enterprise, if any. So long as there is less than full employment in the area, there will be positive employment benefits through the new jobs created and negative employment benefits through existing jobs replaced. In a full employment situation (no unemployment nor underemployment) there will be no positive nor negative benefits because employment effects will be limited to persons moving from one position to another of equal pay.

The schedule of associated benefits, both positive and negative, from employment impacts caused by the enterprise is determined by comparing the payroll earnings for construction and operation of the enterprise with the average earnings of the workers in existing employment. Associated benefits are credited to the enterprise for employment of persons who otherwise would be unemployed or underemployed. Negative associated benefits are charged to the enterprise for workers who will be replaced, and who are not likely to find alternative employment.

The numbers and salaries of workers by labor classification needed in each period for construction and operation of the enterprise are taken from the supporting worksheets used to project capital outlays and operating costs for the enterprise. The number of workers to be replaced by the enterprise is estimated from the projected operating volumes multiplied by the per unit labor to be

saved. Average earnings for such workers is taken from wage and employment reports for the area.

Prevailing unemployment rates in each labor classification relevant to the enterprise are taken from census reports and manpower supply studies for the area. These percentages are applied to total labor costs by classification for the enterprise to estimate positive benefits through reduced unemployment. They are applied to the estimated total earnings of displaced workers to estimate negative benefits through added unemployment. Average underemployment rates (part-time employment and/or employment in lower-paying jobs) also come from manpower studies for the area. Once obtained by labor classification, they are applied in the same manner as the unemployment rates to estimate positive and negative benefits through underemployment impacts.

It is clear that the greater the unemployment and underemployment in the area where the new enterprise is under consideration, the greater the positive employment benefits from jobs created and the greater the negative employment benefits from jobs replaced. The employment effects are relatively great in areas of depressed conditions and lack of employment opportunities; and at the other extreme, they are zero under conditions of full employment.

Property Value Impacts

Many kinds of development enterprises can be expected to have impacts on the sale value of properties which are adjacent to the site or to transport networks serving the site where the enterprise will be located. Capital gains (and losses) in the market value of land, buildings and other real property in the area which are caused by the enterprise are estimated by comparing the expected period-by-period change in asset value with implementation to the change in value of these assets without implementation of the enterprise. Special care should be taken to insure that the capital gains benefits credited to the enterprise do not represent double counting of any direct or associated benefits already reflected through increased incomes from these assets. For example, if added income from linkage benefits to distribution centers is included in projected benefits, then the added asset value of the distribution centers would be double counting, and should not be credited.

In some cases, one has the option of measuring associated benefits either through capital gains or through increased incomes via the linkage effects as described above. So long as these benefits are measured one way or the other, the choice is at the option of the user, depending upon which is easier and/or more accurate in the individual case. Other sources of associated positive and negative benefits can be measured accurately only through the impacts on asset values. This is true of impacts on resale values of residential and other properties which are not linked through the inputs and outputs of the enterprise, for example. For development enterprises such as major airports, much of the total associated benefit may come through impacts on asset values, and needs to be measured accordingly.

The first step in measuring capital value impacts is to identify the assets that will be impacted, and the number of units (e.g., hectares, residential lots, structures by class, etc.) in each impacted classification. For each such

classification, the per unit value in each future period first is estimated in the absence of the enterprise. Then a second set of unit resale values is estimated under conditions with the enterprise in place. The schedule of capital gains and losses attributable to the enterprise is obtained by subtracting the former from the latter. The results are multiplied by the number of units in the classification to obtain the schedule of estimated capital gain or loss impacts for that asset classification.

The projected capital gain rate for a given classification of assets without the enterprise usually can be estimated accurately by projecting historical rates of change in values. Estimated rates of gain with the enterprise in place can be determined by projecting historical rates of change in a comparable area where similar enterprises have been established. If necessary, the rates of change in value shown by such historical figures can be checked with knowledgeable people in the area such as real estate appraisers, loan agents, brokers and other professional people whose business it is to know changes in property values over time. The net schedule of changes in property values due to implementation of the enterprise should be in real terms after adjusting for changes in purchasing power of money. Since the net is obtained by subtraction, this will be the case if both the with and without enterprise property values are in real terms. If the separate projections are made in monetary terms, then the difference will need to be reduced to real terms after the subtraction is made.

Clearly one source of public benefit resulting from the enterprise and its impacts on property values is the resulting increase in base for property tax purposes. However, the resulting increase in property tax revenue is not a proper source of associated benefit, because higher tax revenues represent transfer payments, not increased economic values. The total net added gain in real estate values as measured above is the associated benefit; an additional crediting of a portion of that added gain for added property tax revenues would be double counting.

Environmental Impacts

It is probable that most agribusiness enterprises will have additional impacts on the environment where they are placed. Such impacts include those on (1) health and safety, (2) recreational opportunity, (3) quality of physical environment, (4) time saving, (5) social infrastructure and services, (5) political security, (6) individual opportunity, (7) civil liberty, and (8) peace of mind. Any measurable associated impacts in these categories which have not been reflected through other direct or associated benefits should be included in this section.

The measurement of such associated impacts is accomplished in much the same manner as is the measurement of those on capital values discussed above. The first step involves (1) identifying the specific sources of such impacts and (2) selecting a volume measure for quantifying the impact in each category. Depending upon the kind of impact, the quantity units may be capital value of assets, incomes per hectare, probabilities of losses from adverse environmental conditions, person days of leisure, person days of good health, person years of extended life span, hours of uninterrupted service, probabilities of losses from acts of war, revolt, vandalism, etc., or some other measure. Some imagination

may be needed to find an appropriate unit of measure for all of these potential impacts, but it should be possible to do so for most of them. If it is impossible to find a unit for a specific known impact, then that impact should be excluded from the quantitative analysis, and reflected qualitatively in the narrative report of findings.

The next step in projecting net associated benefits of these kinds is to develop the quantities for measuring them (1) without the enterprise, (2) with the enterprise in place, and (3) differences attributable to the enterprise. This is accomplished in the same manner as outlined above for capital gains benefits. The without case can be done by projecting historical trends, or by budgeting future trends based on prevailing current conditions. The with enterprise case can be done by (1) projecting trends in comparable areas where similar enterprises exist, or (2) budgeting future trends based on conditions which will prevail after implementation of the enterprise. The net amounts which can be attributed to the enterprise are obtained by subtracting the schedules for the without case from those for the with enterprise case. Net amounts with minus signs represent negative associated benefits; those without minus signs represent positive associated benefits.

The final step in measuring the associated benefits of these other kinds involves (1) establishing appropriate unit values for the quantities used, and (2) multiplying the schedules of net quantities by the unit values to establish projected associated benefit schedules. Average unit values for most of the quantity measures can be determined from the unit values currently prevailing in the area. Some such as human lives saved may have to be valued arbitrarily by measures such as the average annual life-time earning power of persons in the population class where the lives would be saved. Once appropriate unit values are established, the associated benefit schedule for each of the other kinds is calculated by straight multiplication of the quantity schedule by the corresponding unit value.

Associated Capital Outlay and Operating Cost

Associated capital outlays and operating costs properly chargeable to the enterprise include those for any additional facilities or working capital plus any added operating expense for staff, energy, materials, repairs and maintenance or other items to insure achievement of the direct plus the associated benefits credited to the enterprise. Capital outlays already included in the asset acquisition schedule should not counted again, but any needed associated capital outlays should be included here, regardless of who will incur them. Likewise, any operating expense included in the projected cashflow used to determine the Internal Rate of Return should not be counted again. Neither should any operating expenses to be incurred by linked industries which already have been reflected in the process of determining net unit values for the linked inputs and outputs. Added expenses for training should be excluded if already included in the direct cashflow, but training expense incurred outside the enterprise should be included in this section. Depreciation and interest expenses should not be included on items reflected through the associated capital outlay schedule, but should be included for any associated items not reflected in this manner.

Probable associated capital outlays for many agribusiness enterprises may include those for added physical infrastructure, including communications, added plant buildings and equipment, and non-recurring expenses for such things as research and development, legal services and financing charges. Typical associated operating costs not covered elsewhere include those incurred by public agencies for supporting services (professional and supporting staffs, publications, communications, travel, etc.), for regulatory services, and for other expenses (facility maintenance, administration, fuel and energy, supplies and materials, etc.).

Associated capital outlay schedules are developed by (1) identifying the specific kinds of outlay needed, (2) estimating the quantity of each such item, and (3) applying the appropriate real unit costs to obtain the outlay schedule for each additional asset needed. Associated operating cost schedules are developed in comparable manner by (1) identifying the specific additional operating inputs needed, (2) estimating the quantity of each such input by accounting period over the economic horizon of the enterprise, and (3) applying projected real unit costs to obtain the schedule of associated operating cost for each additional input item.

SECTION III

ELECTRONIC SPREADSHEET OF ASSOCIATED BENEFITS AND COSTS

The accompanying electronic spreadsheet represents a set of master worksheets for entering appropriate values and calculating the projected cashflow of associated impacts for a specific venture. It is assumed that the internal feasibility for the venture already will have been investigated, so that many of the numbers needed for formal economic impact analysis already are available to the user. The spreadsheet is designed to take full advantage of such numbers, and eliminate the need for duplicating projections and analyses previously made.

Economic impact analysis measures the associated rate of return for the same projected total capital outlay schedule as is used for the internal rate of return (IRR) analysis for the venture. For this reason, the projected capital outlay schedule for land and site development, facilities and working capital used to compute the internal rate of return can be entered without modification to the projected cashflow for economic impact analysis.

The quantities of inputs and outputs needed to establish linkage impacts of the venture should be known from supporting tables used to project the cashflow for IRR analysis. Input requirements for the construction stage are included in the capital cost estimate. Inputs for operation of the venture are included in the schedules of operating costs. The kinds and quantities of outputs are listed in the projected revenue schedules for the venture.

The numbers of employees by classification used to project the payroll for the venture serve as basis for estimating employment impacts. Personnel training projections for the venture provide the basis for estimating training impacts.

The kinds and numbers of surrounding properties affected by the venture are not tabulated directly in any of the supporting schedules for the IRR analysis, but they can identified from detailed maps of the site and access roads to it. The same goes for the kinds and numbers of environmental factors which will be impacted by the venture; they can be identified from detailed maps, from detailed descriptions of the existing infrastructure, and from environmental impacts which have been tabulated for comparable ventures in other areas.

The accompanying worksheets for identifying and measuring the various kinds of economic impacts of a venture provide a systematic framework for (1) tabulating the impact quantities, (2) estimating unit benefits for each kind of impact, and (3) computing net benefits associated with each projected impact. The results provide the basis for the projected cashflow of associated benefits and costs and computation of the Associated Rate of Return on total capital outlay for the enterprise (ARR).

Nature and Purpose of the Spreadsheet

The electronic spreadsheet for projecting the probable associated economic impacts represents a series of 24 worksheets which are linked together to generate the projected cashflow schedule of associated benefits and costs for the venture under study. The 24 worksheets are organized into a tabular format which is three sections wide and eight sections long. The three columnar sections contain quantities, unit values and total values, respectively. The eight horizontal sections contain information for each of the major categories of impacts, extending from construction impacts to environmental impacts and associated costs. The general organization of the spreadsheet is illustrated in Figure 1, below.

	A. Quantities	B. Unit Values	C. Total Values
1.Construction	A1 K71	M1 W71	Y1 AJ71
2. Inputs	A81 K137	M81 W137	Y81 AJ137
3. Outputs	A141 K200	M141 W200	Y141 AJ200
4. Training	A206 K265	M206 W265	Y206 AJ265
5. Employment	A271 K330	M271 W330	Y271 AJ330
6. Property	A336 K396	M336 W396	Y336 AJ396
7. Environment	A401 K460	M401 W460	Y401 AJ460
8. Assoc. Cost	A471 K530	M471 W530	Y471 AJ530

Figure 1. Ranges of Worksheets for Impact Analysis

Worksheets for tabulating the quantities of impacted units appear in the A sections, extending from column A through column K in the spreadsheet. The worksheets extend from Number 1 for Construction on lines 1 through 71 to Number 8 for Associated Costs on lines 471 through 530. Thus, the construction quantities worksheet extends from cell A1 to cell K71, the input quantities worksheet from cell A81 to cell K137, and so on.

The worksheets for determining unit values for the associated impacts in the eight categories are included in columns M through W. The ranges extend from cell M1 to cell W71 for the first category down to cell M471 to cell W530 for the associated costs in the eighth category.

The eight worksheets for determining total values for the associated impacts are located in column Y through column AJ in the spreadsheet. The ranges for these tables extend from cells Y1 to AJ71 down to cells Y471 to AJ530.

The data cells in the eight quantities worksheets in Section A of the spreadsheet are unprotected so that appropriate data for the venture of interest can be entered to replace those for the illustrative Panama rice mill case included on the original spreadsheet. The classes of impact quantities outlined on these eight worksheets serve to suggest classes relevant to the venture under study. Entries are to be made only for those categories and classes which are relevant to the case, leaving blank the cells which do not apply. Non-zero entries for the Panama rice mill case which do not apply for the case at hand should be deleted from the worksheets.

The eight worksheets in Section B for unit values contain unprotected data cells as well as protected cells in which values will be calculated automatically. Consider the worksheet for computing unit values of associated benefits from construction linkages (1B), for example. Unprotected cells are provided for entering (1) the price of each construction input to the venture, (2) the prevailing margin for the supplying industry, (3) available capacity in the supplying industry, and (4) the fixed cost component of the supply price. Added profits to the supplying industry and corresponding total per unit associated benefits are computed by the worksheets. The values for the Panama rice mill example in the Section B worksheets need to be changed only for cells corresponding to cells with non-zero entries in the Section A worksheets for the case under study. The remaining entries will not affect the results (as they will be multiplied by zero), so they can be retained in the Section B worksheets for future reference.

All values in the eight worksheets of Section C are computed by cell formula so that no entries are needed for the case under study. All cells in these worksheets are protected. The values will be computed automatically by the cell formulas when the spreadsheet calculation command is given.

Classes of Associated Benefits and Costs

The eight categories of associated benefits and costs included in the worksheets fall into four distinct groups. One group arises from added economic activity through product linkages from the venture to suppliers of inputs and marketers of outputs from the venture. Another arises from added employment and/or increased payroll created by the venture. A third includes impacts on property values and environmental factors. The last includes any additional capital outlay and operating cost needed to assure the associated benefits projected for the venture.

The four groups of associated benefits and costs are summarized in Figure 2. Linkage benefits include those in the first three categories, Worksheets 1 to

LINKAGE BENEFITS		
1A. Construction Inputs	1B. Earnings from Inputs	1C. Construction Benefits
2A. Operational Inputs	2B. Added Input Margins	2C. Input Linkage Benefits
3A. Operational Outputs	3B. Added Output Margins	3C. Output Linkage Benefits
EMPLOYMENT BENEFITS		
4A. Employees Trained	4B. Increased Wage Rates	4C. Training Benefits
5A. Persons Employed	5B. Increased Earnings	5C. Employment Benefits
OTHER BENEFITS		
6A. Property Impacted	6B. Increased Values	6C. Capital Gain Benefits
7A. Enviromnental Effects	7B. Monetary Values	7C. Environmental Benefits
ASSOCIATED COSTS		
8A. Additional Inputs	8B. Added Unit Costs	8C. Associated Costs

Figure 2. Outline of Associated Benefits and Costs

3, inclusive. Possible benefits from linkages through inputs used in the construction phase of the venture are included in the number 1 set. These include such items as professional services, site preparation, building construction, equipment purchase and installation, energy used in construction, and services for construction workers. Linkage benefits through inputs to be used in operation of the venture are included in the number 2 set as shown in Figure 2. They include such items as raw materials, production supplies, fuel and energy, office supplies, services and subscriptions and other operational inputs. Linkage benefits generated through marketing and distribution of the outputs and services of the venture represent the number 3 set. Such benefits can be generated at all stages in the marketing system, including assembly, storage, processing, transport, wholesale distribution, retail and sub-retail distribution and other marketing services.

Employment linkages give rise to the second group of associated benefits presented in Figure 2. These include possible training benefits generated through the increased earning power of workers after training, as shown in category number 4. They also include benefits arising by employment of those in labor classifications for which some degree of unemployment and/or underemployment exists, as shown in category number 5. Operational functions for which additional employment may be created include buying and receiving, plant operation, packing and shipping, marketing and distribution, and office and other services. Any existing jobs replaced by the venture also will be reflected in the number 5 worksheets and subtracted as negative employment benefits.

Two types of associated benefits are included in the group of other benefits shown in Figure 2. Property value impacts are included in category number 6. They include projected changes in property values (both positive and negative) caused by the venture. Kinds of property that may be impacted include land, residential homes, recreational units, motels and restaurants, and offices and other facilities. The other types of benefits in this group are those arising from environmental impacts in category number 7. They include such components as health and safety, recreation, physical environment, time saving and infrastructural impacts.

The last class of associated impacts shown in Figure 2 includes any associated costs needed to assure the benefits credited to the venture, whether to be incurred by the venture or by others. Both associated capital outlays and operating costs are included in category number 8. Possible capital outlays include those for physical infrastructure, buildings and facililties, and for non-recurring costs such as research and development or legal fees. Possible associated operating costs include expenses for supporting services, for regulatory services and for other expenses (facility maintenance, administration, energy, supplies, etc.). Expenditures included in category number 8 should be in addition to those which were included in direct capital outlays or operating costs used to determine the internal rate of return.

Organization and Location of Spreadsheet Files

The complete layout of the different impact anaylsis worksheets in the electronic spreadsheet is shown in Figure 3. Following the pattern of Figure 1, the diagram indicates worksheets for quantities, unit values and total values in successive columns, and the different categories of associated benefits and costs in successive rows. The 24 separate worksheets for identifying and measuring associated impacts by category extend from Table 1A in the upper left corner to Table 8C in the Y471..AJ530 range of the spreadsheet. To the right of this in the spreadsheet, Table 9 is the projected cashflow of associated benefits and costs. Table 9A, containing the first eight columns of the cashflow, occupies the AK1..AT62 range. Table 9B, containing the last five columns of the cashflow, falls at range AK63..AT113. Table 10, containing the directory of tables in the spreadsheet appears at range AM115..AJ154.

Each of the worksheets has been given a named range corresponds to its numerical designation in the electronic spreadsheet. Worksheet Table 1A containing the quantities of construction inputs is located at the named range of 1A in cells A1..K71. Table 1B containing the unit values of associated construction impacts is located at the named range of 1B in cells M1..W71. Table 1C containing total values of construction impacts is located at the named range of 1C in cells Y1..AJ71. The same pattern follows throughout the complete spreadsheet. For example, the first sec ion of the projected cashflow is located at named range 9A in cells AK1..AT62.

Either the named range or the cell address may be used to reach any of the worksheets. Because the range names are more logical and easier to remember, and at the same time require fewer keystrokes, they are preferred to the corresponding cell address by experienced users. Typing Goto <F5> 5B <return> will bring Table 5B to the screen. Specifying 5B as the print range, transfer range, etc. has the same effect as specifying the M271..W330 range, and is accomplished more quickly and easily.

The table number and cell location for each of the worksheets in the system are listed in Table 10, Directory of Worksheet Tables. When not sure of the location or contents of a particular worksheet, one can type <F5> 10 and refer to this directory.

Using the Spreadsheet to Project Case Impacts

To use the ASSOCBEN electronic spreadsheet to project the economic impacts for a specific venture of interest, one first needs to retrieve the spreadsheet to computer memory. Then one completes each of the relevant A (quantity) and B (unit value) worksheets in succession. After this has been done, the impact values are computed automatically when the spreadsheet is recalculated.

Benefit (Cost)	A. Quantities	B. Unit Values	C. Total Values	Summary
1.Construction Inputs	Table 1A A1..K71	Table 1B M1..W71	Table 1C Y1..AJ71	Table 9A AK1..AT62
2.Operational Inputs	Table 2A A81..K137	Table 2B M81..W137	Table 2C Y81..AJ137	Table 9B AK63..AT113
3.Operational Outputs	Table 3A A141..K155	Table 3B M141..W200	Table 3C Y141..AJ200	Table 10 AM115..AJ154
4. Training Impacts	Table 4A A206..K265	Table 4B M206..W256	Table 4C Y206..AJ265	
5. Employment Impacts	Table 5A A271..K330	Table 5B M271..W330	Table 5C Y271..AJ330	
6.Capital Gain Impacts	Table 6A A336..K386	Table 6B M336..W386	Table 6C Y336..AJ396	
7.Environmental Impacts	Table 7A A401..K460	Table 7B M401..W460	Table 7C Y401..AJ460	
8. Associated Costs	Table 8A A471..K530	Table 8B M471..S530	Table 8C Y471..AJ530	

Figure 3. Location of Files in Impact Analysis Spreadsheet

Although compact and self contained, the ASSOCBEN spreadsheet is large and has many cell formulas, so that substantial memory and disk capacity is needed to operate it. Operating the version compiled with Baler (Copyright by Baler Software Corporation, Rolling Meadows, Illinois 60008) requires a hard disk and at least 512 K of memory, but does not require Lotus or any other spreadsheet software; the RUN.EXE, ASSOCBEN.OVR and ASSOCBEN.BKB files use about 525,000 K bytes of space on the hard disk. Operating the .WK1 spreadsheet requires that the user have Lotus or compatible software and 640 K of memory, but does not require a hard disk; the ASSOCBEN.WK1 file uses 316,086 K bytes of disk space.

Installing the Compiled Spreadsheet

The compiled version of the ASSOCBEN spreadsheet is installed to a hard disk drive directly from the ASSOCBEN Master Disk 1. The steps for doing so are:

1. Create an ASSOCBEN directory on the hard disk by logging to the C Drive and typing MD\ASSOCBEN <return>

2. Log to this directory by typing CD\ASSOCBEN <return>

3. Place the ASSOCBEN Master Disk 1 in Drive A (or B) and type COPY A:(or B:) *.* <return>

4. Create a BAT file for direct entry to the spreadsheet from any drive by typing CD\BIN (or CD\DOS, depending upon how the path in your AUTOEXEC.BAT file is specified) <return>, and then use the DOS editor EDLIN to create the file by typing EDLIN ASSOC.BAT <return>. While in EDLIN type I <return> and the following in response to the numbered prompts:
   1.C: <return>
   2.CD\ASSOCBEN <return>
   3.RUN ASSOCBEN <return>
   4.CD\ <return>
   5.<Ctrl> C and then E to save ASSOC.BAT file.

Retrieving the Compiled Spreadsheet

After the ASSOCBEN files have been installed on hard disk and the ASSOC.BAT file created, the ASSOCBEN spreadsheet is accessed from any drive or directory by typing ASSOC <return>. If the BAT file is not created (or the path is not modified in the AUTOEXEC.BAT file), then the file is accessed by logging to the C drive and typing CD\ASSOCBEN <return> RUN ASSOCBEN <return>. Note that it is not necessary to have Lotus or compatible software to run this version of the spreadsheet.

In order to preserve the master spreadsheet containing the Panama rice mill example, it is a good idea to copy the two original working files, ASSOCBEN.OVR and ASSOCBEN.WKB, to new names in the same subdirectory of the C drive, e.g. ASSOCPAN.OVR and ASSOCPAN.WKB, respectively. This will preserve the ASSOCBEN files for the current venture under analysis. When the files for such venture have been completed, they too can be copied to new names for archive purposes, e.g., ASSOCONE.OVR and ASSOCONE.WKB.

When one is using the ASSOCBEN spreadsheet to enter the numbers for new case, the revised files should be saved from time to time, using the F[ile] S[ave] command. The spreadsheet can be saved under the same name, ASSOCBEN, by typing R[eplace], or under a new name, say ASSOC1ST, by typing ASSOC1ST <return>. If it is saved under a new name, that new name needs to be included in the retrieve command when restarting the spreadsheet. Logged into the ASSOCBEN sub- directory, that command is RUN ASSOCBEN ASSOC1ST <return>.

The ASSOCBEN Master Disk No. 1 contains two additional files, ASSOCOMP.OVR and ASSOCOMP.WKB. They represent a compressed version of the ASSOCBEN spreadsheet which permits larger sections of the worksheets to be viewed on the screen. Most of the data columns are reduced from the standard nine spaces to six spaces. Punctuation is eliminated from the data format, so that larger numbers can be accommodated in the compressed form. If your monitor permits, the line spacing also can be compressed, using the command / V[ideo] S[ize] 4[3-rows] <return>. To bring up the compressed form of the spreadsheet, one logs to the ASSOCBEN subdirectory and types RUN ASSOCOMP <return>. It should be noted that worksheets printed with ASSOCOMP will contain abbreviations or omissions in some of the column headings.

Retrieving the .WK1 Spreadsheet Directly

The user who does not use the compiled version of the ASSOCBEN spreadsheet will need Lotus 123 or compatible software to manipulate the spreadsheet. The ASSOCBEN.WK1 spreadsheet of associated benefits and costs was developed using LOTUS 123, Release 2. One needs to have installed and first bring up this or later version of LOTUS, or compatible competitive spreadsheet software package. When the chosen software comes to computer memory, one then designates for file retrieval the drive containing the spreadsheet file, and the file name **ASSOCBEN** (short for Associated Benefits and Costs). Because of the size of the file, retrieval will take several minutes after the retrieval command is given. The file then is manipulated with the standard spreadsheet commands for the LOTUS or other spreadsheet software one is using.

Entering Impact Quantities

Following the designations and locations shown in Figure 3, one next proceeds to the quantity worksheets which are relevant to the venture under study. The construction impacts worksheet is accessed by typing **<F5> 1A <return>**. Then one proceeds to the appropriate cells for entry of construction input quantities, following the instructions in Section IV. If there are no new entries to the cells used for the Panama case (E22, E23, E24 and E25), be sure to delete these values before leaving Table 1A.

Next, for the quantities of operational input linkages, the appropriate worksheet is accessed by typing **<F5> 2A <return>**. After making the entries for the case of interest following the instructions in Section V, again be sure to delete numbers for the Panama case which are not to be used (E88..K88, E98..K98, E110..K110).

One proceeds to the quantities worksheet for operational output linkages by typing **<F5> 3A <return>**. Entries of the product outputs and corresponding quantities by projection period are made following the guidelines in Section VI. As before, entries for the Panama case in cells E148..K149 which are not used for the current case should be deleted.

The quantities worksheet for training benefits is accessed by typing **<F5> 4A <return>**. If there are training benefits for the case under study, the numbers of persons to be trained are entered to the appropriate cells as indicated in Section VII. The entry for the Panama case in cell D224 should be deleted if it is not replaced by one for the current case.

Next, the worksheet for numbers of jobs to be created (and replaced) by the venture is accessed by typing **<F5> 5A <return>**. Entries are made following the guidelines in Section VIII. If not replaced by those for the venture under study, all entries for the Panama sample case should be deleted. This includes those in cells E280..K280, E288..K288, E290..K290, E292..K292, E299..K299, E316..K316 and E319..K319.

The worksheet for numbers of properties impacted by the venture is accessed by typing **<F5> 6A <return>**. Entries to the appropriate cells, if any, are made in

the manner indicated in Section IX. Before leaving this worksheet, the existing numbers for the Panama case in cells E343 and E346 should be deleted if not replaced by those for the venture under study.

The worksheet for quantities of environmental impacts is accessed by typing **<F5>** 7A <return>, and cell entries are made following the guidelines in Section X. If not used for the case, care should be taken to delete the numbers in cells H444..H446.

Finally, the worksheet for quantities of associated outlays and costs is accessed by typing <F5> 8A <return>. Entries for the case are made for the various categories of cost and periods following the steps outlined in Section XI. If not replaced by numbers for the case, all numbers for the Panama example should be deleted before leaving this worksheet. Cells involved include E481 and E483, F497 and G497, H501 and the block, E505..K510.Y

Entering Unit Values for Impacts

The unit values are entered to the worksheets in similar fashion following the designations and locations shown in Figure 3. The worksheet for unit values of construction inputs is accessed by typing **<F5>** 1B <return>. Then one proceeds to the cells corresponding to those for quantity entries in Table 1A and enters the unit values for his case in place of those for the Panama Rice Mill case example. The remaining values in Table 1B need not be changed or deleted because no quantities have been entered to multiply by them. For the lines in Table 1B where new entries are made, only the highlighted unprotected cells need to be considered. Added profit in column R and the values in columns U, V and W are calculated by formula.

For the unit values of operational inputs, the appropriate worksheet is accessed by typing <F5> 2B <return>. Revised values for the case of interest are made on the lines corresponding to non zero quantity entries in Table 2A, following the instructions in Section V. No new entries need to be made on lines corresponding to those left blank in Table 2A, nor in the columns containing protected cells where values are computed by formula.

One proceeds to the unit values worksheet for operational output linkages by typing <F5> 3B <return>. Revised values are made for the relevant market levels on lines corresponding to non zero quantity entries in Table 3A, following the instructions in Section VI. As before, no new entries need to be made on lines corresponding to those left blank in Table 3A, nor in the columns containing protected cells. If some of the market levels in Table 3B are not relevant to the case, the existing entries will need to be changed to zero on those lines corresponding to those containing entries in Table 3A.

The unit values worksheet for training benefits is accessed by typing **<F5> 4B** <return>. If there are training benefits for the case under study, revised values are made on the lines corresponding to non zero quantity entries in Table 4A, following the instructions in Section VII. No new entries need to be made on lines corresponding to those left blank in Table 4A, nor in columns T, V and W containing protected cells where values are computed by formula.

Next, the worksheet for unemployment and underemployment benefits (including negative benefits) for the venture is accessed by typing <F5> 5B <return>. Entries are made following the guidelines in Section VIII on lines corresponding to those with non zero entries in Table 5A. No new entries need to be made on lines corresponding to those left blank in Table 5A, nor in columns R, U and W.

The worksheet for changes in real property values caused by the venture is accessed by typing <F5> 6B <return>. Entries to the appropriate cells are made on lines corresponding to non zero entries to Table 6A in the manner indicated in Section IX.

The worksheet for unit values of environmental impacts is accessed by typing <F5> 7B <return>, and revised cell entries are made on lines corresponding to those with non zero entries to Table 7A following the guidelines in Section X. No revisions need to be made on lines corresponding to those left blank in Table 7A.

Finally, the worksheet for unit values of associated outlays and costs is accessed by typing <F5> 8B <return>. Revised cell entries for the case are made on lines corresponding to those containing non zero entries in Table 8A, following the steps outlined in Section XI. No changes are necessary on lines not used for the case in Table 8A.

Calculating Associated Benefits and Costs

Projected associated benefits and costs by category in the C Section of the electronic spreadsheet (Figure 3) are computed by period over the economic horizon for the venture simply by pressing the recalculation key, <F9>. No additional data need to be entered in order to make the calculation. The computation may be delayed until all entries have been made to the complete set of quantity tables and to the complete set of unit value tables, so that final computations are made at one time. Alternatively, the computations can be made category by category as the entries to the corresponding quantity and unit value worksheets are completed. For example, as entries are completed to Table 1A and to Table 1B, it may be desirable to compute the total linkage benefits from the construction stage immediately. This accomplished by keying <F5> 1C <return> to go to Table 1C and then <F9> to recalculate. The figures in Table 1C will be computed immediately, as illustrated in Section IV. In either case it may be desirable to make more than one iteration in the spreadsheet calculation in order to be sure than stable final values are obtained. This is done by recalculating the spreadsheet more than once, for example by keying <F9> <F9> <F9>.

Computation of Associated Rate of Return for the Case

When the spreadsheet is recalculated with final input figures in the complete sets of quantity and unit value tables, the projected cashflow of net associated benefits and costs is developed by the spreadsheet at the same time as the set of total net benefit and cost tables. The first section of the cashflow incorporating values from Tables 1C, 2C, 4C and 5C is contained in Table 9A; the second section incorporating values from Tables 3C, 6C, 7C and 8C is contained in Table 9B. The projected capital outlay schedule for the venture also is included in Table 9A.

The latter figures are not recomputed by the spreadsheet, because they are presumed to exist from the internal feasibility analysis and the projected IRR cashflow for the venture. Such figures are entered by hand to Table 9A, or are transferred from the projected internal cashflow worksheet file using the **F**[ile] C[ombine] A[dd] N[amed Range] spreadsheet command.

When the complete cashflow is ready, it is saved as a print (.PRN) file for use with the feasibility analysis software accompanying the companion publication of the Food and Feed Grains Institute, Special Report No. 20. [1] That software will compute the Associated Rate of Return on total capital investment (ARR) for the the venture. It also has options for conducting sensitivity analyis of the ARR to levels of specific associated benefits or costs which may vary from those projected for the base case. The sensitivity analysis is accomplished with the software by introducing "scaler" multipliers on the appropriate benefit and/or cost columns of the input data used for the computations.

As described in Section XII below, the spreadsheet commands for creating the print file which will be read by the IRR software as DOS (ASCII) values are P[rint] F[ile] B:ASSOCBEN <return> R[ange] CASHFLOW <return> O[ptions] M[argins] L[eft] 0 <return> M[argins] R[ight] 96 <return> M[argins] T[op] 0 <return> M[argins] B[ottom] 0 <return> O[ther] U[nformatted] Q[uit] C[lear] B[orders] G[o] Q[uit]. After creating the print file, one exits the spreadsheet program to run the feasibility analysis (IRR) software.

Prior to running the IRR software it is necessary to rename the print file to DATA.IRR using the DOS command REName by typing REN ASSOCBEN.PRN DATA.IRR <return>. After this is done, the IRR run is initiated by typing IRR(ENG) <return>. At the appropriate screen prompts by that software one indicates for his case the monetary unit, accounting periods per year in cashflow, options for sunken investment and benefit-cost calculations, discount rates, number of years in the cashflow, columnar organization of the data set, type of analysis (3 = ARR), number of scale options, data file creation, and title, column headings and footnotes. When ready the output is echoed to the printer by typing **<Ctrl> P** and the run is initiated by keying <return>. These steps are detailed in Section XII.

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[1] Phillips, Richard. IRR Feasibility Analysis Program for Use on MS DOS Microcomputers, Release 2. Special Report No. 20, Food and Feed Grains Institute, Kansas State University, Manhattan. Revised Oct. 1990.

SECTION IV

ESTIMATING IMPACTS OF DESIGN AND CONSTRUCTION

The worksheets for estimating economic impacts associated with the construction phase of a venture are included in the upper portion of the electronic spreadsheet for impact analysis, ASSOCBEN. The first step in accessing the worksheets is to retrieve the spreadsheet into computer memory. For those who have installed the compiled software package, ASSOCBEN, as outlined on page 24, this is done by typing RUN ASSOCBEN (or simply ASSOC if the Assoc.Bat file has been created) and then keying <return>. The spreadsheet will be recalled promptly as indicated by the beep sound and the screen prompt, "Press any key to continue". When the spreadsheet comes to view on the monitor, it will display a portion of the first worksheet, Table 1A showing quantities of construction inputs by classification and by period for the venture. To remove the "CALC" message at the bottom of the screen and insure that everything is ready for you to proceed, type <F9> to recalculate the spreadsheet. If your monitor accommodates it, you may want to change the display so that you can see more lines of the worksheet at the same time. This is accomplished by the command / V[ideo] S[ize] 4[3-rows] (or 5[0-rows) Q[uit]. If you want to see more columns of the worksheet at the same time, you would retrieve the ASSOCOMP spreadsheet rather than ASSOCBEN (by typing RUN ASSOCOMP <return> as described on pages 24 and 25). The / V[ideo] C[olor] and/or L[CD/B&W] commands may be used to change the color and shading appearance of the screen if desired.

For those who are working from the LOTUS spreadsheet, ASSOCBEN.WK1, with Lotus 123 or compatible spreadsheet software, the first step is to bring the software into memory (e.g., by typing LOTUS and keying <return>). After that one retrieves the spreadsheet by typing / F[ile] R[etrieve] ASSOCBEN <return>. Because of the size of the spreadsheet, it will take the software several minutes to retrieve the file to memory. When this spreadsheet comes to view on the monitor, the portion of the spreadsheet displayed may not be the upper left section of Table 1A. If not, remember that the goto Table 1A command is **<F5> 1A** <return>. As with the complied version, one then types <F9> to recalculate the spreadsheet and insure that everything is ready to proceed.

Layout of the Construction Impact Worksheets

The layout of the three worksheets for estimating the impacts of the design and construction phases of the venture is shown in Figure 4. Table 1A for entry of quantities of construction inputs by classification in each projected period is located in the upper left block from cell A1 to cell K69. Table 1B for entry of the unit values of construction input linkages is in the center section from cell M1 to cell W69. Table 1C showing calculated construction linkage benefits is located in the right section from cell Y1 to cell AJ69.

The Table 1A and Table 1C worksheets contain seven identical classes of inputs covering the planning, design and construction phases of the venture. Professional services appear on lines 8 through 13. Site preparation inputs are on lines 17 and 18. Building construction is listed on lines 22 through 33. Plant

machinery acquisition and installation are shown on lines 37 through 46. Inputs by energy source are included on lines 50 through 54. Services for construction operations are reported on lines 58 through 63. Other construction inputs are shown on lines 67 through 69.

The unit values worksheet, Table 1B, contains the same line items, but the columns represent factors used to compute the unit benefits of the line items rather than the construction periods in the cashflow. Project price appears in column P. Industry margin is in column Q. Added profit is presented in column R, excess capacity in column S, fixed cost in column T, and variable cost in column U. The cost factor for each line item is in column V, and the computed unit benefit for the item is listed in column W.

Figure 4 provides a convenient reference for locating specific classes of construction inputs when reviewing the quantities, unit values and construction impacts for the venture of interest. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 1A through 1C in connection with the venture, or when assessing the impacts of another venture.

Table 1A Quantities of Construction Inputs by Class by Period	Table 1B Unit Values of Construction Input Linkages by Class	Table 1C Linkage Benefits from Construction Inputs by Period
PROFESSIONAL SERVICES D8..K13	PROJECT PRICE P8..P69	PROFESSIONAL SERVICES AB8..AJ13
SITE PREPARATION D17..K18	INDUSTRY MARGIN Q8..Q69	SITE PREPARATION AB17..AJ18
BUILDING CONSTRUCTION D22..K33	ADDED PROFIT R8..R69	BUILDING CONSTRUCTION AB22..AJ33
PLANT MACHINERY D37..K46	EXCESS CAPACITY S8..S69	PLANT MACHINERY AB37..AJ46
ENERGY SOURCE D50..K54	FIXED COST T8..T69	ENERGY SOURCE AB50..AJ54
SERVICES FOR CONSTRUCTION D58..K63	VARIABLE COST U8..U69	SERVICES FOR CONSTRUCTION AB58..AJ63
OTHER CONSTRUCTION INPUTS D67..K69	COST FACTOR V8..V69	OTHER CONSTRUCTION INPUTS AB67..AJ69
	UNIT BENEFIT W8..W69	

Figure. 4. Layout of Worksheets for Estimating Impacts of Construction

Quantities of Raw Materials and Supplies by Class in Table 1A

Table 1A serves as the starting point for projecting the associated benefits and costs one can expect through impacts the venture will make on its economic environment. When the title of the venture is entered to cell F2 of the worksheet, it will be transferred automatically to the other two worksheets in Figure 4, as well as to all other worksheets in the total electronic spreadsheet, when the calculation command is given. The entries to the B cells on lines 13, 18, 32, 54 and 63, and those to the A cells on lines 67-69 will be transferred to the corresponding positions in Table 1B and Table 1C at recalculation also.

It will be noted that the only cells in Table 1A which contain entries for the Panama rice mill example are E22 through E25 under building construction for the second year in the projected cashflow. None of the other classes of input were applicable for that case. This will not be true for other ventures; there may be entries in any one or all of the classes included in the table. For those ventures which do not have nonzero entries in the occupied E22 to E25 cells, do not forget to remove the entries for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase].

Now let us proceed to the various classes of inputs in the planning, design and construction phases of the venture.

Professional services expenditures for planning, formation, design, engineering and constructing the venture are to be entered under the years such expenditures will be incurred in cells D8 through K13 of Worksheet 1A. Separate lines are itemized for architectural services, engineering services, economic and business analyses, legal and accounting services, general contractors' fees and other professional services. The unit of measure for such services ordinarily is the total fee for the service, even though some of them (e.g., engineering fees), may be estimated as percentages of the total construction cost. The various service fees for the venture can be taken from the cost estimate schedules used to project the total capital outlay required.

Only those professional service lines in the worksheet which are relevant to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Site preparation expenditures relevant to the venture include those for grading and leveling, and those for other site development (grade crossings, access roads, surfacing, etc.). They are entered under the appropriate years in cells D17 to K18. Expenditures in the "Other" category can be identified by kind in cell B18. The appropriate unit of measure for grading may be cubic yards or cubic meters; that for those in the other category probably will be the total monetary cost.

The expenditures for site preparation can be taken directly from the cost estimate schedules used to project total capital outlay for the venture.

Table 1A. Quantities of Construction Inputs by Class by Period
Project: PANAMA RICE MILL

Class of Input	Unit of Measure	Quantities Used by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th
PROFESSIONAL SERVICES:									
1. Architectural	$ Fee								
2. Engineering	$ Fee								
3. Econ. & Business	$ Fee								
4. Legal & Accting	$ Fee								
5. General Contractor	$ Fee								
6. Other _____	$ Fee								
		---	---	---	---	---	---	---	---
SITE PREPARATION:									
1. Grading	Cu.Yd.								
2. Other _____	$ Cost								
		---	---	---	---	---	---	---	---
BUILDING CONSTRUCTION:									
1. Concrete	Cu.Yd.		40						
2. Lumber	100 Bd.Ft.		6						
3. Steel	Tons		1						
4. Other Materials	$ Cost		1877						
5. Skilled Labor	P/Mo.								
6. Other Labor	P/Mo.								
7. Supervision	P/Mo.								
8. Electrical	$ Cost								
9. Plumbing	$ Cost								
10. Heating & Cooling	$ Cost								
11. Other _____	$ Cost								
12. Material Transport	$ Cost								
		---	---	---	---	---	---	---	---
PLANT MACHINERY:									
1. Receiving Equip.	$ Cost								
2. Conveying Equip.	$ Cost								
3. Processing Equip.	$ Cost								
4. Packing Equip.	$ Cost								
5. Warehousing Equip.	$ Cost								
6. Loading Equip.	$ Cost								
7. Other Machinery	$ Cost								
8. Installation	$ Cost								
9. Mobile Equip.	$ Cost								
10. Delivery Cost	$ Cost								
		---	---	---	---	---	---	---	---
ENERGY SOURCE:									
1. Generating Unit	$ Cost								
2. Line Hookups	$ Cost								
3. Fuel Receiving	$ Cost								
4. Fuel Storage	$ Cost								
5. Other _____	$ Cost								
		---	---	---	---	---	---	---	---
SERVICES FOR CONSTRUCTION:									
1. Meals and Drinks	P/Mo.								
2. Personnel Transport	P/Mo.								
3. Health Services	P/Mo.								
4. Clothing	P/Mo.								
5. Entertainment	P/Mo.								
6. Other _____	P/Mo.								
		---	---	---	---	---	---	---	---
OTHER CONSTRUCTION INPUTS:									
1. _____									
2. _____									
3. _____									
		---	---	---	---	---	---	---	---

Building construction expenditures include construction materials, construction labor, subcontracts for plumbing, heating and cooling, electrical, etc., plus transport to the site and related construction expenses. The units of measure vary from cubic yards (or cubic meters) of concrete in place and 100 board feet for lumber to person months for construction labor and total money expenditure for subcontracts. The construction quantities needed for the venture are taken directly from the cost estimation details. They are entered for the appropriate periods in the section bounded by cells D22 and K33.

Only those building construction lines in the worksheet which are relevant to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case. A reminder that if the cells used for the Panama rice mill case are not used for the venture of interest, don't forget to remove the rice mill numbers from cells E22 to E25.

Plant machinery expenditures are entered for the appropriate construction periods in the section of the worksheet from D37 to K46. Separate entry lines are provided for receiving equipment, conveying equipment, processing equipment, packing equipment, warehousing equipment, loading equipment, other plant machinery, and mobile equipment. In addition, the costs for delivery and for installation are to be entered on separate lines. This type of breakdown of capital expenditures for plant machinery and equipment provides opportunity to consider differences in economic impact per unit of monetary expenditure for equipment in the different categories.

The source of data for the machinery expenditures entered to Table 1A is the capital cost estimate for the venture, together with the supporting schedules upon which the estimate is made. The unit of measure for all such expenditures normally will be the total monetary cost for plant machinery in each category.

Energy source expenditures include all capital costs to be incurred by the venture in developing sources of energy and power for the operation. These may include the power generating unit, be it electrical, steam, or compressed fluids, and regardless of the fuel to be used. They also may include line hookups to the sources of fuel and energy, fuel receiving, storage and transport systems, as well an any other expenditures for the energy plant to support the venture (water supply, cooling facility, clean environment equipment, etc.). The unit of measure for such items is the total monetary cost in each line category, and the information is taken directly from the details of the capital cost estimate for the venture.

Expenditures in this group are entered to the appropriate lines and for the appropriate periods in the range from cell D50 to cell K54. Word description of the "Other" item on line 54 is entered to cell B54.

Services for construction are to be entered quantitatively by construction period in the section of the worksheet from cell D58 to cell K63. These items can be entered in units of person months of construction workers. Appropriate quantitative values can be estimated per person month for meals and drinks, for personnel transport, for health services, for clothing, for entertainment, and for other services, the latter to be identified in cell B63.

The quantities of these "secondary" construction inputs do not come directly from the capital cost estimate as do those in the above classes. Instead, they are derived from the projected construction schedule and the numbers of construction workers at each professional and skill level (as per the details of the cost estimate), applied to the kinds of supporting infrastructure in the vicinity of the construction site. For construction work by permanent residents in the local community, these items will be minimal. At the other extreme, construction requiring the maintenance of "construction" camps for some period of time will generate substantial quantities of services input.

Other construction inputs will vary with the nature of the venture under study. For cases to which they apply, such items will be identified in cells **A67** to **A69**, and the quantities entered in the appropriate construction periods in the range from cell **D67** to cell **K69**.

Examples of other construction inputs for specific cases might include expenditures for environmental protection facilities, for flood control facilities, for training institute and facilities, for access roads and bridges, for employee housing and community services, for communications networks, and for landscaping and other "beautification" programs. If the venture under study does not have construction inputs other than those already reflected in the above classes, then the entire section of other construction inputs will be left blank.

Unit Benefits to Linked Industries in Table 1B

Unit benefits corresponding to line items for which quantity entries are made to Table 1A are to be entered to Table 1B. Even though this worksheet as displayed for the Panama rice mill case contains entries in all cells, the entries are activated only when a quantity entry is made to the corresponding multiplier cell in Table 1A. For this reason it is not necessary to modify or erase values in Table 1B that do not relate to relevant quantities for the case at hand. These "dummy" values serve as useful guides to the functioning of the worksheet, and indicate the general magnitude of values that one can expect. The project name at the top of the worksheet, the identifications for the "Other" line items in columns M and N, and the units of measure in column O are completed automatically when the spreadsheet is recalculated.

It will be noted that unlike Table 1A, the unit value table does not contain columnar entries corresponding to the various construction periods. Instead the different columns from P to V contain data used to compute the net unit benefit shown in column W for each line item in the table. The net unit benefit then is applied to the quantities in all columns of Table 1A.

Project prices for each of the line items are indicated in column P of Table 1B. These are the prices charged to the venture for each unit of the corresponding item. The price entry is 1.00 on items for which the unit of measure is the total monetary cost. It is something other than 1.00 for line items with units of measure such as cubic yards, person months, and metric tons. Prices paid for each item by the venture are taken directly from the details of the capital cost estimate.

Table 1B. Unit Values of Construction Input Linkages by Class

Project: PANAMA RICE MILL

Class of Input	Unit of Measure	Project Price	Industry Margin	Added Profit	Excess Capacity	Fixed Cost	Variable Cost	Cost Factor	Unit Benefit
PROFESSIONAL SERVICES:									
1. Architectural	$ Fee	1.00	0.110	0.110	3000	0.300	0.590	0.300	0.41
2. Engineering	$ Fee	1.00	0.097	0.097	5000	0.120	0.783	0.120	0.22
3. Econ. & Business	$ Fee	1.00	0.130	0.130	0	0.230	0.640	0.000	0.13
4. Legal & Accting	$ Fee	1.00	0.106	0.106	0	0.300	0.594	0.000	0.11
5. General Contractor	$ Fee	1.00	0.086	0.086	0	0.310	0.604	0.000	0.09
6. Other _____	$ Fee	1.00	0.091	0.091	0	0.270	0.639	0.000	0.09
SITE PREPARATION:									
1. Grading	Cu.Yd.	5.00	0.090	0.450	5000	0.220	0.690	0.220	1.55
2. Other _____	$ Cost	1.00	0.100	0.100	5000	0.150	0.750	0.150	0.25
BUILDING CONSTRUCTION:									
1. Concrete	Cu.Yd.	50.00	0.070	3.500	10000	0.200	0.730	0.200	13.50
2. Lumber	100 Bd.Ft	150.00	0.090	13.500	10000	0.150	0.760	0.150	36.00
3. Steel	Tons	600.00	0.095	57.000	10000	0.240	0.665	0.240	201.00
4. Other Materials	$ Cost	1.00	0.100	0.100	10000	0.200	0.700	0.200	0.30
5. Skilled Labor	P/Mo.	3000.00	0.070	210.000	0	0.250	0.680	0.000	210.00
6. Other Labor	P/Mo.	2500.00	0.080	200.000	0	0.250	0.670	0.000	200.00
7. Supervision	P/Mo.	4000.00	0.050	200.000	0	0.250	0.700	0.000	200.00
8. Electrical	$ Cost	1.00	0.110	0.110	10000	0.230	0.660	0.230	0.34
9. Plumbing	$ Cost	1.00	0.120	0.120	10000	0.300	0.580	0.300	0.42
10. Heating & Cooling	$ Cost	1.00	0.100	0.100	10000	0.310	0.590	0.310	0.41
11. Other _____	$ Cost	1.00	0.100	0.100	10000	0.270	0.630	0.270	0.37
12. Material Transport	$ Cost	1.00	0.070	0.070	10000	0.190	0.740	0.190	0.26
PLANT MACHINERY:									
1. Receiving Equip.	$ Cost	1.00	0.095	0.095	9000	0.230	0.675	0.230	0.33
2. Conveying Equip.	$ Cost	1.00	0.100	0.100	9000	0.300	0.600	0.300	0.40
3. Processing Equip.	$ Cost	1.00	0.070	0.070	9000	0.310	0.620	0.310	0.38
4. Packing Equip.	$ Cost	1.00	0.080	0.080	9000	0.270	0.650	0.270	0.35
5. Warehousing Equip.	$ Cost	1.00	0.050	0.050	9000	0.190	0.760	0.190	0.24
6. Loading Equip.	$ Cost	1.00	0.110	0.110	9000	0.200	0.690	0.200	0.31
7. Other Machinery	$ Cost	1.00	0.120	0.120	9000	0.150	0.730	0.150	0.27
8. Installation	$ Cost	1.00	0.100	0.100	9000	0.240	0.660	0.240	0.34
9. Mobile Equip.	$ Cost	1.00	0.100	0.100	9000	0.200	0.700	0.200	0.30
10. Delivery Cost	$ Cost	1.00	0.070	0.070	9000	0.150	0.780	0.150	0.22
ENERGY SOURCE:									
1. Generating Unit	$ Cost	1.00	0.090	0.090	8000	0.270	0.640	0.270	0.36
2. Line Hookups	$ Cost	1.00	0.130	0.130	8000	0.190	0.680	0.190	0.32
3. Fuel Receiving	$ Cost	1.00	0.110	0.110	8000	0.200	0.690	0.200	0.31
4. Fuel Storage	$ Cost	1.00	0.125	0.125	8000	0.150	0.725	0.150	0.28
5. Other _____	$ Cost	1.00	0.087	0.087	8000	0.240	0.673	0.240	0.33
SERVICES FOR CONSTRUCTION:									
1. Meals and Drinks	P/Mo.	1200.00	0.160	192.000	7000	0.180	0.660	0.180	408.00
2. Personnel Transport	P/Mo.	300.00	0.095	28.500	7000	0.220	0.685	0.220	94.50
3. Health Services	P/Mo.	150.00	0.088	13.200	7000	0.195	0.717	0.195	42.45
4. Clothing	P/Mo.	85.00	0.124	10.540	7000	0.210	0.666	0.210	28.39
5. Entertainment	P/Mo.	95.00	0.167	15.865	7000	0.220	0.613	0.220	36.77
6. Other _____	P/Mo.	115.00	0.120	13.800	7000	0.187	0.693	0.187	35.31
OTHER CONSTRUCTION INPUTS:									
1. _____	$ Cost	1.00	0.085	0.085	7000	0.250	0.665	0.250	0.34
2. _____	$ Cost	1.00	0.092	0.092	7000	0.250	0.658	0.250	0.34
3. _____	$ Cost	1.00	0.113	0.113	7000	0.250	0.637	0.250	0.36

Industry margins for each of the construction inputs are entered as decimal fractions in column Q of Table 1B. These prevailing margins for the various kinds of construction inputs (professional services, land grading, building construction, plant machinery, etc.) usually can be found in industry trade association publications, trade and commerce reports, state offices of economic development and/or similar sources. Under competitive conditions they are market determined. They tend to be higher in professional service industries than in construction, say in the usual range of .10 to .12 in the former compared to that of .05 to .08 in the latter. They tend to be lower for those industries which are well established than for those kinds of industries which are not fully developed in the area.

It should be noted again that the industry margins in Table 1B need to be changed only on those rows corresponding to nonzero entries in Table 1A. The rest need not be changed.

Added profit for each line item shown in column R is computed by formula, multiplying the price in column P by the margin in column Q. These values are computed automatically when the spreadsheet is recalculated. The cells in column R are protected so that the user cannot erase any of the formulas accidentally by typing a number into one of the cells.

Excess capacity in the industry supplying each of the line items in Table 1B is entered to column S. The values are entered as numbers of the units of measure entered to column O. These quantities are relevant because industries with excess capacity greater than or equal to the volume needed for the venture under study need recover only variable costs of supplying the venture. Those without available capacity must recover both fixed and variable costs of providing the input to the venture; this is true because they will have to make additional investment in order to handle the added volume.

Available capacities in the various industries supplying construction inputs in the area can be obtained from reports by trade associations, departments of commerce, economic development agencies and similar sources. Ordinarily, ventures which require volumes of input representing a small percentage of total volume for the industry will not tax existing capacities. Ventures which need large quantities of particular construction inputs may require further capital investment on the part of the supplying industries.

Fixed cost as decimal fraction of the supply price for each construction input item is entered to column T of Table 1B. This information also is available from reports by trade associations and departments of commerce. The fixed cost component of the supply price can be .5 or greater for high-technology capital-intensive industries such as those for industrial equipment manufacture. At the other extreme, fixed costs may be only .1 or .2 of the supply price in labor intensive industries such as carpentry or restaurant services.

Again the user is reminded that revised entries to column T of Table 1B need to be made only on rows to which nonzero entries were made in Table 1A. The existing entries on all other lines of column T can remain as they are.

Variable cost as decimal fraction of the supply price shown in column U of Table 1B is computed by the spreadsheet as 1.0 minus the industry margin (column Q) minus the fixed cost (column T). No entries are to be made in this column by the user. The correct values are computed automatically when the spreadsheet is recalculated by pressing the <F9> key.

Cost factors for each of the line entries in Table 1B are shown in column V. These values are inserted by spreadsheet formula also. They are set equal to the fixed cost in column T if excess capacity is shown in column S; otherwise they are set equal to 0.00. All of the cells in column V are protected so that the formulas cannot be lost by accidentally inserting numerical entries.

Unit benefits for each of the construction inputs as calculated by the spreadsheet are shown in column W of Table 1B. The formula for these cells is the supply price (column P) multiplied by the sum of the industry margin (column Q) plus the cost factor (column V). The values in this column are computed automatically when the spreadsheet is recalculated.

The labels, data entries and formulas for Table 1B are illustrated by the reproduction of the worksheet cell formulas in Appendix I.

Associated Benefits from Construction in Table 1C

Linkage benefits from the planning, design and construction phases of the venture are given in Table 1C. All values in this worksheet are computed by cell formula from the entries to the corresponding cells in Tables 1A and 1B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 1C are illustrated in Appendix II. The project name at the top of the worksheet and the identifications for the "Other" line items in columns Y and Z also are completed automatically when the spreadsheet is recalculated. Only the monetary unit of measure in cell AA5 at the top of the worksheet (e.g., Dollars) needs to be typed in--everything else in Table 1C is generated internally.

It will be noted that Table 1C follows exactly the same format as Table 1A, with the different classes of construction inputs extending from rows 7 to 74, and the various construction periods extending from column AB to column AJ. Because they are determined by cell formula, all values in Table 1C are zero except those corresponding to nonzero entries to Table 1A.

As illustrated in Appendix II, each value in Table 1C is the product of the quantity in Table 1A and the unit benefit value in column W of Table 1B. The cell formula for cell AB8 is as follows, for example:

@IF($S8>=D8,D8*$W8,(D8-$S8)*$R8+$S8*$W8).

Table 1C. Linkage Benefits from Construction Inputs by Period

Project: PANAMA RICE MILL

Class of Input	Unit = Dollars	Linkage Benefits by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th	Total
PROFESSIONAL SERVICES:										
1. Architectural		0	0	0	0	0	0	0	0	0
2. Engineering		0	0	0	0	0	0	0	0	0
3. Econ. & Business		0	0	0	0	0	0	0	0	0
4. Legal & Accting		0	0	0	0	0	0	0	0	0
5. General Contractor		0	0	0	0	0	0	0	0	0
6. Other _____		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
SITE PREPARATION:										
1. Grading		0	0	0	0	0	0	0	0	0
2. Other _____		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
BUILDING CONSTRUCTION:										
1. Concrete		0	540	0	0	0	0	0	0	540
2. Lumber		0	216	0	0	0	0	0	0	216
3. Steel		0	201	0	0	0	0	0	0	201
4. Other Materials		0	563	0	0	0	0	0	0	563
5. Skilled Labor		0	0	0	0	0	0	0	0	0
6. Other Labor		0	0	0	0	0	0	0	0	0
7. Supervision		0	0	0	0	0	0	0	0	0
8. Electrical		0	0	0	0	0	0	0	0	0
9. Plumbing		0	0	0	0	0	0	0	0	0
10. Heating & Cooling		0	0	0	0	0	0	0	0	0
11. Other _____		0	0	0	0	0	0	0	0	0
12. Material Transport		0	0	0	0	0	0	0	0	0
		0	1520	0	0	0	0	0	0	1520
PLANT MACHINERY:										
1. Receiving Equip.		0	0	0	0	0	0	0	0	0
2. Conveying Equip.		0	0	0	0	0	0	0	0	0
3. Processing Equip.		0	0	0	0	0	0	0	0	0
4. Packing Equip.		0	0	0	0	0	0	0	0	0
5. Warehousing Equip.		0	0	0	0	0	0	0	0	0
6. Loading Equip.		0	0	0	0	0	0	0	0	0
7. Other Machinery		0	0	0	0	0	0	0	0	0
8. Installation		0	0	0	0	0	0	0	0	0
9. Mobile Equip.		0	0	0	0	0	0	0	0	0
10. Delivery Cost		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
ENERGY SOURCE:										
1. Generating Unit		0	0	0	0	0	0	0	0	0
2. Line Hookups		0	0	0	0	0	0	0	0	0
3. Fuel Receiving		0	0	0	0	0	0	0	0	0
4. Fuel Storage		0	0	0	0	0	0	0	0	0
5. Other _____		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
SERVICES FOR CONSTRUCTION:										
1. Meals and Drinks		0	0	0	0	0	0	0	0	0
2. Personnel Transport		0	0	0	0	0	0	0	0	0
3. Health Services		0	0	0	0	0	0	0	0	0
4. Clothing		0	0	0	0	0	0	0	0	0
5. Entertainment		0	0	0	0	0	0	0	0	0
6. Other		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
OTHER CONSTRUCTION INPUTS:										
1. _____		0	0	0	0	0	0	0	0	0
2. _____		0	0	0	0	0	0	0	0	0
3. _____		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0

The formula checks to see that available capacity in the industry is sufficient to serve the volume of the venture; if so, it calculates the benefit as the quantity used by the venture (cell D8) times the total unit benefit (cell W8). Otherwise, it calculates the benefit as the difference between the volume needed for the venture (D8) and the available capacity (S8) multiplied by the added profit (R8) plus the available capacity (S8) multiplied by the total unit benefit (W8).

Totals by class of construction input and by construction period are calculated by the worksheet as well. For example, the value for the Panama rice mill case for total building construction in the 2nd period of $1,520 is the sum of the calculated values in cells AC22 through AC33.

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration (pushing <F9> once) is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets can be printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It may also be necessary to narrow the left and right margins slightly from the 1-inch default values.

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 1A, Table 1B and Table 1C, it is necessary to recalculate the spreadsheet (by pushing <F9>) after each worksheet is printed. After this has been done and the appropriate font, line spacing, and margin settings made, the printing is done with standard spreadsheet print commands. For example, Table 1C is printed by typing / P[rint] P[rinter] R[ange] 1C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION V

ESTIMATING IMPACTS THROUGH OPERATIONAL INPUT LINKAGES

The set of worksheets for estimating the impacts of the venture on the suppliers of operational inputs occupies the section of the electronic spreadsheet extending from row 81 to row 137 (see Figure 3, page 23). The quantities worksheet, Table 2A, occupies columns A to K; the unit values worksheet, Table 2B, occupies columns M to W, and the input linkage benefit worksheet, Table 2C, occupies columns Y to AJ.

If the ASSOCBEN spreadsheet already has been retrieved from disk file to computer memory in connection with the construction impact worksheets, then one can proceed directly to worksheet 2A by the spreadsheet command <F5> 2A <return>. If the spreadsheet currently is not in memory, then one first needs to retrieve the spreadsheet file. The steps for doing so are outlined on page 29, above. If the spreadsheet has been saved under a name other than ASSOCBEN, the new name needs to be included in the retrieval command, e.g., **RUN ASSOCBEN ASSOC1ST** <return>.

Layout of Worksheets for Estimating Impacts of Operating Inputs

The layout of the three worksheets for estimating the impacts of the venture through operational input linkages is shown in Figure 5. Table 2A for entry of quantities of operating inputs by classification in each projected period is located in the left block from cell A81 to cell K137. Table 2B for entry of the unit values of operating input linkages is in the center section from cell M81 to cell W137. Table 2C showing calculated input linkage benefits is located in the right section from cell Y81 to cell AJ134.

The Table 2A and Table 2C worksheets contain six identical classes of inputs covering all phases of project operations. Raw material purchases appear on lines 88 through 93. Production supplies inputs are on lines 97 through 102. Fuel and energy inputs are listed on lines 106 through 111. Office supply inputs are shown on lines 115 through 119. Services and subscriptions inputs are included on lines 123 through 128. Other operational inputs are shown on lines 132 through 134.

While the unit values worksheet, Table 2B, contains these same line items, its columns represent factors used to compute the unit benefits of the line items rather than the projected periods in the cashflow. Project price appears in column P. Industry margin is in column Q. Added profit is presented in column R, excess capacity in column S, fixed cost in column T, and variable cost in column U. The cost factor for each line item is in column V, and the computed unit benefit for the item is listed in column W.

Figure 5 provides a convenient reference for locating specific classes of operating inputs when reviewing the quantities, unit values and input linkage impacts for the venture of interest. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 2A through 2C in connection with the venture, or when assessing the impacts of another venture.

Table 2A Quantities of Raw Materials and Supplies by Class	Table 2B Unit Values of Operational Input Linkages by Class	Table 2C Linkage Benefits of Operational Inputs by Period
RAW MATERIAL PURCHASES D88..K93	PROJECT PRICE P88..P134	RAW MATERIAL PURCHASES AB88..AJ93
PRODUCTION SUPPLIES D97..K102	INDUSTRY MARGIN Q88..Q134	PRODUCTION SUPPLIES AB97..AJ102
FUEL AND ENERGY D106..K111	ADDED PROFIT R88..R134	FUEL AND ENERGY AB106..AJ111
OFFICE SUPPLIES D115..K119	EXCESS CAPACITY S88..S134	OFFICE SUPPLIES AB115..AJ119
SERVICES AND SUBSCRIPTIONS D123..K128	FIXED COST T88..T134	SERVICES AND SUBSCRIPTIONS AB123..AJ128
OTHER OPERATIONAL INPUTS D132..K134	VARIABLE COST U88..U134	OTHER OPERATIONAL INPUTS AB132..AJ134
	COST FACTOR V88..V134	
	UNIT BENEFIT W88..W134	

Figure 5. Layout of Worksheets for Estimating Impacts of Operating Inputs

Quantities of Raw Materials and Supplies by Class in Table 2A

Table 2A serves as the starting point for projecting the associated benefits from operational input linkages for the venture. The title of the venture need not be entered to cell F82 because it is transferred automatically when the spreadsheet is recalculated. The total number of periods in the cashflow is to be entered to cell K83 of the worksheet; this number will be transferred to the

Table 2A. Quantities of Raw Materials and Supplies by Class by Period

Project: PANAMA RICE MILL

Total Number of Periods: 30

Class of Input	Unit of Measure	Quantities Used by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th Onward
RAW MATERIAL PURCHASES:									
1. Rough Rice	MT		4385	4385	4385	4385	4385	4385	4385
2. _____									
3. _____									
4. _____									
5. _____									
6. _____									
		---	---	---	---	---	---	---	---
PRODUCTION SUPPLIES:									
1. Spare parts									
2. Packing materials	$ Cost		60	60	60	60	60	60	60
3. Lubricants, etc.									
4. Cleaners, etc.									
5. Light bulbs, etc.									
6. Other _____									
		---	---	---	---	---	---	---	---
FUEL AND ENERGY:									
1. Diesel & gasoline									
2. Natural gas									
3. Propane									
4. Coal, etc.									
5. Electric energy	$ Cost		14200	14200	14200	14200	14200	14200	14200
6. Other _____									
		---	---	---	---	---	---	---	---
OFFICE SUPPLIES:									
1. Paper, forms, etc.									
2. Ribbons, pens, etc.									
3. Cleaners, etc.									
4. Furniture, etc.									
5. Other _____									
		---	---	---	---	---	---	---	---
SERVICES AND SUBSCRIPTIONS:									
1. Phone, fax, etc.									
2. Postage, etc.									
3. Maint. contracts									
4. Journals & mag.									
5. Computer costs									
6. Other _____									
		---	---	---	---	---	---	---	---
OTHER OPERATIONAL INPUTS:									
1. _____									
2. _____									
3. _____									
		---	---	---	---	---	---	---	---

other two worksheets in Figure 5, as well as to all other worksheets in the total electronic spreadsheet, when the recalculation command is given. The entries to the A cells on lines 88 to 93 and 132 to 134, and those to the B cells on lines 102, 111, 119 and 128 will be transferred to the corresponding positions in Table 2B and Table 2C at recalculation also. The same is true for the units of measure in column C.

It will be noted that the only cells in Table 2A which contain entries for the Panama rice mill example are E88 through K88, E98 through K98, and E110 through K110. None of the other classes of input were applicable for the case. This will not be true for other ventures; there may be entries in any one or all of the classes included in the table. For those ventures which do not have nonzero entries in the occupied cells on lines 88, 98 and 110, do not forget to remove the entries for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase.

Now let us proceed to the various classes of inputs in the operation of the venture.

Raw material purchases by the venture are to be entered in cells D88 through K93 of Worksheet 2A, starting with the year when operations begin. Separate lines are provided for up to six different kinds of raw materials. The unit of measure for such services ordinarily will be in metric tons or other quantity measure. The purchase quantities can be taken from the projected operating schedules used to develop revenue projections for the venture.

Only those raw material lines in the worksheet which are needed for the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Production supplies for the venture include spare parts, packaging materials, lubricants, cleaning materials, light bulbs, etc., and an "Other" category. They are entered under the appropriate years in cells D97 to K102. Expenditures in the "Other" categegy can be identified by kind in cell B102. The appropriate unit of measure for some of the supplies can be physical quantities, but that for many of them probably will be the total monetary cost.

The needed quantities of the various production supplies can be taken directly from the estimated operating cost schedules for the venture.

Fuel and energy requirements include diesel fuel and gasoline, natural gas, propane, coal and other fosil fuels, electrical energy and "Other", the latter to be identified in cell B111 of the worksheet. The units of measure for each of these items will be entered to cells C106 to C111. The input quantities needed for the venture are taken directly from the estimated operating cost schedules. They are entered for the appropriate periods in the section bounded by cells D106 and K111.

Only lines in the worksheet for energy sources which are relevant to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case. A reminder that if the cells used for

the Panama rice mill case are not used for the venture of interest, don't forget to remove the rice mill numbers from cells E110 to K110.

Office supplies are entered for the appropriate operating periods in the section of the worksheet from D115 to K119. Separate entry lines are provided for paper, forms, etc., for ribbons, pens, etc., for cleaners, etc., for furniture, etc., and for "Other", the latter being identified in cell B119. Units of measure entered to cells C115 to C119 can be physical quantities, but for many items, entries will need to be total monetary expenditure.

The source of data for the office supplies entered to Table 2A is projected office expense component of the the operating cost estimate for the venture.

Services and subscriptions include those regular items which the venture will require. In the section of Table 2A bounded by cell D123 and cell K128, separate lines are provided for telephone, fax, etc., for postage, etc., for maintenance contracts, for journals and magazines, for computer costs, and for "Other", the latter being identified in cell C128. The unit of measure for such items is the total monetary cost in each line category, and the information is taken directly from the details of the office expense component of the operating cost estimate for the venture.

Other operational inputs will vary with the nature of the venture under study. For cases to which they apply, such items will be identified in cells A132 to A134, and the quantities entered in the appropriate operating periods in the range from cell D132 to cell K134.

Examples of other operational inputs for specific cases might include expenditures for market research and advertising, for equipment leases, for legal, financial and accounting services, etc. If the venture under study does not have operational inputs other than those already reflected in the above classes, then the entire section of other operational inputs will be left blank.

Unit Benefits to Linked Industries in Table 2B

Unit benefits corresponding to line items for which quantity entries are made to Table 2A are to be entered to Table 2B. Even though this worksheet as displayed for the Panama rice mill case contains entries in all cells, the entries are activated only when a quantity entry is made to the corresponding multiplier cell in Table 2A. For this reason it is not necessary to modify or erase values in Table 2B that do not relate to relevant quantities for the case at hand. These "dummy" values serve as useful guides to the functioning of the worksheet, and indicate the general magnitude of values that one can expect. The project name at the top of the worksheet, the identifications for the "Other" line items in columns M and N, and the units of measure in column O are completed automatically when the spreadsheet is recalculated.

It will be noted that unlike Table 2A, the unit value table does not contain columnar entries corresponding to the various operating periods. Instead the different columns from P to V contain data used to compute the net unit benefit shown in column W for each line item in the table. The net unit benefit then is applied to the quantities in all columns of Table 2A.

Table 2B. Unit Values of Operational Input Linkages by Class
Project: PANAMA RICE MILL

Class of Input	Unit of Measure	Project Price	Industry Margin	Added Profit	Excess Capacity	Fixed Cost	Variable Cost	Cost Factor	Unit Benefit
RAW MATERIAL PURCHASES:									
1. Rough Rice	MT	150.00	0.030	4.500	0	0.300	0.670	0.000	4.500
2. _____		1.00	0.097	0.097	5000	0.120	0.783	0.120	0.217
3. _____		1.00	0.130	0.130	1000	0.200	0.670	0.200	0.330
4. _____		1.00	0.106	0.106	1000	0.200	0.694	0.200	0.306
5. _____		1.00	0.086	0.086	1000	0.200	0.714	0.200	0.286
6. _____		1.00	0.091	0.091	1000	0.200	0.709	0.200	0.291
PRODUCTION SUPPLIES:									
1. Spare parts		200.00	0.150	30.000	1000	0.250	0.600	0.250	80.000
2. Packing materials	$ Cost	485.00	0.119	57.715	0	0.250	0.631	0.000	57.715
3. Lubricants, etc.		1.00	0.125	0.125	1000	0.250	0.625	0.250	0.375
4. Cleaners, etc.		1.00	0.115	0.115	0	0.250	0.635	0.000	0.115
5. Light bulbs, etc.		1.00	0.095	0.095	1000	0.250	0.655	0.250	0.345
6. Other _____		1.00	0.095	0.095	1000	0.250	0.655	0.250	0.345
FUEL AND ENERGY:									
1. Diesel & gasoline		1.00	0.070	0.070	5000	0.230	0.700	0.230	0.300
2. Natural gas		1.00	0.080	0.080	5000	0.230	0.690	0.230	0.310
3. Propane		1.00	0.090	0.090	5000	0.230	0.680	0.230	0.320
4. Coal, etc.		1.00	0.050	0.050	5000	0.230	0.720	0.230	0.280
5. Electric energy	$ Cost	1.00	0.020	0.020	0	0.230	0.750	0.000	0.020
6. Other _____		1.00	0.080	0.080	5000	0.230	0.690	0.230	0.310
OFFICE SUPPLIES:									
1. Paper, forms, etc.		1.00	0.100	0.100	1000	0.220	0.680	0.220	0.320
2. Ribbons, pens, etc.		1.00	0.100	0.100	1000	0.220	0.680	0.220	0.320
3. Cleaners, etc.		1.00	0.100	0.100	1000	0.220	0.680	0.220	0.320
4. Furniture, etc.		1.00	0.100	0.100	1000	0.220	0.680	0.220	0.320
5. Other _____		1.00	0.100	0.100	1000	0.220	0.680	0.220	0.320
SERVICES AND SUBSCRIPTIONS:									
1. Phone, fax, etc.		1.00	0.110	0.110	2000	0.210	0.680	0.210	0.320
2. Postage, etc.		1.00	0.110	0.110	2000	0.210	0.680	0.210	0.320
3. Maint. contracts		1.00	0.110	0.110	2000	0.210	0.680	0.210	0.320
4. Journals & mag.		1.00	0.110	0.110	2000	0.210	0.680	0.210	0.320
5. Computer costs		1.00	0.110	0.110	2000	0.210	0.680	0.210	0.320
6. Other _____		1.00	0.110	0.110	2000	0.210	0.680	0.210	0.320
OTHER OPERATIONAL INPUTS:									
1. _____		1.00	0.090	0.090	3000	0.230	0.680	0.230	0.320
2. _____		1.00	0.090	0.090	3000	0.230	0.680	0.230	0.320
3. _____		1.00	0.090	0.090	3000	0.230	0.680	0.230	0.320

Project prices for each of the line items are indicated in column P of Table 2B. These are the prices charged to the venture for each unit of the corresponding item. The price entry is 1.00 on items for which the unit of measure is the total monetary cost. It is something other than 1.00 for line items with units of measure such as cubic yards, person months, and metric tons. Prices paid for each item by the venture are taken directly from the details of the operating cost estimate.

Industry margins for each of the operating inputs are entered as decimal fractions in column Q of Table 2B. These prevailing margins for the various kinds of operating inputs (raw material purchases, production supplies, fuel and energy, offices supplies, etc.) usually can be found in industry trade association publications, trade and commerce reports, state offices of economic development and/or similar sources. Under competitive conditions they are market determined. They tend to be higher in the energy and services supplying industries than in those supplying agricultural raw materials, for example--say in the usual range of .10 to .12 in the former compared to that of .03 to .08 in the latter. They tend to be lower for those industries which are well established than for those kinds of industries which are not fully developed in the area.

It should be noted again that the industry margins in Table 2B need to be changed only on those rows corresponding to nonzero entries in Table 2A. The rest need not be changed.

Added profit for each line item shown in column R is computed by formula, multiplying the price in column P by the margin in column Q. These values are computed automatically when the spreadsheet is recalculated. The cells in column R are protected so that the user cannot erase any of the formulas accidentally by typing a number into one of the cells.

Excess capacity in the industry supplying each of the line items in Table 2B is entered to column S. The values are entered as numbers of the units of measure entered to column O. These quantities are relevant because industries with excess capacity greater than or equal to the volume needed for the venture under study need recover only variable costs of supplying the venture. Those without available capacity must recover both fixed and variable costs of providing the input to the venture; this is true because they will have to make additional investment in order to handle the added volume.

Available capacities in the various industries supplying operating inputs in the area can be obtained from reports by trade associations, departments of commerce, economic development agencies and similar sources. Ordinarily, ventures which require volumes of input representing a small percentage of total volume for the industry will not tax existing capacities. Ventures which need large quantities of particular operating inputs may require further capital investment on the part of the supplying industries.

Fixed cost as decimal fraction of the supply price for each operating input item is entered to column T of Table 2B. This information also is available from reports by trade associations and departments of commerce. The fixed cost component of the supply price can be .5 or greater for high-technology capital-intensive industries such as those for production supplies and energy inputs. At the other extreme, fixed costs may be only .2 or .3 of the supply price in

labor intensive industries such as production agriculture in developing countries.

Again the user is reminded that revised entries to column T of Table 2B need to be made only on rows to which nonzero entries were made in Table 2A. The existing entries on all other lines of column T can remain as they are.

Variable cost as decimal fraction of the supply price shown in column U of Table 2B is computed by the spreadsheet as 1.0 minus the industry margin (column Q) minus the fixed cost (column T). No entries are to be made in this column by the user. The correct values are computed automatically when the spreadsheet is recalculated by pressing the <F9> key.

Cost factors for each of the line entries in Table 2B are shown in column V. These values are inserted by spreadsheet formula also. They are set equal to the fixed cost in column T if excess capacity is shown in column S; otherwise they are set equal to 0.00. All of the cells in column V are protected so that the formulas cannot be lost by accidentally inserting numercial entries.

Unit benefits for each of the operating inputs as calculated by the spreadsheet are shown in column W of Table 2B. The formula for these cells is the supply price (column P) multiplied by the sum of the industry margin (column Q) plus the cost factor (column V). The values in this column are computed automatically when the spreadsheet is recalculated.

The labels, data entries and formulas for Table 2B are illustrated by the reproduction of the worksheet cell formulas in Appendix I.

Associated Benefits from Operating Input Linkages in Table 2C

Linkage benefits from operating inputs to the venture are given in Table 2C. All values in this worksheet are computed by cell formula from the entries to the corresponding cells in Tables 2A and 2B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 2C are illustrated in Appendix II. The project name at the top of the worksheet, the total periods in cell AH84, and the identifications for the "Other" line items in columns Y and Z also are completed automatically when the spreadsheet is recalculated. The monetary unit of measure in cell AA85 at the top of the worksheet (e.g., Dollars) in Table 2C is generated internally as well.

It will be noted that Table 2C follows exactly the same format as Table 2A, with the different classed of operating inputs extending from rows 87 to 136, and the various construction periods extending from column AB to column AJ. Because they are determined by cell formula, all values in Table 2C are zero except those corresponding to nonzero entries to Table 2A.

As illustrated in Appendix II, each value in Table 2C is the product of the quantity in Table 2A and the unit benefit value in column W of Table 2B. The cell formula for cell AB88 is as follows, for example:

Table 2C. Linkage Benefits from Operational Inputs by Period

Project: PANAMA RICE MILL

Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
		Unit =		Linkage Benefits by Period			Total Periods:		30		
Class of Input		Dollars	1st	2nd	3rd	4th	5th	6th	7th	8th On	Total
RAW MATERIAL PURCHASES:											
1. Rough Rice			0	19,733	19,733	19,733	19,733	19,733	19,733	19,733	572,243
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. _____			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. _____			0	0	0	0	0	0	0	0	0
			0	19,733	19,733	19,733	19,733	19,733	19,733	19,733	572,243
PRODUCTION SUPPLIES:											
1. Spare parts			0	0	0	0	0	0	0	0	0
2. Packing materials			0	3,463	3,463	3,463	3,463	3,463	3,463	3,463	100,424
3. Lubricants, etc.			0	0	0	0	0	0	0	0	0
4. Cleaners, etc.			0	0	0	0	0	0	0	0	0
5. Light bulbs, etc.			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	3,463	3,463	3,463	3,463	3,463	3,463	3,463	100,424
FUEL AND ENERGY:											
1. Diesel & gasoline			0	0	0	0	0	0	0	0	0
2. Natural gas			0	0	0	0	0	0	0	0	0
3. Propane			0	0	0	0	0	0	0	0	0
4. Coal, etc.			0	0	0	0	0	0	0	0	0
5. Electric energy			0	284	284	284	284	284	284	284	8,236
6. Other _____			0	0	0	0	0	0	0	0	0
			0	284	284	284	284	284	284	284	8,236
OFFICE SUPPLIES:											
1. Paper, forms, etc.			0	0	0	0	0	0	0	0	0
2. Ribbons, pens, etc.			0	0	0	0	0	0	0	0	0
3. Cleaners, etc.			0	0	0	0	0	0	0	0	0
4. Furniture, etc.			0	0	0	0	0	0	0	0	0
5. Other _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
SERVICES AND SUBSCRIPTIONS:											
1. Phone, fax, etc.			0	0	0	0	0	0	0	0	0
2. Postage, etc.			0	0	0	0	0	0	0	0	0
3. Maint. contracts			0	0	0	0	0	0	0	0	0
4. Journals & mag.			0	0	0	0	0	0	0	0	0
5. Computer costs			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
OTHER OPERATIONAL INPUTS:											
1. _____			0	0	0	0	0	0	0	0	0
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0

@IF($S88>=D88,D88*$W88,(D88-$S88)*$R88+$S88*$W88).

The formula checks to see that available capacity in the industry is sufficient to serve the volume of the venture; if so, it calculates the benefit as the quantity used by the venture (cell D88) times the total unit benefit (cell W88). Otherwise, it calculates the benefit as the difference between the volume needed for the venture (D88) and the available capacity (S88) multiplied by the added profit (R88) plus the available capacity (S88) multiplied by the total unit benefit (W88).

Totals by class of operating input and by projected period are calculated by the worksheet as well. For example, the value for the Panama rice mill case for total raw material purchases in the 2nd period of $19,733 is the sum of the calculated values in cells AC88 through AC93 (all of which are zero in this case except for the purchases of rough rice on line 88).

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration (pushing <F9> once) is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets are printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It may also be necessary to narrow the left and right margins slightly from the 1-inch default values.

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 2A, Table 2B and Table 2C, it is necessary to recalculate the spreadsheet after each worksheet is printed. Then when the font, line spacing, and margin settings are made, printing is done with standard spreadsheet print commands. For example, Table 2C is printed by typing / P[rint] P[rinter] R[ange] 2C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION VI

ESTIMATING IMPACTS THROUGH PRODUCT AND SERVICE OUTPUT LINKAGES

The set of worksheets for estimating the impacts of the venture through the marketing and distribution of product outputs occupies the section of the electronic spreadsheet extending from row 141 to row 200 (see Figure 3, page 23). The quantities worksheet, Table 3A, occupies columns A to K; the unit values worksheet, Table 3B, occupies columns M to W, and the output linkage benefit worksheet, Table 3C, occupies columns Y to AJ.

If the ASSOCBEN spreadsheet already has been retrieved from disk file to computer memory in connection with the construction impact or operating input worksheets, then one can proceed directly to worksheet 3A by the spreadsheet command <F5> 3A <return>. If the spreadsheet currently is not in memory, then one first needs to retrieve the spreadsheet file. The steps for doing so are outlined on page 29, above. If the spreadsheet has been saved under a name other than ASSOCBEN, the new name needs to be included in the retrieval command, e.g., **RUN ASSOCBEN** ASSOC1ST <return>.

Layout of Worksheets for Estimating Impacts of Product Output

The layout of the three worksheets for estimating the impacts of the venture through product output linkages is shown in Figure 6. Table 3A for entry of quantities of product outputs by classification in each projected period is located in the left block from cell A141 to cell K155. Table 3B for entry of the unit values of product output linkages is in the center section from cell M141 to cell W200. Table 3C showing calculated output linkage benefits is located in the right section from cell Y141 to cell AJ200.

The Table 3B and Table 3C worksheets contain six levels of product distribution covering all phases of marketing and distribution. Assembly and storage appear on lines 147 through 155. Wholesaling and transport appear on lines 156 through 164. Processing and packaging appear on lines 165 through 173. Retail distribution is shown on lines 174 through 182. Other distribution appears on lines 183 through 191. Total distribution is shown on lines 192 through 200.

While the unit values worksheet, Table 3B, contains these line items, its columns represent factors used to compute the unit benefits of the line items rather than the projected periods in the cashflow. Project price appears in column P. Industry margin is in column Q. Added profit is presented in column R, excess capacity in column S, fixed cost in column T, and variable cost in column U. The cost factor for each line item is in column V, and the computed unit benefit for the item is listed in column W.

Figure 6 provides a convenient reference for locating specific steps in the marketing system for project outputs when reviewing the quantities, unit values and output linkage impacts for the venture of interest. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 3A through 3C in connection with the venture, or when assessing the impacts of another venture.

Table 3A Quantities of Project Output to Be Marketed by Period	Table 3B Unit Values of Operational Output Linkages by Product	Table 3C Linkage Benefits from Operational Outputs by Period
PROJECT OUTPUTS D148..K153	PROJECT PRICE P148..P200	ASSEMBLY & STORAGE AB148..AJ153
	INDUSTRY MARGIN Q148..Q200	WHOLESALING & TRANSPORT AB157..AJ162
	ADDED PROFIT R148..R200	PROCESSING & PACKAGING AB166..AJ171
	EXCESS CAPACITY S148..S200	RETAIL DISTRIBUTION AB175..AJ180
	FIXED COST T148..T200	OTHER DISTRIBUTION AB184..AJ189
	VARIABLE COST U148..U200	TOTAL DISTRIBUTION AB193..AJ198
	COST FACTOR V148..V200	
	UNIT BENEFIT W148..W200	

Figure 6. Layout of Worksheets for Estimating Impacts of Product Outputs

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Quantities of Product Outputs by Class in Table 3A

Table 3A serves as the starting point for projecting the associated benefits from product output linkages for the venture. The title of the venture need not be entered to cell F142 because it is transferred automatically when the spreadsheet is recalculated. The product identification entries to the A cells and the units

Table 3A. Quantities of Project Outputs to Be Marketed by Period
Project: PANAMA RICE MILL

A	B	C	D	E	F	G	H	I	J	K
Product		Unit of Measure	Quantities Marketed by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th Onward
1. Milled Rice		MT		2850	2850	2850	2850	2850	2850	2850
2. Rice Bran		MT		325.3	325.3	325.3	325.3	325.3	325.3	325.3
3.										
4.										
5.										
6.										
			---	---	---	---	---	---	---	---

of measure in the C cells on lines 148 to 153 will be transferred to the appropriate sections of Tables 3B and 3C when the spreadsheet is recalculated.

It will be noted that the only cells in Table 3A which contain entries for the Panama rice mill example are E148 through K148 and E149 through K149. There are no other product outputs for the Panama rice mill. This will not be true for other ventures; there may be entries on up to the six product output lines available in the table. For those ventures which do not have nonzero entries in the occupied cells on lines 148 and 149, do not forget to remove the entries for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase].

Now let us proceed to the various levels of market distribution through which product output linkage benefits can be generated. These are not illustrated by Table 3A, but are shown in both Table 3B and Table 3C.

Assembly and storage functions for the product outputs of the venture occupy lines 148 through 153 of Worksheets 3B and 3C. Separate lines are provided for up to six different kinds of output. The unit of measure for the outputs ordinarily will be metric tons or other quantity measure. The sales quantities can be taken from the projected sales schedules used to develop revenue projections for the venture.

Only those product lines in the worksheets which apply to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Wholesaling and transport together with related functions for the outputs of the venture occupy lines 157 through 162 of the worksheets. The output quantity entries from lines 148 through 153 in Table 3A are applied automatically to the unit values in this section of Table 3B to obtain the projected benefits for the category in Table 3C.

Processing and packaging functions for the outputs of the venture occupy lines 166 through 171 of the worksheets. The output quantity entries from lines 148 through 153 in Table 3A also are applied automatically to the unit values in this section of Table 3B to obtain the projected benefits for the category in Table 3C.

Retail distribution for the outputs of the venture occupies lines 175 through 180 of the worksheets. The output quantity entries from lines 148 through 153 in Table 3A also are applied automatically to the unit values in this section of Table 3B to obtain the projected benefits for the category in Table 3C.

Other distribution functions for the outputs of the venture occupy lines 184 through 189 of the worksheets. The output quantity entries from lines 148 through 153 in Table 3A also are applied automatically to the unit values in this section of Table 3B to obtain the projected benefits for the category in Table 3C.

Total distribution of the outputs of the venture through the complete marketing system from the docks of the plant to the final user appear on lines 193 through 198 of Tables 3B and 3C. The values in this section represent totals of those

Table 3B. Unit Values of Operational Output Linkages by Product
Project: PANAMA RICE MILL

Market Level & Product	Unit of Measure	Purchase Price	Average Markup	Profit Margin	Excess Capacity	Fixed Cost	Variable Cost	Cost Factor	Unit Benefit
ASSEMBLY & STORAGE:									
1. Milled Rice	MT	140.0	0.040	0.150	3000	0.300	0.550	0.300	2.520
2. Rice Bran	MT	98.5	0.045	0.140	5000	0.120	0.640	0.120	1.152
3. _____		165.0	0.037	0.135	5000	0.250	0.615	0.250	2.350
4. _____		105.0	0.035	0.135	3000	0.285	0.580	0.285	1.544
5. _____		170.0	0.044	0.140	1000	0.308	0.552	0.308	3.351
6. _____		125.0	0.029	0.140	0	0.295	0.565	0.000	0.508
WHOLESALING & TRANSPORT:									
1. Milled Rice	MT	145.6	0.032	0.145	3000	0.264	0.591	0.264	1.906
2. Rice Bran	MT	102.9	0.029	0.152	4000	0.253	0.595	0.253	1.209
3. _____		171.1	0.025	0.150	2500	0.221	0.629	0.221	1.587
4. _____		108.7	0.027	0.135	0	0.295	0.570	0.000	0.396
5. _____		177.5	0.028	0.145	4500	0.275	0.580	0.275	2.087
6. _____		128.6	0.030	0.140	3700	0.233	0.627	0.233	1.439
PROCESSING & PACKAGING:									
1. Milled Rice	MT	150.3	0.110	0.110	6000	0.350	0.540	0.350	7.603
2. Rice Bran	MT	105.9	0.105	0.105	6000	0.290	0.605	0.290	4.393
3. _____		175.4	0.092	0.100	7000	0.276	0.624	0.276	6.067
4. _____		111.6	0.104	0.112	8500	0.305	0.583	0.305	4.840
5. _____		182.4	0.120	0.110	6500	0.238	0.652	0.238	7.619
6. _____		132.5	0.123	0.108	5000	0.345	0.547	0.345	7.382
RETAIL DISTRIBUTION:									
1. Milled Rice	MT	166.8	0.080	0.095	3000	0.155	0.750	0.155	3.336
2. Rice Bran	MT	117.0	0.085	0.100	3000	0.278	0.622	0.278	3.760
3. _____		191.5	0.085	0.105	4000	0.176	0.719	0.176	4.574
4. _____		123.2	0.078	0.090	5000	0.190	0.720	0.190	2.691
5. _____		204.3	0.082	0.097	3000	0.200	0.703	0.200	4.977
6. _____		148.8	0.090	0.100	2000	0.235	0.665	0.235	4.486
OTHER DISTRIBUTION:									
1. Milled Rice	MT	180.1	0.000	0.090	5000	0.200	0.000	0.200	0.000
2. Rice Bran	MT	127.0	0.000	0.090	5000	0.200	0.000	0.200	0.000
3. _____		207.8	0.000	0.090	5000	0.200	0.000	0.200	0.000
4. _____		132.8	0.000	0.090	5000	0.200	0.000	0.200	0.000
5. _____		221.1	0.000	0.090	5000	0.200	0.000	0.200	0.000
6. _____		162.2	0.000	0.090	5000	0.200	0.000	0.200	0.000
TOTAL DISTRIBUTION:									
1. Milled Rice	MT	140.0		40.131					15.364
2. Rice Bran	MT	98.5		28.487					10.515
3. _____		165.0		42.797					14.579
4. _____		105.0		27.827					9.471
5. _____		170.0		51.100					18.034
6. _____		125.0		37.169					13.814

for the five sections shown above in the worksheets. They are computed internally by the spreadsheet without need for additional entry by the user.

Unit Benefits to Linked Industries in Table 3B

Unit benefits at the various levels in the product distribution system are to be entered to Table 3B. Even though this worksheet as displayed for the Panama rice mill case contains entries in all cells, the entries are activated only when quantity entries are made to the product multiplier cells in Table 3A. For this reason it is not necessary to modify or erase values in Table 3B that do not relate to relevant quantities for the case at hand. These "dummy" values serve as useful guides to the functioning of the worksheet, and indicate the general magnitude of values that one can expect. The project name at the top of the worksheet, the identifications for the products in column M and the units of measure in column O are completed automatically when the spreadsheet is recalculated.

It will be noted that unlike Tables 3A and 3C, the unit value table does not contain columnar entries corresponding to the various operating periods. Instead the different columns from P to V contain data used to compute the net unit benefit shown in column W for each line item in the table. The net unit benefit then is applied to the quantities in all columns of Table 3A.

Purchase prices for each of the line items are indicated in column P of Table 3B. Those in the upper section of the table on lines 148 to 153 are prices received by the venture for products sold. Those in the next section on lines 157 to 162 are calculated by adding the average markup from the previous level to the price at that previous level. The average markups at each level are listed in column Q of Table 3B. The same procedure is followed through all stages of marketing and distribution, down through those for other distribution shown on lines 184 through 189.

Prices received by the venture for each item are taken directly from the projected sales revenue schedule.

Average markups at each level in the marketing systems for the products of the venture are entered to column Q of Table 3B. These prevailing markups for the various products by marketing level usually can be found in industry trade association publications, trade and commerce reports, state offices of economic development and/or similar sources. They are related to the industry margins used in Tables 1B and 2B, but they are applied to the cost price rather than to the sales price at each level. The markup entries are made in terms of the decimal fraction of the procurement price represented by the price spread between purchase and sale at each level in the marketing system. For example, the entry of .04 shown in cell Q148 is applied to the project price of 140 to establish the sales price at that level of 145.60 (the computed purchase price at the next level).

It should be noted again that the average markups in Table 3B need to be changed only for the product lines corresponding to nonzero entries in Table 3A. The rest need not be changed.

Profit margins for each line item and marketing level are entered as decimal fractions of the spread between cost price and sales price in column R of Table 3B. As with the prevailing markups, the profit margins by marketing level usually can be found in trade association publications, trade and commerce reports by national, state and local agencies. Profit margins are determined by industry characteristics and competitive conditions. They tend to be relatively low in well-established high-volume sectors, and highest in situations characterized by rapid change and substantial risk.

Excess capacity in the marketing industries at each level in the distribution systems for the products of the venture under study is to be entered to column S of Table 3B. The values are entered as numbers of the units of measure shown in column O. These quantities are relevant because industries with excess capacity greater than or equal to the volume needed for the venture under study need recover only variable costs of supplying the venture. Those without available capacity must recover both fixed and variable costs of providing the input to the venture; this is true because they will have to make additional investment in order to handle the added volume.

Available capacities at the various levels of the marketing system can be obtained from reports by trade associations, departments of commerce, economic development agencies and similar sources. Ordinarily, ventures producing output representing a small share of the total market do not tax existing capacities. Ventures turning out specialized products which can represent a major share of the total market may require further capital investment on the part of the marketing industries at one or more levels in the system.

Fixed cost as decimal fraction of the price spread at each level in the marketing system is entered to column T of Table 3B. This information also is available from reports by trade associations and departments of commerce. The fixed cost can represent .4 or more of the price spread for high-technology capital-intensive marketing agencies such as those doing multimodal shipping. At the other extreme, fixed costs may be only .2 or .3 of the price spread in labor intensive marketing functions such as house-to-house retailing.

Again the user is reminded that revised entries to column T of Table 3B need to be made only on rows corresponding to product entries in Table 3A. The existing entries on all other lines of column T can remain as they are.

Variable cost as decimal fraction of the price spread at each market level shown in column U of Table 3B is computed by the spreadsheet as 1.0 minus the industry profit margin (column R) minus the fixed cost (column T). No entries are to be made in this column by the user. The correct values are computed automatically when the spreadsheet is recalculated by pressing the <F9> key.

Cost factors for each of the line entries in Table 3B are shown in column V. These values are inserted by spreadsheet formula also. They are set equal to the fixed cost in column T if excess capacity is shown in column S; otherwise they are set equal to 0.00. All of the cells in column V are protected so that the formulas cannot be lost by accidentally inserting numerical entries.

Unit benefits for each of the operating inputs as calculated by the spreadsheet are shown in column W of Table 3B. The formula for these cells is the purchase price (column P) multiplied by the average markup (column Q) multiplied by the sum of the profit margin (column R) and the cost factor (column V). The values in this column are computed automatically when the spreadsheet is recalculated.

The labels, data entries and formulas for Table 3B are illustrated by the reproduction of the worksheet cell formulas in Appendix I.

Associated Benefits from Output Linkages in Table 3C

Associated benefits from linkages of product outputs through the marketing system are given in Table 3C. All values in this worksheet are computed by cell formula from the entries in Tables 3A and 3B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 3C are illustrated in Appendix II. The project name at the top of the worksheet, the total periods in cell AH144, and the identifications for the product outputs in columns Y and Z also are completed automatically when the spreadsheet is recalculated. The monetary unit of measure in cell AA145 at the top of the worksheet (e.g., Dollars) in Table 3C is generated internally as well.

It will be noted that Table 3C follows the columnar organization of Table 3A and the line organization of Table 3B. Because they are determined by cell formula, all values in Table 3C are zero except those corresponding to nonzero entries to Table 3A.

As illustrated in Appendix II, each value in Table 3C is the product of the quantity in Table 3A and the unit benefit value in column W of Table 3B. The cell formula for cell AB148 is as follows, for example:

@IF($S148>=D148,D148*$W148,(D148-$S148)*$R148+$S148*$W148).

The formula checks to see that available capacity in the industry is sufficient to serve the volume of the venture; if so, it calculates the benefit as the quantity marketed by the venture (cell D148) times the total unit benefit (cell W148). Otherwise, it calculates the benefit as the difference between the volume sold by the venture (D148) and the available capacity (S148) multiplied by the profit margin (R148) plus the available capacity (S148) multiplied by the total unit benefit (W148).

Totals by class of operating input and by projected period are calculated by the worksheet as well. For example, the value for the Panama rice mill case for total assembly and storage in the 2nd period of $7,557 is the sum of the calculated values in cells AC148 through AC153 (all of which are zero in this case except for milled rice and rice bran sales on lines 148 and 149).

Table 3C. Linkage Benefits from Operational Outputs by Period
Project: PANAMA RICE MILL

Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
		Unit =		Linkage Benefits by Period			Total Periods:		30		
Market Level & Product		Dollars	1st	2nd	3rd	4th	5th	6th	7th	8th On	Total
ASSEMBLY & STORAGE:											
1. Milled Rice			0	7,182	7,182	7,182	7,182	7,182	7,182	7,182	208,278
2. Rice Bran			0	375	375	375	375	375	375	375	10,872
3. _____			0	0	0	0	0	0	0	0	0
4. _____			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. _____			0	0	0	0	0	0	0	0	0
			0	7,557	7,557	7,557	7,557	7,557	7,557	7,557	219,150
WHOLESALING & TRANSPORT:											
1. Milled Rice			0	5,431	5,431	5,431	5,431	5,431	5,431	5,431	157,499
2. Rice Bran			0	393	393	393	393	393	393	393	11,405
3. _____			0	0	0	0	0	0	0	0	0
4. _____			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. _____			0	0	0	0	0	0	0	0	0
			0	5,824	5,824	5,824	5,824	5,824	5,824	5,824	168,904
PROCESSING & PACKAGING:											
1. Milled Rice			0	21,669	21,669	21,669	21,669	21,669	21,669	21,669	628,397
2. Rice Bran			0	1,429	1,429	1,429	1,429	1,429	1,429	1,429	41,442
3. _____			0	0	0	0	0	0	0	0	0
4. _____			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. _____			0	0	0	0	0	0	0	0	0
			0	23,098	23,098	23,098	23,098	23,098	23,098	23,098	669,839
RETAIL DISTRIBUTION:											
1. Milled Rice			0	9,507	9,507	9,507	9,507	9,507	9,507	9,507	275,700
2. Rice Bran			0	1,223	1,223	1,223	1,223	1,223	1,223	1,223	35,475
3. _____			0	0	0	0	0	0	0	0	0
4. _____			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. _____			0	0	0	0	0	0	0	0	0
			0	10,730	10,730	10,730	10,730	10,730	10,730	10,730	311,175
OTHER DISTRIBUTION:											
1. Milled Rice			0	0	0	0	0	0	0	0	0
2. Rice Bran			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. _____			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
TOTAL DISTRIBUTION:											
1. Milled Rice			0	43,789	43,789	43,789	43,789	43,789	43,789	43,789	1269874
2. Rice Bran			0	3,420	3,420	3,420	3,420	3,420	3,420	3,420	99,193
3. _____			0	0	0	0	0	0	0	0	0
4. _____			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. _____			0	0	0	0	0	0	0	0	0
			0	47,209	47,209	47,209	47,209	47,209	47,209	47,209	1369068

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets can be printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It also may be necessary to narrow the left and right margins slightly from the 1-inch default values.

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 3A, Table 3B and Table 3C, it is necessary to recalculate the spreadsheet (by pushing <F9>) after each worksheet is printed. Then when the font, line spacing, and margin settings are made, printing is done with standard spreadsheet print commands. For example, Table 3C is printed by typing / P[rint] P[rinter] R[ange] 3C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION VII

ESTIMATING IMPACTS OF PERSONNEL TRAINING

The set of worksheets for estimating the impacts of the venture through personnel training occupies the section of the electronic spreadsheet extending from row 206 to row 265 (see Figure 3, page 23). The worksheet for numbers trained, Table 4A, occupies columns A to K; the worksheet for added earning power, Table 4B, occupies columns M to W, and the training benefit worksheet, Table 4C, occupies columns Y to AJ.

If the ASSOCBEN spreadsheet already has been retrieved from disk file to computer memory in connection with the previous worksheets, then one can proceed directly to worksheet 4A by the spreadsheet command <F5> 4A <return>. If the spreadsheet currently is not in memory, then one first needs to retrieve the spreadsheet file. The steps for doing so are outlined on page 29, above. If the spreadsheet has been saved under a name other than ASSOCBEN, the new name needs to be included in the retrieval command, e.g., RUN ASSOCBEN ASSOC1ST <return>.

Layout of Worksheets for Estimating Impacts of Personnel Training

The layout of the three worksheets for estimating the impacts of the venture through personnnel training programs is shown in Figure 7. Table 4A for entry of numbers of persons trained by classification in each projected period is located in the left block from cell A206 to cell K265. Table 4B for entry of trainees' earning rates before and after training is in the center section from cell M206 to cell W256. Table 4C showing calculated associated benefits from training programs is located in the right section from cell Y206 to cell AJ265.

The Table 4A and Table 4C worksheets contain six categories of operating functions for which personnel may need training. Buying and receiving appear on lines 213 through 218. Plant operations appear on lines 222 through 227. Packing and shipping appear on lines 231 through 236. Marketing and distribution are shown on lines 240 through 245. Office and other functions appear on lines 249 through 254. Total operations for the venture appear on lines 258 through 263.

While the worksheet for comparative earning rates, Table 4B, contains these same line items, its columns represent factors used to compute the unit training benefits of the line items rather than the projected periods in the cashflow. Project wage appears in column P. Prior wage is in column R. Wage increase is presented in column T, average age in column U, years of benefit in column V, and training benefit in column W.

Figure 7 provides a convenient reference for locating specific labor classifications requiring training, numbers to be trained, increased wage earning power after training and training benefits for the venture. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 4A through 4C in connection with the venture, or when assessing the impacts of another venture.

Table 4A Numbers of Persons Trained by Labor Classification	Table 4B Earning Rates Before and After Training by Class	Table 4C Associated Benefits from Training Programs by Period
BUYING & RECEIVING D213..K218	PROJECT WAGE P213..P254	BUYING & RECEIVING AB213..AJ218
PLANT OPERATIONS D222..K227	PRIOR WAGE R213..R254	PLANT OPERATIONS AB222..AJ227
PACKING & SHIPPING D231..K236	WAGE INCREASE T213..T254	PACKING & SHIPPING AB231..AJ236
MARKETING & DISTRIBUTION D240..K245	AVERAGE AGE U213..U254	MARKETING & DISTRIBUTION AB240..AJ245
OFFICE & OTHER D249..K254	YEARS OF BENEFIT V213..V254	OFFICE & OTHER AB249..AJ254
TOTAL OPERATIONS D258..K263	TRAINING BENEFIT W213..W254	TOTAL OPERATIONS AB258..AJ263

Figure 7. Layout of Worksheets for Estimating Personnel Training Impacts

Numbers of Persons Trained by Class in Table 4A

Table 4A serves as the starting point for projecting the associated benefits from training programs by the venture. The title of the venture need not be entered to cell F207 because it is transferred automatically when the spreadsheet is recalculated. No product identification entries nor units of measure are needed for this table.

It will be noted that the only cell in Table 4A which contains entry for the Panama rice mill example is D224. There are no trainees for any other positions in the Panama rice mill. This will not be true for other ventures; there may be entries on up to the six labor classification lines available in each of the five functions included in the table. For those ventures which do not have a nonzero entry in the occupied cell on line 224, do not forget to remove the entry for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase].

Table 4A. Numbers of Persons Trained by Labor Classification by Period

Project: PANAMA RICE MILL

Function & Classification	Numbers Trained by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th Onward
BUYING & RECEIVING:								
1. Managerial								
2. Supervisory								
3. Skilled								
4. Semi-Skilled								
5. Unskilled								
6. Casuals								
PLANT OPERATIONS:								
1. Managerial								
2. Supervisory								
3. Skilled	2							
4. Semi-Skilled								
5. Unskilled								
6. Casuals								
PACKING & SHIPPING:								
1. Managerial								
2. Supervisory								
3. Skilled								
4. Semi-Skilled								
5. Unskilled								
6. Casuals								
MARKTG & DISTRIBUTION:								
1. Managerial								
2. Supervisory								
3. Skilled								
4. Semi-Skilled								
5. Unskilled								
6. Casuals								
OFFICE & OTHER:								
1. Managerial								
2. Supervisory								
3. Skilled								
4. Semi-Skilled								
5. Unskilled								
6. Casuals								
TOTAL OPERATIONS:								
1. Managerial	0	0	0	0	0	0	0	0
2. Supervisory	0	0	0	0	0	0	0	0
3. Skilled	2	0	0	0	0	0	0	0
4. Semi-Skilled	0	0	0	0	0	0	0	0
5. Unskilled	0	0	0	0	0	0	0	0
6. Casuals	0	0	0	0	0	0	0	0

Now let us proceed to the various operating functions for which preservice training of future employees may be needed to be assured of the skill levels required for effective performance. These are illustrated by Table 4A.

Buying and receiving functions for venture occupy lines 213 through 218 of Worksheets 4A, 4B and 4C. Separate lines are provided for up to six employment classifications, ranging from managerial to casuals. The numbers to be trained in each classification can be taken from the personnel development and training plan for the venture.

Only those classification lines in the worksheets which apply to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Plant operations functions for the venture occupy lines 222 through 227 of the worksheets. The numbers to be trained by labor classification for this function also can be taken directly from the personnel development and training plan outlined in connection with the feasibility study for the venture of interest.

Packing and shipping functions may require personnel training in one or more of the six labor classifications shown Table 4A. If so the numbers trained will be entered to the range from D231 to K236 of the worksheet.

Marketing and distribution functions which require personnel training will mean entries to the appropriate classifications on lines 240 through 245 of Worksheet 4A. As with the numbers to be trained for the other functions, the numbers of trainees can be taken directly from the personnel development and training plan for the venture.

Office and other functions may require no training beyond skill levels available in the labor market place; however, if training is required in any of the six classifications, the numbers of trainees from the training plan are entered to the appropriate lines and columns of the D249..K254 range.

Total operations shown in the lower section of Table 4A require no additional entries by the user; the total numbers of future employees to be trained for this section are computed by cell formula and inserted automatically to the proper cell in the D258 to K263 range of the worksheet.

The trainee number entries in Worksheet 4A are applied automatically to the unit training benefits in Table 4B to obtain the projected benefits from training programs in Table 4C.

Increased Earning Rates after Training in Table 4B

Earning rates before and after training, increased earning rates, average age of trainees, years of training benefits, and total training benefits per trainee are included in Table 4B. The Panama rice mill case example contains entries in

Table 4B. Earning Rates Before and After Training by Classification
Project: PANAMA RICE MILL

Function & Classification	Unit = Man Yr.	Project Wage	Prior Wage	Wage Increase	Average Age	Years of Benefit	Training Benefit
BUYING & RECEIVING:							
1. Managerial		48,000	38,000	10,000	40	25.0	250,000
2. Supervisory		36,000	25,000	11,000	38	27.0	297,000
3. Skilled		30,000	22,000	8,000	32	33.0	264,000
4. Semi-Skilled		24,000	17,500	6,500	30	35.0	227,500
5. Unskilled		15,000	12,500	2,500	22	43.0	107,500
6. Casuals		14,400	12,500	1,900	22	43.0	81,700
PLANT OPERATIONS:							
1. Managerial		48,000	35,000	13,000	44	21.0	273,000
2. Supervisory		36,000	28,000	8,000	40	25.0	200,000
3. Skilled		30,000	23,500	6,500	35	30.0	195,000
4. Semi-Skilled		24,000	20,000	4,000	33	32.0	128,000
5. Unskilled		15,000	12,500	2,500	28	37.0	92,500
6. Casuals		14,400	11,500	2,900	25	40.0	116,000
PACKING & SHIPPING:							
1. Managerial		48,000	40,000	8,000	45	20.0	160,000
2. Supervisory		36,000	26,000	10,000	40	25.0	250,000
3. Skilled		30,000	23,000	7,000	37	28.0	196,000
4. Semi-Skilled		24,000	17,500	6,500	32	33.0	214,500
5. Unskilled		15,000	13,000	2,000	27	38.0	76,000
6. Casuals		14,400	12,000	2,400	24	41.0	98,400
MARKTG & DISTRIBUTION:							
1. Managerial		48,000	39,000	9,000	42	23.0	207,000
2. Supervisory		36,000	28,000	8,000	40	25.0	200,000
3. Skilled		30,000	22,750	7,250	34	31.0	224,750
4. Semi-Skilled		24,000	18,000	6,000	30	35.0	210,000
5. Unskilled		15,000	14,000	1,000	28	37.0	37,000
6. Casuals		14,400	13,500	900	22	43.0	38,700
OFFICE & OTHER:							
1. Managerial		48,000	37,500	10,500	43	22.0	231,000
2. Supervisory		36,000	29,000	7,000	40	25.0	175,000
3. Skilled		30,000	23,500	6,500	37	28.0	182,000
4. Semi-Skilled		24,000	18,600	5,400	32	33.0	178,200
5. Unskilled		15,000	11,750	3,250	29	36.0	117,000
6. Casuals		14,400	11,000	3,400	22	43.0	146,200

all cells, but the entries are activated only when numbers trained are entered to the multiplier cells in Table 4A. For this reason it is not necessary to modify or erase values in Table 4B that do not relate to training for the case at hand. These "dummy"values serve as useful guides to the functioning of the worksheet, and indicate the general magnitude of values that one can expect. The project name at the top of the worksheet is completed automatically when the spreadsheet is recalculated.

It will be noted that unlike Tables 4A and 4C, the earning rates table does not contain columnar entries corresponding to the various operating periods. Instead the different columns from P to V contain data used to compute the net training benefit shown in column W for each line item in the table. The net unit benefit then is applied to the corresponding numbers trained in all columns of Table 4A.

Project wages for each labor classification and operating function are indicated in column P of Table 4B. These wage rates for employment in the venture after training are taken directly from the labor cost schedules used in the internal feasibility study. The wages are stated in real terms per person year in each of the relevant classifications.

Prior wages of the trainees for each classification and function in the venture are entered to column R of Worksheet 4B, also in terms of earnings per person year. The prevailing previous earnings for trainees should reflect those for the lower job classification held, or for which qualified, before training. This information is available from employment and earnings reports released by federal, state and local departments of labor, and/or by trade associations for the kind of industry represented by the venture of interest.

It should be noted that the wage entries in Table 4B need to be changed only for the functions and labor classifications corresponding to nonzero entries in Table 4A. The rest need not be changed.

Wage increases for each line entry in column T of Table 4B are computed by cell formula, subtracting the prior wage in column R from the project wage after training in column P. Thus, all cells in column T are protected so that the formulas cannot be destroyed accidently by making an entry to them. Values in these cells are computed automatically by pushing the spreadsheet calculation key, <F9>.

Average ages of trainees in the different classifications and functions of the venture are entered to column U of the worksheet. This information is needed as basis for estimating the number of years into the future that training benefits can be projected. If candidates for the needed training have been selected, or will be selected from a known sub population, then the ages of trainees can be obtained directly. If candidates have not yet been identified, then reported average ages in job classifications appropriate for entry to the training can be used in column U of Table 4B.

Years of benefit shown in column V of Table 4B are computed by cell formula in each function and job classification for which training will be conducted. The formulas reflect an average retirement age of 65 years, so that the values shown are 65 minus the average age at training in column U.

It is recognized that many of those trained may move to other employment during the course of their remaining life, but years of tenure really are not relevant to the measurement of training benefits. Once a person has been trained from a prior skill level commanding annual salary of say $16,000 to a higher skill level commanding annual salary of say $20,000, a $4,000 annual training benefit has been created no matter where the person completing the training is employed, or how often that person may change jobs.

Training benefit per person trained in each classification and function is shown in column W of Table 4B. These values are computed by cell formula also, simply by applying the years of benefit in column V to the annual wage increase in column T. Even though computed values are shown in this column on all lines of the table for the Panama rice mill, only those matching nonzero entries for numbers to be trained in Table 4A are active in computing estimated training benefits for the venture in Table 4C.

Associated Benefits from Training Programs in Table 4C

Projected associated benefits from training programs for the venture are given in Table 4C. All values in this worksheet are computed by cell formula from the entries in Tables 4A and 4B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 4C are illustrated in Appendix II. The project name at the top of the worksheet, the total periods in cell AH209, and the identification of the monetary unit in cell AA210 are completed automatically when the spreadsheet is recalculated.

It will be noted that Table 4C follows the organization pattern of Table 4A with projected periods represented by successive columns. Because they are determined by cell formula, all values in Table 4C are zero except those on lines containing nonzero entries in Table 4A.

As illustrated in Appendix II, each value in Table 4C is the product of the numbers trained in Table 4A, the annual wage increase in Table 4B and the years of benefit in Table 4B. The cell formula for cell AE224 is as follows, for example:

+AD224+(F224*$T224), where AD224=AC224+(E224*$224), etc.

Thus the values on line 224 in all columns of Table 4C result from the entry of two persons completing training in the first period. Resulting training benefits start the second period and continue for 30 years (see column V, Table 4B). Annual benefits are given in columns AC through AI of Table 4C. The total for all 30 years is shown in 000s in column AJ on line 224.

Totals by operating function and by projected period are calculated by the worksheet as well. For example, the training benefit for the Panama rice mill case for total plant operation in the 2nd period of $13,000 is the sum of the calculated values in cells AC222 through AC227 (all of which are zero in this case except for skilled workers on line 224).

Table 4C. Associated Benefits from Training Programs by Period

Project: PANAMA RICE MILL

Function & Labor Class	Unit = Dollars	Training Benefits by Period: 1st	2nd	3rd	4th	Total Periods: 5th	6th	30 7th	8th On	Total (000)
BUYING & RECEIVING:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
PLANT OPERATIONS:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	13,000	13,000	13,000	13,000	13,000	13,000	13,000	390
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	13,000	13,000	13,000	13,000	13,000	13,000	13,000	390
PACKING & SHIPPING:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
MARKTG & DISTRIBUTION:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
OFFICE & OTHER:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
TOTAL OPERATIONS:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	13,000	13,000	13,000	13,000	13,000	13,000	13,000	390
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	13,000	13,000	13,000	13,000	13,000	13,000	13,000	390

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets can be printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It also may be necessary to narrow the left and right margins slightly from the 1-inch default values.

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 4A, Table 4B and Table 4C, it is necessary to recalculate the spreadsheet (by pushing <F9>) after each worksheet is printed. Then when the font, line spacing, and margin settings are made, printing is done with standard spreadsheet print commands. For example, Table 4C is printed by typing / P[rint] P[rinter] R[ange] 4C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION VIII

ESTIMATING EMPLOYMENT IMPACTS

The set of worksheets for estimating the impacts of the venture through employment effects occupies the section of the electronic spreadsheet extending from row 271 to row 330 (see Figure 3, page 23). The worksheet for person months of employment, Table 5A, occupies columns A to K; the worksheet for unemployment and underemployment rates, Table 5B, occupies columns M to W, and the employment benefit worksheet, Table 5C, occupies columns Y to AJ.

If the ASSOCBEN spreadsheet already has been retrieved from disk file to computer memory in connection with the previous worksheets, then one can proceed directly to worksheet 5A by the spreadsheet command <F5> 5A <return>. If the spreadsheet currently is not in memory, then one first needs to retrieve the spreadsheet file. The steps for doing so are outlined on page 29, above. If the spreadsheet has been saved under a name other than ASSOCBEN, the new name needs to be included in the retrieval command, e.g., RUN ASSOCBEN ASSOC1ST <return>.

Layout of Worksheets for Estimating Employment Impacts

The layout of the three worksheets for estimating the employment impacts of the venture is shown in Figure 8. Table 5A for entry of person months of employment by classification in each projected period is located in the left block from cell A271 to cell K330. Table 5B for entry of unemployment and underemployment rates is in the center section from cell M271 to cell W330. Table 5C showing calculated associated benefits from employmwent impacts is located in the right section from cell Y271 to cell AJ330.

The Table 5A and Table 5C worksheets contain five categories of operating functions for which personnel may be needed plus an additional category for jobs that may be replaced by the venture. Buying and receiving appear on lines 278 through 283. Plant operations appear on lines 287 through 292. Packing and shipping appear on lines 296 through 301. Marketing and distribution are shown on lines 305 through 310. Office and other functions appear on lines 314 through 319. Jobs displaced by the venture appear on lines 323 through 328.

While the worksheet for unemployment and underemployment rates, Table 5B, contains these same line items, its columns represent factors used to compute the unit employment benefits of the line items rather than the projected periods in the cashflow. Project wage appears in column P. Unemployment rate for each employment classification is in column Q. Unemployment benefit from employment in each classification by the venture is presented in column R. Underemployment rates are shown in column S, existing wage rates in the underemployment in column T, and underemployment benefits in column U. Combined benefits through reduced unemployment and underemployment are listed in column W.

Figure 8 provides a convenient reference for locating person months of employment by labor classification, unemployment and underemployment rates, jobs displaced, net employment impacts and employment benefits of the venture. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 5A through 5C.

Table 5A Numbers of Employees by Labor Classification	Table 5B Employment and Underemployment Benefits by Class	Table 5C Net Benefits through Employment Impacts by Period
BUYING & RECEIVING D278..K283	PROJECT WAGE P278..P328	BUYING & RECEIVING AB278..AJ283
PLANT OPERATIONS D287..K292	UNEMPLOYMENT RATE Q278..Q328	PLANT OPERATIONS AB287..AJ292
PACKING & SHIPPING D296..K301	UNEMPLOYMENT BENEFIT R278..R328	PACKING & SHIPPING AB296..AJ301
MARKETING & DISTRIBUTION D305..K310	UNDEREMPLOYMENT RATE S278..S328	MARKETING & DISTRIBUTION AB305..AJ310
OFFICE & OTHER D314..K319	EXISTING WAGE T278..T328	OFFICE & OTHER AB314..AJ319
JOBS DISPLACED D323..K328	UNDEREMPLOYMENT BENEFIT U278..U329	JOBS DISPLACED AB323..AJ328
	COMBINED BENEFIT W278..W329	

Figure 8. Layout of Worksheets for Estimating Employment Impacts

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Numbers of Persons Employed by Class in Table 5A

Table 5A serves as the starting point for projecting the associated benefits from employment effects. The title of the venture need not be entered to cell F272 because it is transferred automatically when the spreadsheet is recalculated. No product identification entries nor units of measure are needed for this table. The unit of measure for entry to this worksheet is person months.

Table 5A. Numbers of Employees by Labor Classification by Period
Project: PANAMA RICE MILL

Function & Classification	Person Months:	Numbers by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th Onward
BUYING & RECEIVING:									
1. Managerial									
2. Supervisory									
3. Skilled			8	8	8	8	8	8	8
4. Semi-Skilled									
5. Unskilled									
6. Casuals									
PLANT OPERATIONS:									
1. Managerial									
2. Supervisory			12	12	12	12	12	12	12
3. Skilled									
4. Semi-Skilled			24	24	24	24	24	24	24
5. Unskilled									
6. Casuals			15	15	15	15	15	15	15
PACKING & SHIPPING:									
1. Managerial									
2. Supervisory									
3. Skilled									
4. Semi-Skilled			12	12	12	12	12	12	12
5. Unskilled									
6. Casuals									
MARKTG & DISTRIBUTION:									
1. Managerial									
2. Supervisory									
3. Skilled									
4. Semi-Skilled									
5. Unskilled									
6. Casuals									
OFFICE & OTHER:									
1. Managerial									
2. Supervisory									
3. Skilled			12	12	12	12	12	12	12
4. Semi-Skilled									
5. Unskilled									
6. Casuals			4	4	4	4	4	4	4
JOBS DISPLACED:									
1. Managerial									
2. Supervisory									
3. Skilled									
4. Semi-Skilled									
5. Unskilled									
6. Casuals									

It will be noted that the only lines in Table 5A which contain entries for the Panama rice mill example are numbers 280, 288, 290, 292, 299, 316, and 319. There are no employees in other positions in the Panama rice mill. This will not be true for other ventures; there may be entries for up to the six labor classifications in each of the five functions included in the table. For those ventures which do not have nonzero entries in the occupied cells of Table 5A for the Panama rice mill, do not forget to remove the entries for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase].

Now let us proceed to the various operating functions for which employees may be needed by the venture under study. These are illustrated by Table 5A.

Buying and receiving functions for the venture occupy lines 278 through 283 of Worksheets 5A, 5B and 5C. Separate lines are provided for up to six employment classifications, ranging from managerial to casuals. The person months of employment in each classification are be taken from the employment projections of the operating cost estimates for the venture.

Only those classification lines in the worksheets which apply to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Plant operations functions for the venture occupy lines 287 through 292 of the worksheets. The person months of employment by labor classification for this function also can be taken directly from the employment projections for the venture of interest.

Packing and shipping functions may require employees in one or more of the six labor classifications shown Table 5A. If so the person months of employment will be entered to the range from D296 to K301 of the worksheet.

Marketing and distribution functions which require employment of personnel will mean entries to the appropriate classifications on lines 305 through 310 of Worksheet 5A. As with employment in the other functions, the person months of employment can be taken directly from the employment projections for the venture.

Office and other functions for which employment is needed by labor classification are included on lines 314 to 319. Employees required in any of the six classifications are entered as person months per year.

The person months of employment in Worksheet 5A are applied automatically to the unit benefits through reduced unemployment and underemployment in Table 5B to obtain the projected benefits from employment by the venture in Table 5C.

Jobs displaced shown in the lower section of Table 5A are entered in units of person months by labor classification to lines 323 to 328 of the worksheet. This information is estimated from the kind of technology for the venture in relation to that now prevailing in the area together with existing labor use patterns in the technology to be displaced. Some ventures will displace no existing employment, but others may displace those in some skilled and supervisory positions as well as a number of unskilled and casual workers.

Value of Increased Employment in Impact Area in Table 5B

Earning rates in employment by the venture, prevailing unemployment rates, prevailing underemployment rates, existing wages in unemployment, and combined per unit employment benefits are included in Table 5B. The Panama rice mill case example contains entries in all cells, but the entries are activated only when person months of employment are entered to the multiplier cells in Table 5A. For this reason it is not necessary to modify or erase values in Table 5B that do not relate to employment for the case at hand. These "dummy" values serve as useful guides to the functioning of the worksheet, and indicate the general magnitude of values that one can expect. The project name at the top of the worksheet is completed automatically when the spreadsheet is recalculated.

It will be noted that unlike Tables 5A and 5C, Table 5B does not contain columnar entries corresponding to the various operating periods. Instead the different columns from P to U contain data used to compute the combined employment benefit shown in column W for each line item in the table. The combined unit benefit then is applied to the corresponding person months of employment in all columns of Table 5A.

Project wages for each labor classification and operating function are indicated in column P of Table 5B. These wage rates for employment in the venture are taken directly from the labor cost schedules used in the internal feasibility study. The wages are stated in real terms per person month in each of the relevant classifications.

Unemployment rates prevailing in the area for each classification and function in the venture are entered to column Q of Worksheet 5B, in terms of decimal fractions of the total work force in each category. This information is available from employment and earnings reports released by federal, state and local departments of labor, and/or by trade associations for the kind of industry represented by the venture of interest.

It should be noted that the unemploywent rates in Table 5B need to be changed only for the functions and labor classifications corresponding to nonzero entries in Table 5A. The rest need not be changed.

Unemployment benefits for each line entry in column R of Table 5B are computed by cell formula, multiplying the project wage in column P by the corresponding unemployment rate in column Q. Thus, all cells in column R are protected so that the formulas cannot be destroyed accidently by making an entry to them. Values in these cells are computed automatically by pushing the spreadsheet calculation key, <F9>.

Underemployment rates prevailing in the area for each function and labor classification are entered to column S of Worksheet 5B, in terms of decimal fractions of the total work forcce in each category. This information is available for the area from labor department employment and earnings reports, but may not be listed for all labor classifications and functions contained in the table. If not, some extrapolation will be necessary to complete entries on all lines for which employment entries are made to Table 5A.

Table 5B. Unemployment and Underemployment Benefits by Classification

Project: PANAMA RICE MILL

Function & Classification	Unit = Man Mo.	Project Wage	Unempl. Rate	Unempl. Benefit	Underemp. Rate	Exist. Wage	Underemp. Benefit	Combined Benefit
BUYING & RECEIVING:								
1. Managerial		4,000.0	0.220	880.0	0.300	3,200.0	240.0	1,120.0
2. Supervisory		3,000.0	0.150	450.0	0.230	2,700.0	69.0	519.0
3. Skilled		2,500.0	0.100	250.0	0.155	2,100.0	62.0	312.0
4. Semi-Skilled		2,000.0	0.070	140.0	0.165	1,600.0	66.0	206.0
5. Unskilled		1,500.0	0.090	135.0	0.170	1,300.0	34.0	169.0
6. Casuals		1,200.0	0.120	144.0	0.050	1,000.0	10.0	154.0
PLANT OPERATIONS:								
1. Managerial		4,000.0	0.150	600.0	0.250	3,200.0	200.0	800.0
2. Supervisory		3,000.0	0.120	360.0	0.230	2,700.0	69.0	429.0
3. Skilled		2,500.0	0.110	275.0	0.200	2,100.0	80.0	355.0
4. Semi-Skilled		2,000.0	0.105	210.0	0.180	1,600.0	72.0	282.0
5. Unskilled		1,500.0	0.097	145.5	0.160	1,300.0	32.0	177.5
6. Casuals		1,200.0	0.086	103.2	0.130	1,000.0	26.0	129.2
PACKING & SHIPPING:								
1. Managerial		4,000.0	0.110	440.0	0.300	3,200.0	240.0	680.0
2. Supervisory		3,000.0	0.105	315.0	0.250	2,700.0	75.0	390.0
3. Skilled		2,500.0	0.092	230.0	0.200	2,100.0	80.0	310.0
4. Semi-Skilled		2,000.0	0.104	208.0	0.150	1,600.0	60.0	268.0
5. Unskilled		1,500.0	0.120	180.0	0.100	1,300.0	20.0	200.0
6. Casuals		1,200.0	0.123	147.6	0.050	1,000.0	10.0	157.6
MARKTG & DISTRIBUTION:								
1. Managerial		4,000.0	0.080	320.0	0.200	3,200.0	160.0	480.0
2. Supervisory		3,000.0	0.085	255.0	0.150	2,700.0	45.0	300.0
3. Skilled		2,500.0	0.085	212.5	0.150	2,100.0	60.0	272.5
4. Semi-Skilled		2,000.0	0.078	156.0	0.100	1,600.0	40.0	196.0
5. Unskilled		1,500.0	0.082	123.0	0.070	1,300.0	14.0	137.0
6. Casuals		1,200.0	0.090	108.0	0.070	1,000.0	14.0	122.0
OFFICE & OTHER:								
1. Managerial		4,000.0	0.050	200.0	0.130	3,200.0	104.0	304.0
2. Supervisory		3,000.0	0.080	240.0	0.110	2,700.0	33.0	273.0
3. Skilled		2,500.0	0.097	242.5	0.100	2,100.0	40.0	282.5
4. Semi-Skilled		2,000.0	0.130	260.0	0.070	1,600.0	28.0	288.0
5. Unskilled		1,500.0	0.150	225.0	0.060	1,300.0	12.0	237.0
6. Casuals		1,200.0	0.110	132.0	0.020	1,000.0	4.0	136.0
JOBS DISPLACED:								
1. Managerial		4,000.0	0.050	200.0	0.130	3,200.0	104.0	304.0
2. Supervisory		3,000.0	0.080	240.0	0.110	2,700.0	33.0	273.0
3. Skilled		2,500.0	0.097	242.5	0.100	2,100.0	40.0	282.5
4. Semi-Skilled		2,000.0	0.130	260.0	0.070	1,600.0	28.0	288.0
5. Unskilled		1,500.0	0.150	225.0	0.060	1,300.0	12.0	237.0
6. Casuals		1,200.0	0.110	132.0	0.020	1,000.0	4.0	136.0

Existing wages in underemployment, whether due to part-time employment, or due to employment in a lower-paying job than that for which qualified, are shown in column T of Table 5B. Entries are made in terms of average earnings per person month in each employment classification. The information can be compiled from labor department employment and earnings reports, and from supplemental sources such as industry trade association reports, and statistics from chambers of commerce, trade unions and vocational education training institutes. Here too, some extrapolation may be necessary to complete entries on all lines for which employment entries are made to Table 5A.

Underemployment benefits for each line entry in column U of Table 5B are computed by cell formula, multiplying the difference between the project wage in column P and the existing wage in column T by the corresponding underemployment rate in column S. All cells in column U are protected so that the formulas cannot be destroyed accidently by making an entry to them. Values in these cells are computed automatically by pushing the spreadsheet calculation key, <F9>.

Combined benefits per person month of employment in each classification and function are in column W of Table 5B. These values are computed by cell formula also, simply by adding the unemployment benefit in column R to the underemployment benefit in column U. Even though computed values are shown in this column on all lines of the table for the Panama rice mill, only those matching nonzero entries for person months of employment in Table 5A are active in computing estimated employment benefits for the venture in Table 5C.

Associated Employment Benefits in Table 5C

Projected employment impacts for the venture are given in Table 5C. All values in this worksheet are computed by cell formula from the entries in Tables 5A and 5B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 5C are illustrated in Appendix II. The project name at the top of the worksheet, the total periods in cell AH274, and the identification of the monetary unit in cell AA275 are completed automatically when the spreadsheet is recalculated.

It will be noted that Table 5C follows the organization pattern of Table 5A with projected periods represented by successive columns. Because they are determined by cell formula, all values in Table 5C are zero except those on lines containing nonzero entries in Table 5A.

As illustrated in Appendix II, each value in Table 5C is the product of the person months of employment in Table 5A and the combined employment benefit in Table 5B. The cell formula for cell AC280 is +D280*$W280, for example. The formula for the total in column AJ is @SUM(AB..280..AH280)+(AI280*($AH$274-7)).

Totals by operating function and by projected period are calculated by the worksheet as well. For example, the employment benefit for the Panama rice mill case for total plant operations in the 2nd period of $13,854 is the sum of the calculated values in cells AC287 through AC292 (some of which are zero in this case).

Table 5C. Net Benefits through Employment Impacts by Period

Project: PANAMA RICE MILL

Function & Labor Class	Unit = Dollars	Employment Benefits by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th On	Total
		Total Periods: 30								
BUYING & RECEIVING:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	2,496	2,496	2,496	2,496	2,496	2,496	2,496	72,384
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	2,496	2,496	2,496	2,496	2,496	2,496	2,496	72384
PLANT OPERATIONS:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	5,148	5,148	5,148	5,148	5,148	5,148	5,148	149,292
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	6,768	6,768	6,768	6,768	6,768	6,768	6,768	196,272
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	1,938	1,938	1,938	1,938	1,938	1,938	1,938	56,202
		0	13,854	13,854	13,854	13,854	13,854	13,854	13,854	401766
PACKING & SHIPPING:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	3,216	3,216	3,216	3,216	3,216	3,216	3,216	93,264
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	3,216	3,216	3,216	3,216	3,216	3,216	3,216	93264
MARKTG & DISTRIBUTION:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
OFFICE & OTHER:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	3,390	3,390	3,390	3,390	3,390	3,390	3,390	98,310
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	544	544	544	544	544	544	544	15,776
		0	3,934	3,934	3,934	3,934	3,934	3,934	3,934	114086
JOBS DISPLACED:										
1. Managerial		0	0	0	0	0	0	0	0	0
2. Supervisory		0	0	0	0	0	0	0	0	0
3. Skilled		0	0	0	0	0	0	0	0	0
4. Semi-Skilled		0	0	0	0	0	0	0	0	0
5. Unskilled		0	0	0	0	0	0	0	0	0
6. Casuals		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets can be printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It also may be necessary to narrow the left and right margins slightly from the 1-inch default values.

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 5A, Table 5B and Table 5C, it is necessary to recalculate the spreadsheet (by pushing <F9>) after each worksheet is printed. Then when the font, line spacing, and margin settings are made, printing is done with standard spreadsheet print commands. For example, Table 5C is printed by typing / P[rint] P[rinter] R[ange] 5C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION IX

ESTIMATING IMPACTS ON PROPERTY VALUES

The set of worksheets for estimating the impacts of the venture on real property values in the area occupies the section of the electronic spreadsheet extending from row 336 to row 396 (see Figure 3, page 23). The worksheet for land and property impacted, Table 6A, occupies columns A to K; the worksheet for changes in real property values, Table 6B, occupies columns M to W, and the capital gains benefits worksheet, Table 6C, occupies columns Y to AJ.

If the ASSOCBEN spreadsheet already has been retrieved from disk file to computer memory in connection with previous worksheets, then one can proceed directly to worksheet 6A by the spreadsheet command <F5> 6A <return>. If the spreadsheet currently is not in memory, then one first needs to retrieve the spreadsheet file. The steps for doing so are outlined on page 29, above. If the spreadsheet has been saved under a name other than ASSOCBEN, the new name needs to be included in the retrieval command, e.g., RUN ASSOCBEN ASSOC1ST **<return>**.

Layout of Worksheets for Estimating Impacts on Property Values

The layout of the three worksheets for estimating the impacts on property values by the venture is shown in Figure 9. Table 6A for entry of numbers of properties affected by classification in each projected period is located in the left block from cell A336 to cell K386. Table 6B for entry of changes in property values is in the center section from cell M336 to cell W386. Table 6C showing calculated capital gains benefits is located in the right section from cell Y336 to cell AJ396.

The Table 6A, Table 6B and Table 6C worksheets contain five categories of real properties for which resale values may be impacted by the venture plus an total category representing the sum of the five. Undeveloped land appears on lines 343 through 348. Residential homes appear on lines 352 through 357. Recreational units appear on lines 361 through 366. Motels and restaruants are shown on lines 370 through 375. Office and other properties appear on lines 379 through 384. Total properties impacted by the venture appear on lines 388 through 393.

The different columns in the worksheets for property value impacts represent projected years into the future, extending from the 1st year to the 8th year from the start of the venture. It is assumed that the full impacts on surrounding property values will have been exercised by that time.

Figure 9 provides a convenient reference for locating numbers of properties impacted by classification and the changes in property values for each class of impacted property. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 6A through 6C.

Table 6A Land and Property to be Impacted by Period	Table 6B Changes in Real Property Values Due to Venture	Table 6C Capital Gains Benefits by Period
UNDEVELOPED LAND D343..K348	UNDEVELOPED LAND P343..W348	UNDEVELOPED LAND AB343..AJ348
RESIDENTIAL HOMES D352..K357	RESIDENTIAL HOMES P352..W357	RESIDENTIAL HOMES AB352..AJ357
RECREATIONAL UNITS D361..K366	RECREATIONAL UNITS P361..K366	RECREATIONAL UNITS AB361..AJ366
MOTELS & RESTAURANTS D370..K375	MOTELS & RESTAURANTS P370..W375	MOTELS & RESTAURANTS AB370..AJ375
OFFICES & OTHER D379..K384	OFFICES & OTHER P379..W384	OFFICES & OTHER AB379..AJ378
		TOTAL OPERATIONS AB388..AJ393

Figure 9. Layout of Worksheets for Estimating Impacts on Property Values

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Property Units Impacted by the Enterprise in Table 6A

Table 6A serves as the starting point for projecting the impacts of the venture on resale values of adjoining real properties. The title of the venture need not be entered to cell F337 because it is transferred automatically when the spreadsheet is recalculated. The property identification entries and the units of measure entered to this worksheet will be transferred forward to Tables 6B and 6C when the spreadsheet is recalculated.

It will be noted that the only cells in Table 6A which contain entries for the Panama rice mill example are numbers E343 and E346. There are no properties in the other categories which are impacted by the Panama rice mill. This will not be true necessarily for other ventures; there may be entries on up to the six

Table 6A. Land and Property to Be Impacted by Project by Period
Project: PANAMA RICE MILL

Property & Classification	Unit of Measure	Number of Units Impacted by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th
UNDEVELOPED LAND:	Acres								
1. Adjoining Project			100						
2. _____									
3. _____									
4. Adjoining Roads			14						
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
RESIDENTIAL HOMES:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
RECREATIONAL UNITS:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
MOTELS & RESTAURANTS:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
OFFICES & OTHER:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---

property classification lines available for each of the five functions included in the table. For those ventures which do not have nonzero entries in the occupied cells of Table 6A for the Panama rice mill, do not forget to remove the entries for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase].

Now let us proceed to the various classes of assets which may be impacted by the venture under study. These are illustrated by Table 6A.

Undeveloped land for which resale values may be impacted by the venture occupies lines 343 through 348 of Worksheets 6A, 6B and 6C. Separate lines are provided for up to six land classifications, depending upon location with respect to the venture and access roads to it. The number of acres (or other unit of land measure) in each classification to be impacted can be estimated from detailed site maps of the area and projected flow patterns to and from the venture.

Only those classification lines in the worksheets which apply to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Residential homes for which resale values may be impacted occupy lines 352 through 357 of the worksheets. The numbers of such homes by classification also can be estimated from detailed site maps and projected traffic patterns. The different classes of residential properties may or may not correspond to the classes used for undeveloped land.

Recreational units for which resale values may be impacted by the venture occupy lines 361 to 366 of Tables 6A, 6B and 6C. The numbers of such units, if any, by classification can be estimated from their locations with respect to the venture and the anticipated effects on traffic patterns and the physical environment in the area.

A note of caution is in order here. Impacts of the venture on existing enterprises, including recreational units, can be measured in terms of either increases (decreases) in capital asset values or increases (decreases) in annual net earnings by the enterprises, but not both. To include both measures would be double counting. Usually impacts on recreational units can be measured more accurately by changes in asset value, but this is not always the case. If the impacts are measured through the projected annual output linkages of the venture in Table 3C, or in some other worksheet, then those assets should not be included in Table 6A.

Motels and restaurants for which resale values may be impacted by the venture occupy lines 370 to 375 of the Table 6 worksheets. The numbers of such units by classification can be estimated from their locations with respect to the venture and the anticipated effects on travel volumes in the area. Here too, if impacts are to be measured through projected annual input or output linkages, or some other worksheet, then such motels and restaurants should not be listed again in Table 6A.

Office and other assets for which resale values may be impacted occupy lines 379 to 384 of the Table 6 worksheets. The numbers of such units by classification also can be estimated from their locations with respect to the venture and anticipated effects of the venture on travel volumes, traffic patterns and physical environment in the area. Again caution should be exercised to measure such impacts through asset resale values or annual earnings from the assets, but not both.

Added Valuations of Impacted Properties in Table 6B

Added valuations for the impacted properties included in Table 6A are entered by year in Table 6B. The project title in cell R337, the property classifications in columns M and N, and the units of measure in column O are entered automatically when the spreadsheet is recalculated. All of the data in the table needs to be entered directly to the unprotected cells on the lines in the P343 to W384 range containing entries in Table 6A; none of the numbers in the table are computed by cell formula. Entries for the Panama rice mill case are limited to cells P343..W343 and P346..W346.

The added valuations for entry to Table 6B represent the difference between projected values of the impacted property with or after the venture and their projected values without or in the absence of the venture. Furthermore, the entries to the table should be in real terms after adjustment for anticipated inflation in the general price level. This means that some sort of supporting schedule is needed to calculate the values for Table 6B. An example of such supporting schedule for a given class of assets is shown in Figure 10.

Property: Land adjoining project Line number: 343

Beginning year: 1992 Annual inflation rate: 0.06

Projected Year	Value with Venture	Value without Venture	Monetary Difference	Real Difference*
1st	759.00	600.00	159	150
2nd	818.54	650.00	168.54	150
3rd	878.65	700.00	178.65	150
4th	900.00	900.00	0	0
5th	925.00	925.00	0	0
6th	950.00	950.00	0	0
7th	975.00	975.00	0	0
8th	1,000.00	1,000.00	0	0

* Monetary difference divided by 1.0 plus annual inflation rate

Figure 10. Schedule of Change in Property Values Due to Venture

Table 6B. Changes in Property Values Due to Venture
Project: PANAMA RICE MILL

Property & Classification	Unit of Measure	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year
UNDEVELOPED LAND:	Acres								
1. Adjoining Project		150	150	150	0	0	0	0	0
2. _____									
3. _____									
4. Adjoining Roads		250	250	250	0	0	0	0	0
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
RESIDENTIAL HOMES:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
RECREATIONAL UNITS:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
MOTELS & RESTAURANTS:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---
OFFICES & OTHER:	Number								
1. Adjoining Project									
2. _____									
3. _____									
4. Adjoining Roads									
5. _____									
6. Other _____									
		---	---	---	---	---	---	---	---

As an example the schedule in Figure 10 is completed for land adjoining the venture on line 343 of Table 6B. The beginning year is taken as 1992, and the annual inflation rate is projected at 6 percent. The projected years in the first column of the schedule are extended from the 1st to the 8th, matching columns P through W in Table 6B. The projected schedule of property values with the venture is listed in the next column, extending from 759 the 1st year to 1,000 the 8th year in the example. The corresponding schedule of property values without the venture is listed in the third column, ranging from 600 the first year to 1,000 the 8th year. The differences in projected monetary values for this asset as shown in the next column are obtained by subtraction. Finally, the differences are converted to real values with the formula indicated in the footnote to the schedule, applying the projected annual inflation rate entered at the top of the schedule. The figures in the last column then are entered to line 343 of Table 6B, starting with column P.

A copy of the Figure 10 schedule will need to be completed for each class of impacted assets which has entries to Table 6A. The added real values from the final column of the schedule then will be transferred to the appropriate lines of Table 6B for the venture.

Associated Impacts on Property Values in Table 6C

Projected impacts by the venture on values of properties in the different classifications are given in Table 6C. All values in this worksheet are computed by cell formula from the entries in Tables 6A and 6B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 6C are illustrated in Appendix II. The project name at the top of the worksheet, the property classification identifications in columns Y and Z, and the monetary unit in cell AA340 are completed automatically when the spreadsheet is recalculated.

It will be noted that Table 6C follows the same organization pattern as Tables 6A and 6B, with projected periods represented by successive columns. Because they are determined by cell formula, all values in Table 6C are zero except those on lines containing nonzero entries in Tables 6A and 6B.

As illustrated in Appendix II, each value in Table 6C is the product of the number of impacted properties in Table 6A and the added property values in Table 6B. The cell formula for cell AC343 is (E343*$P343)+(D343*$Q343), for example; that for cell AJ343 is (K343*$P343)+(J343*$Q343)+(I343*$R343)+(H343*$S343)+(G343 *$T343)+(F343*$U343)+(E343*$V343)+(D343*W343). The formulas apply the 1st year's added value to the year the assets are impacted, the 2nd year's added value to assets impacted the prior year, the 3rd year's added value to assets impacted two years earlier, and so on over the eight years when impacts may take place.

Totals by operating function and by projected period are calculated by the worksheet as well. For example, the total capital gain on undeveloped land values for the Panama rice mill case in the 2nd period of $18,500 is the sum of the calculated values in cells AC343 through AC348 (some of which are zero in this case).

Table 6C. Capital Gains Benefits by Period
Project: PANAMA RICE MILL

Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
Property & Classif.		Unit = Dollars	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
UNDEVELOPED LAND:											
1. Adjoining Project			0	15,000	15,000	15,000	0	0	0	0	0
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. Adjoining Roads			0	3,500	3,500	3,500	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	18,500	18,500	18,500	0	0	0	0	0
RESIDENTIAL HOMES:											
1. Adjoining Project			0	0	0	0	0	0	0	0	0
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. Adjoining Roads			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
RECREATIONAL UNITS:											
1. Adjoining Project			0	0	0	0	0	0	0	0	0
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. Adjoining Roads			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
MOTELS & RESTAURANTS:											
1. Adjoining Project			0	0	0	0	0	0	0	0	0
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. Adjoining Roads			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
OFFICES & OTHER:											
1. Adjoining Project			0	0	0	0	0	0	0	0	0
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. Adjoining Roads			0	0	0	0	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0
TOTAL PROPERTIES:											
1. Adjoining Project			0	15,000	15,000	15,000	0	0	0	0	0
2. _____			0	0	0	0	0	0	0	0	0
3. _____			0	0	0	0	0	0	0	0	0
4. Adjoining Roads			0	3,500	3,500	3,500	0	0	0	0	0
5. _____			0	0	0	0	0	0	0	0	0
6. Other _____			0	0	0	0	0	0	0	0	0
			0	18500	18500	18500	0	0	0	0	0

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets can be printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It also may be necessary to narrow the left and right margins slightly from the 1-inch default values.

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 6A, Table 6B and Table 6C, it is necessary to recalculate the spreadsheet after each worksheet is printed. Then when the font, line spacing, and margin settings are made, printing is done with standard spreadsheet print commands. For example, Table 6C is printed by typing / P[rint] P[rinter] R[ange] 6C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION X

ESTIMATING ENVIRONMENTAL IMPACTS

The set of worksheets for estimating the environmental impacts of the venture occupies the section of the electronic spreadsheet extending from row 401 to row 460 (see Figure 3, page 23). The worksheet for extent of environmental impacts, Table 7A, occupies columns A to K; that for the unit values of the environmental impacts, Table 7B, occupies columns M to W, and the net environmental benefits worksheet, Table 7C, occupies columns Y to AJ.

If the ASSOCBEN spreadsheet already has been retrieved from disk file to computer memory in connection with previous worksheets, then one can proceed directly to worksheet 7A by the spreadsheet command <F5> 7A <return>. If the spreadsheet currently is not in memory, then one first needs to retrieve the spreadsheet file. The steps for doing so are outlined on page 29, above. If the spreadsheet has been saved under a name other than ASSOCBEN, the new name needs to be included in the retrieval command, e.g., RUN ASSOCBEN ASSOC1ST **<return>**.

Layout of Worksheets for Estimating Environmental Impacts

The layout of the three worksheets for estimating the environmental impacts of the venture is shown in Figure 11. Table 7A for entry of numbers of units impacted by classification in each projected period is located in the left block from cell A401 to cell K460. Table 7B for entry of unit values of environmental impacts is in the center section from cell M401 to cell W460. Table 7C showing calculated benefits from environmental impacts is located in the right section from cell Y401 to cell AJ460.

The Table 7A, Table 7B and Table 7C worksheets contain six categories of environmetal factors which may be impacted by the venture. **Health and safety** impacts appear on lines 408 through 413. Recreation impacts appear on lines 417 through 422. Factors in the physical environment appear on lines 426 through 431. Time saving factors are shown on lines 435 through 440. **Infrastructure** aids appear on lines 444 through 449. Other benefits to the environment appear on lines 453 through 458.

The different columns in the worksheets for estimating environmental impacts represent projected years into the future, extending from the 1st year to the 7th year from the start of the venture, with the last column representing entries for the periods from the 8th year forward.

Figure 11 provides a convenient reference for locating the extent of environmental impacts by type and source, the unit values of these impacts, and the net environmental benefits of the venture. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 7A through 7C.

Table 7A Environmental Impacts by Kind by Period	Table 7B Unit Values of Environmental Impacts by Period	Table 7C Net Environmental Benefits of Venture by Period
HEALTH AND SAFETY D408..K413	HEALTH AND SAFETY P408..W413	HEALTH AND SAFETY AA408..AJ413
RECREATION D417..K422	RECREATION P417..W422	RECREATION AB417..AJ422
PHYSICAL ENVIRONMENT D426..K431	PHYSICAL ENVIRONMENT P426..K431	PHYSICAL ENVIRONMENT AB426..AJ431
TIME SAVING D435..K440	TIME SAVING P435..W440	TIME SAVING AB435..AJ440
INFRASTRUCTURE AIDS D444..K449	INFRASTRUCTURE AIDS P444..W449	INFRASTRUCTURE AIDS AB444..AJ449
OTHER BENEFITS D453..K458	OTHER BENEFITS P453..W458	OTHER BENEFITS AB453..AJ458

Figure 11. Layout of Worksheets for Estimating Environmental Impacts

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Kinds and Quantities of Environmental Impacts in Table 7A

Table 7A serves as the starting point for projecting the impacts of the venture on environmental factors in the area. The title of the venture need not be entered to cell F402 because it is transferred automatically when the spreadsheet is recalculated. The "Other" sources of benefit entries and the units of measure entered to this worksheet will be transferred forward to Tables 7B and 7C when the spreadsheet is recalculated.

It will be noted that the only cells in Table 7A which contain entries for the Panama rice mill example are H444, H445 and H446. There are no environmental impacts in other categories by the Panama rice mill. This will not be true necessarily for other ventures; there may be entries for any of the six sources of benefit for each type of environmental impact itemized in the worksheet. For those ventures which do not have nonzero entries in the occupied cells of Table 7A for the Panama rice mill, do not forget to remove the entries for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase].

Table 7A. Environmental Impacts by Kind by Period

Project: PANAMA RICE MILL

Benefit Type & Source	Unit of Measure	Number of Units of Benefit by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th
HEALTH & SAFETY:	1000 per.								
1. Adult Health									
2. Child Health									
3. Infant Health									
4. Adult Safety									
5. Child Safety									
6. Other _____									
RECREATION:	Per. Yrs.								
1. Fishing & Hunting									
2. Camping & Boating									
3. Hiking & Running									
4. Equestrian									
5. Vehicular									
6. Other _____									
PHYSICAL ENVIRONMENT:	Rel. Unit								
1. Cleaner Air									
2. Cleaner Water									
3. Improved Sanitation									
4. Less Congestion									
5. Sight & Sound									
6. Other _____									
TIME SAVING:	Per. Yrs.								
1. Professionals									
2. Skilled Workers									
3. Semi-skilled wkrs.									
4. Other Workers									
5. Young Persons									
6. Other _____									
INFRASTRUCTURE AIDS:	No. Imp.								
1. Travel Network						3			
2. Communications						1			
3. Education						1			
4. Medical System									
5. Church Programs									
6. Other _____									
OTHER BENEFITS:	Scale								
1. Polit. Security									
2. Ind. Opportunity									
3. Civil Liberties									
4. Peacefulness									
5. Other _____									
6. Other _____									

Now let us proceed to the various types of environmental impacts which may be caused by the venture under study. These are illustrated by Table 7A.

Health and safety factors which may be impacted by the venture occupy lines 408 through 413 of Worksheets 7A, 7B and 7C. Separate lines are provided for up to six source-population segments ranging from adult health to child safety and "Other". The number of 1000-person (or other unit of measure) units in each classification to be impacted can be estimated from health and accident reports for the area and the expected influence of the venture on the major factors affecting human health and safety.

Only those health and safety lines in the worksheets which apply to the venture of interest need to be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Recreation activities which may be impacted are listed on lines 417 through 422 of the worksheets. To be entered are the number of person years (or other unit of measure) benefitted under each type of recreation, from fishing and hunting to vehicular and "Other" recreational activities. Entries should include those affected adversely (negative benefits) as well as those affected favorably (positively benefits). The information can be assembled from site maps of the vicinity, reports of local recreational facilities and patterns, effects of the venture on traffic flows and travel times, and related sources.

Care should be exercised to avoid double counting of any capital gain benefits to recreational units credited on Worksheet 6A (see Section IX). Those recreation activities which have been reflected through impacts on asset values should not be included again on Worksheet 7A.

Physical environment benefits (negative benefits) for the venture may arise through favorable (unfavorable) impacts on air quality, water quality, sanitation, scenic view, sounds, general congestion, and similar factors. Any benefits of this kind are entered in appropriate units (air and water quality scales, etc.) to lines 426 through 431 of Table 7A. The numbers of such units by type of environmental impact can be estimated from the design, location and projected throughput of the facility, and the expected effects of these factors on the different elements of the physical environment.

Time saving can be of significant associated benefit for some kinds of ventures. The value of time saved varies from one segment of the population to another (for example, saved time of medical doctors compared to saved time of preschool children), but all can be measured in terms of person years of time saved. Amounts of time saved can be estimated from the impacts of the venture on traffic patterns and volumes, from the kind of technology employed in the venture relative to that prevailing in the area, and from the characteristics of the outputs of the venture as they will be handled by the ultimate user. For ventures to which they apply, numbers of person years of time saved are entered to Worksheet 7A on lines 435 to 440.

Infrastructure aids created directly or indirectly by the venture may generate associated benefits through favorable impacts on travel networks, communications systems, educational institutions, medical systems, church programs, and other

infrastructural institutions and networks. The numbers of such units by classification also can be estimated from the locations of the units with respect to the venture and anticipated effects of the venture on travel volumes, traffic patterns and physical environment in the area. Again caution should be exercised to measure such impacts through asset resale values or annual earnings from the assets, but not both.

Other benefits through over-all environmental impacts include those on political security (line 453), individual opportunity (line 454), civil liberties (line 455), peacefulness (line 456), and "Other" such factors (lines 457 and 458). Quantitative units of measure for such factors are difficult to define, but usually depend upon some sort of scale comparable to that for temperature. Any scale system that permits a unit value to be applied to specified degrees of change in the factor is satisfactory for the purpose at hand.

Most kinds of agroindustrial ventures will have minimal impacts on these kinds of other benefits, so that this section of Worksheet 7A can be left blank. Occasionally, the nature of the venture being studied is such that one can expect significant impacts on one or more of the other environmental factors. In such case it should be possible to estimate the general magnitude of the impact from the detailed description of the venture and how it relates to the environmental surroundings. Then the appropriate scale quantities can be entered on the relevant line or lines for the appropriate year or years.

Unit Values of the Environmental Impacts in Table 7B

The unit values of the environmental impacts included in Table 7A are entered by year in Table 7B. The project title in cell R402, the identification of the "Other" sources of benefits in column N, and the units of measure in column O are entered automatically when the spreadsheet is recalculated. All of the data in the table needs to be entered to the unprotected cells on the lines in the P408 to W458 range containing entries in Table 7A; none of these values are computed by cell formula.

It will be noted that the accompanying Table 7B for the Panama rice mill case contains entries in all cells. However, only those corresponding to nonzero entries in Table 7A as multiplier cells are activated. For this reason it is not necessary to modify or erase values in Table 7B that do not relate to relevant quantities for the case at hand. These "dummy" values serve as useful guides to the functioning of the worksheet, and indicate the general magnitude of values that one can expect.

Now let us proceed to discussion of the various types of environmental impacts for which monetary values per specified units of measure need to be estimated in Table 7B.

Health and safety factors can be valued per 1000 persons impacted in terms of additional healthy days per year, reduced probabilities of accidental injury or death, and similar factors. Values can be established in terms of savings in costs for medicines, hospitalization, etc., and/or in terms of productivity during the added healthy days at work. The value of reduced probability of

Table 7B. Unit Values of Environmental Impacts by Kind
Project: PANAMA RICE MILL

Benefit Type & Source	Unit of Measure	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	Remaining Years
HEALTH & SAFETY:	1000 per.								
1. Adult Health		100	150	150	150	150	150	150	150
2. Child Health		40	60	60	60	60	60	60	60
3. Infant Health		20	40	40	40	40	40	40	40
4. Adult Safety		150	150	150	150	150	150	150	150
5. Child Safety		75	75	75	75	75	75	75	75
6. Other _____		50	50	50	50	50	50	50	50
RECREATION:	Per. Yrs.								
1. Fishing & Hunting		100	150	150	150	150	150	150	150
2. Camping & Boating		40	60	60	60	60	60	60	60
3. Hiking & Running		20	40	40	40	40	40	40	40
4. Equestrian		150	150	150	150	150	150	150	150
5. Vehicular		75	75	75	75	75	75	75	75
6. Other _____		40	40	40	40	40	40	40	40
PHYSICAL ENVIRONMENT:	Rel. Unit								
1. Cleaner Air		800	1,000	1,200	1,400	1,600	1,800	2,000	2,000
2. Cleaner Water		600	1,200	1,200	1,200	1,200	1,200	1,200	1,200
3. Improved Sanitation		300	500	600	600	600	600	600	600
4. Less Congestion		150	350	350	450	450	450	450	450
5. Sight & Sound		100	100	200	200	200	200	200	200
6. Other _____		200	200	200	200	200	200	200	200
TIME SAVING:	Per. Yrs.								
1. Professionals		45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
2. Skilled Workers		35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
3. Semi-skilled wkrs.		25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
4. Other Workers		20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
5. Young Persons		15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
6. Other _____		25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
INFRASTRUCTURE AIDS:	No. Imp.								
1. Travel Network		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
2. Communications		1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
3. Education		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
4. Medical System		2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
5. Church Programs		2,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
6. Other _____		1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
OTHER BENEFITS:	Scale								
1. Polit. Security		8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
2. Ind. Opportunity		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
3. Civil Liberties		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
4. Peacefulness		7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
5. Other _____		6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
6. Other _____		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000

accidental death can be established in terms of human productivity over remaining working life. Thus, with some thought and imagination, one can develop reasonable unit values for entry to those cells in the health and safety section of Table 7B which correspond to those with nonzero entries in Table 7A.

Recreation impacts per person year of use of the recreation facilities need to be valued for each of the types of recreation itemized on lines 417 to 422 of the worksheet, extending from fishing and hunting to vehicular and "Other" recreational activities. In some areas, market determined unit values can be assembled from daily or weekly charges made by existing commercial recreation facilities. If these "use rate" charges do not exist for the kinds of recreation activities containing nonzero entries in Table 7A, it will be necessary to establish estimated unit values from probable expenditures in alternative recreation activities.

Physical environment benefits need to be valued in terms of the worth of a given degree of improvement in air quality, water quality, sanitation, scenic views, sounds, general congestion, or similar factors with nonzero entries to Table 7A. Because such factors are measured on thermometer-like scales, the unit values need to relate to one "degree" of change on such scales. The values that a society places on these factors usually depends upon how congested conditions have become. One approach to establishing appropriate unit values is the "least-cost alternative" way of achieving the same degree environmental improvement. For example, the value of one "degree" of improvement in water quality may be established by the cost of achieving the improvement in a water purification system.

Time saving benefits per person month or person year of time saved can be valued in terms of the average earning rate of persons in the different classes itemized on lines 435 to 440 of Table 7B (professionals, skilled workers, semi-skilled workers, other workers, young persons, etc.). This information can be assembled for the area from employment and earnings reports by federal, state and local departments of commerce and labor. The saving of travel and other time of homemakers, children and others who are not employed will need to be valued in terms of alternative uses of the time (e.g., charges for child care services, home care services, etc.). The existing entries for the Panama rice mill case in cells of Table 7B corresponding to those which do not contain entries in Table 7A need not be removed nor changed.

Infrastructure aids to travel networks, communications systems, educational institutions, medical systems, church programs, and other infrastructural institutions and networks can be valued in terms of added earnings or reduced costs for the impacted system. The resulting unit values will be entered to those cells on lines 444 to 449 of Table 7B which correspond to those with nonzero quantity entries in Table 7A.

Other benefits through over-all environmental impacts, including those on political security (line 453), individual opportunity (line 454), civil liberties (line 455), peacefulness (line 456), and "Other" such factors (lines 457 and 458), need to be valued in terms of society's appreciation for them. Because these impacts can only be in terms of "degrees" on thermometer-like scales, the

unit value for each item containing nonzero entries in Table 7A must correspond to the type of scale used.

Frequently it is necessary to use the "least-cost alternative" approach to establishing realistic values for added degrees of political security, civil liberties, peacefulness, etc. What additional police or security force protection would be needed to provide the same degree of security and peacefulness, and what would it cost, for example?

Most kinds of agroindustrial ventures will have minimal impacts on these kinds of other benefits, so that this section of worksheet 7B will be left blank. Occasionally, the nature of the venture being studied is such that one can expect significant impacts on one or more of these factors. In such cases, one needs to develop estimated unit values applicable for the society where the venture will be located which are as realistic as they can be made to be.

Magnitude of Environmental Impacts in Table 7C

Net environmental impacts by the venture under the different types and sources of impact are given in Table 7C. All values in this worksheet are computed by cell formula from the entries in Tables 7A and 7B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 7C are illustrated in Appendix II. The project name at the top of the worksheet, the total number of periods in cell AG404, and the monetary unit in cell AA405 are completed automatically when the spreadsheet is recalculated.

It will be noted that Table 7C follows the same organization pattern as Tables 7A and 7B, with projected periods represented by successive columns. Because they are determined by cell formula, all values in Table 7C are zero except those on lines containing nonzero entries in Tables 7A.

As illustrated in Appendix II, each value in Table 7C is the product of the number of units of environmental impact in Table 7A and the unit value of the impact in Table 7B. The cell formula for cell AF444 is (H444*$P444)+(G444*$Q444)+(F344*$R343)+(E444*$S444)+(D444*$T444), for example. The formulas apply the 1st year's unit value to the year of the impact, the 2nd year's unit value to the impact in the prior year, the 3rd year's unit value to environmental impact two years earlier, and so on for the seven and remaining years over which impacts are projected to occur.

Totals by operating function and by projected period are calculated by the worksheet as well. For example, the total infrastructure impact for the Panama rice mill case in the 5th period of $18,500 is the sum of the calculated values in cells AF444 through AF449 (some of which are zero in this case).

Table 7C. Net Environmental Benefits of Venture by Period

Project: PANAMA RICE MILL

Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
Benefit Type & Source		Unit = Dollars	1st	2nd	3rd	4th	Total Periods 5th	30 6th	7th	Remaining Years	Total (000)
HEALTH & SAFETY:											
1. Adult Health			0	0	0	0	0	0	0	0	0.0
2. Child Health			0	0	0	0	0	0	0	0	0.0
3. Infant Health			0	0	0	0	0	0	0	0	0.0
4. Adult Safety			0	0	0	0	0	0	0	0	0.0
5. Child Safety			0	0	0	0	0	0	0	0	0.0
6. Other _____			0	0	0	0	0	0	0	0	0.0
			0	0	0	0	0	0	0	0	0.0
RECREATION:											
1. Fishing & Hunting			0	0	0	0	0	0	0	0	0.0
2. Camping & Boating			0	0	0	0	0	0	0	0	0.0
3. Hiking & Running			0	0	0	0	0	0	0	0	0.0
4. Equestrian			0	0	0	0	0	0	0	0	0.0
5. Vehicular			0	0	0	0	0	0	0	0	0.0
6. Other _____			0	0	0	0	0	0	0	0	0.0
			0	0	0	0	0	0	0	0	0.0
PHYSICAL ENVIRONMENT:											
1. Cleaner Air			0	0	0	0	0	0	0	0	0.0
2. Cleaner Water			0	0	0	0	0	0	0	0	0.0
3. Improved Sanitation			0	0	0	0	0	0	0	0	0.0
4. Less Congestion			0	0	0	0	0	0	0	0	0.0
5. Sight & Sound			0	0	0	0	0	0	0	0	0.0
6. Other _____			0	0	0	0	0	0	0	0	0.0
			0	0	0	0	0	0	0	0	0.0
TIME SAVING:											
1. Professionals			0	0	0	0	0	0	0	0	0.0
2. Skilled Workers			0	0	0	0	0	0	0	0	0.0
3. Semi-skilled Wkrs.			0	0	0	0	0	0	0	0	0.0
4. Other Workers			0	0	0	0	0	0	0	0	0.0
5. Young Persons			0	0	0	0	0	0	0	0	0.0
6. Other _____			0	0	0	0	0	0	0	0	0.0
			0	0	0	0	0	0	0	0	0.0
INFRASTRUCTURE AIDS:											
1. Travel Network			0	0	0	0	12,000	12,000	12,000	12,000	312.0
2. Communications			0	0	0	0	1,500	1,500	1,500	1,500	39.0
3. Education			0	0	0	0	5,000	5,000	5,000	5,000	130.0
4. Medical System			0	0	0	0	0	0	0	0	0.0
5. Church Programs			0	0	0	0	0	0	0	0	0.0
6. Other _____			0	0	0	0	0	0	0	0	0.0
			0	0	0	0	18,500	18,500	18,500	18,500	481.0
OTHER BENEFITS:											
1. Polit. Security			0	0	0	0	0	0	0	0	0.0
2. Ind. Opportunity			0	0	0	0	0	0	0	0	0.0
3. Civil Liberties			0	0	0	0	0	0	0	0	0.0
4. Peacefulness			0	0	0	0	0	0	0	0	0.0
5. Other _____			0	0	0	0	0	0	0	0	0.0
6. Other _____			0	0	0	0	0	0	0	0	0.0
			0	0	0	0	0	0	0	0	0.0

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets can be printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It also may be necessary to narrow the left and right margins slightly from the 1-inch default values.

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 7A, Table 7B and Table 7C, it is necessary to recalculate the spreadsheet after each worksheet is printed. Then when the font, line spacing, and margin settings are made, printing is done with standard spreadsheet print commands. For example, Table 7C is printed by typing / P[rint] P[rinter] R[ange] 7C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION XI

ESTIMATING ASSOCIATED CAPITAL OUTLAYS AND COSTS

The set of worksheets for estimating the associated capital outlays and recurring operating costs for the venture occupies the section of the electronic spreadsheet extending from row 471 to row 430 (see Figure 3, page 23). The worksheet for quantities of outlay and operating expense inputs, Table 8A, occupies columns A to K; that for the unit values of the associated inputs of capital and operating expenses, Table 8B, occupies columns M to W, and the total capital outlay and operating cost worksheet, Table 8C, occupies columns Y to AJ.

If the ASSOCBEN spreadsheet already has been retrieved from disk file to computer memory in connection with previous worksheets, then one can proceed directly to worksheet 8A by the spreadsheet command <F5> 8A <return>. If the spreadsheet currently is not in memory, then one first needs to retrieve the spreadsheet file. The steps for doing so are outlined on page 29, above. If the spreadsheet has been saved under a name other than ASSOCBEN, the new name needs to be included in the retrieval command, e.g., RUN ASSOCBEN ASSOC1ST <return>.

Layout of Worksheets for Associated Outlay and Cost

The layout of the three worksheets for estimating the associated capital outlay and recurring operating cost for the venture is shown in Figure 12. Table 8A for entry of quantites of associated outlay and expense items is located in the left block from cell A471 to cell K530. Table 8B for entry of unit values of accociated outlays and expenses is in the center section from cell M471 to cell W530. Table 8C showing calculated total associated outlays and costs is located in the right section from cell Y471 to cell AJ530.

The Table 8A, Table 8B and Table 8C worksheets contain six categories of associated outlays and costs which may be incurred by the venture. **Infrastructure** developments are listed on lines 478 through 483. **Plant facility** needs appear on lines 487 through 492. **Non-recurring** costs for development appear on lines 496 through 501. **Supporting services** are shown on lines 505 through 510. **Regulatory services** appear on lines 514 through 519. **Other expenses** associated with the venture appear on lines 523 through 528.

The different columns in worksheets 8A and 8C represent projected years into the future, extending from the 1st year to the 7th year from the start of the venture, with the last column representing entries for the periods from the 8th year forward. Worksheet 8B has only one data column for unit values of the accociated inputs; the values are to be entered in real terms so that they apply to all projected years.

Figure 12 provides a convenient reference for locating the quantities of associated inputs by type and source, the unit values of these inputs, and the associated capital outlays and costs for the venture. The chart also serves as reminder of the structure of the worksheets and the interrelationships among them. Users will find it helpful to refer briefly to the chart each time they start to make use of Tables 8A through 8C.

Table 8A Associated Capital Outlay and Cost by Classification	Table 8B Unit Values of Associated Inputs by Classification	Table 8C Associated Capital Outlay and Cost by Period
INFRASTRUCTURE D478..K483	INFRASTRUCTURE P478..W483	INFRASTRUCTURE AB478..AJ483
PLANT FACILITIES D487..K492	PLANT FACILITIES P222..W227	PLANT FACILITIES AB487..AJ492
NONRECURRING COSTS D496..K501	NONRECURRING COSTS P496..K501	NONRECURRING COSTS AB496..AJ501
SUPPORTING SERVICES D505..K510	SUPPORTING SERVICES P505..W510	SUPPORTING SERVICES AB505..AJ510
REGULATORY SERVICES D514..K519	REGULATORY SERVICES P514..W519	REGULATORY SERVICES AB514..AJ519
OTHER EXPENSES D523..K528	OTHER EXPENSES P523..W528	OTHER EXPENSES AB523..AJ528

Figure 12. Layout of Worksheets for Estimating Associated Capital Costs

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Kinds and Quantities of Associated Inputs in Table 8A

Table 8A serves as the starting point for projecting the associated capital outlays and costs for the venture. The venture title need not be entered to cell F472 because it is transferred automatically when the spreadsheet is recalculated. The "Other" sources of outlay and cost entered in column B and the units of measure entered in column C of this worksheet will be transferred forward to Tables 8B and 8C when the spreadsheet is recalculated.

It will be noted that the only cells in Table 8A which contain entries for the Panama rice mill example are E481, E483, F497, G497, H501 and the ranges E505 to K510 and E523 to K528. There are no associated inputs in other categories for the Panama rice mill. This will not be true necessarily for other ventures; there may be entries for any of the six sources of outlay and cost for each type

Table 8A. Associated Capital Outlay and Cost by Class by Period

Project: PANAMA RICE MILL

Type & Source of Cost	Unit of Measure	Number of Units by Period: 1st	2nd	3rd	4th	5th	6th	7th	8th On
INFRASTRUCTURE:									
1. Roads & Streets	Miles								
2. Sewers & Drains	Miles								
3. Utility Services	Units								
4. Communications	Units		2						
5. Information Base	Units								
6. Other _____	Units		1						
PLANT FACILITIES:									
1. Plant Buildings	Number								
2. Warehouses	Number								
3. Office Buildings	Number								
4. Mech. & Electrical	Units								
5. Equipment	Units								
6. Other _____	Units								
NON-RECURRING COSTS:									
1. Research & Dev.	Per. Mo.								
2. Legal & Acctg.	Per. Mo.			2	1				
3. Finance Charges	$1000								
4. Training	Per. Mo.								
5. Other _____	Per. Mo.								
6. Other _____	Per. Mo.					1			
SUPPORTING SERVICES:									
1. Professional Staff	Per. Mo.		2	2	2	2	2	2	2
2. Supporting Staff	Per. Mo.		1	1	1	1	1	1	1
3. Publications	Number		1	1	1	1	1	1	1
4. Communications	Yearly		1	1	1	1	1	1	1
5. Travel	Per. Mo.		1	1	1	1	1	1	1
6. Other _____	Per. Mo.		0	0	0	0	0	0	0
REGULATORY SERVICES:									
1. Professional Staff	Per. Mo.								
2. Supporting Staff	Per. Mo.								
3. Publications	Number								
4. Communications	Yearly								
5. Travel	Per. Mo.								
6. Other _____	Per. Mo.								
OTHER EXPENSES:									
1. Facility Maint.	Base		1	1	1	1	1	1	1
2. Admin. & Overhead	Units		0	0	0	0	0	0	0
3. Fuel & Energy	Units		0	0	0	0	0	0	0
4. Supplies & Mater.	Units		0	0	0	0	0	0	0
5. Other _____	Units		1	1	1	1	1	1	1
6. Other _____	Units		0	0	0	0	0	0	0

of associated input itemized in the worksheet. For those ventures which do not have nonzero entries in the occupied cells of Table 8A for the Panama rice mill, do not forget to remove the entries for the Panama rice mill case, using the spreadsheet command / R[ange] E[rase.

Now let us proceed to the various types of associated inputs which may be needed by the venture under study. These are illustrated by Table 8A.

Infrastructure facilities which may be needed occupy lines 478 through 483 of Worksheets 8A, 8B and 8C Separate lines are provided for six types of infrastructure, including roads and streets, sewers and drains, utility services, communications, information base, and "Other". The number of miles (or other unit of measure) for each applicable source of outlay can be estimated from detailed maps of the site and surrounding area, and descriptions of designs and layouts of existing facilities compared to those needed when the venture is in place.

Only those infrastructural input lines in the worksheets which apply to the venture of interest need to be used; in cases where existing infrastructure is adequate to support the venture, the corresponding lines will not be used. Those lines left blank will pose no problem in the use of the total spreadsheet for the case.

Plant facilities which may be needed to support the venture are listed on lines 487 through 492 of the worksheets. To be entered are the numbers of plant buildings (or other unit of measure), warehouses, office buildings, mechanical and electrical facilities, pieces of equipment and "Other" plant facilities, the latter to be identified in cell B492. This information can be developed from site maps of the vicinity, lists of types and capacities of existing plant facilities to support the venture, and estimates of the needs for supporting facilities when the venture is in place.

Care should be taken not to double count any of the plant facilities already included in the capital cost estimate for the venture used for internal feasibility analysis. Likewise, plant expansion needed by industries linked to to the venture through construction inputs (Table 1A), operating inputs (Table 2A) or product outputs (Table 3A) should be excluded from this section of Table 8A. Such expansion has been accounted for by including fixed costs as well as variable costs in the values subtracted to obtain linkage benefits for industries without sufficient existing capacity to handle the added volumes to be generated by the venture (see Tables 1B, 2B and 3B). Only those additional plant facilities which have not been reflected elsewhere that are necessary to assure the direct and associated benefits credited to the venture should be included in Table 8A.

Non-recurring costs which may be needed to support the venture include those for research and development, legal and accounting, financing, training and "Other" services. Any needed associated inputs of this sort not already reflected elsewhere are entered in appropriate units (person months of professional service, etc.) to lines 496 through 501 of Table 8A. The quantities of such inputs by type of service can be estimated from the projected needs for the

venture and descriptions of the kinds and quantities of supporting studies and organizational structure already existing in the area.

Supporting services of a continuing nature for professional and supporting staff, publications, communications, travel, etc. which are needed to assure the success of the venture and its associated benefits are to be entered on lines 505 to 510 of Table 8A. Steps involved in estimating needed quantities of such supporting services are (1) identification and listing of needed kinds of supporting services (presumably public services, but may include some private services on a contractual basis), together with the agencies providing the services, (2) projecting needed amounts of such support by the venture which are beyond those already existing in the area, (3) outlining a tentative plan for generating the needed added support, and (4) developing estimates of the quantities of the six types of supporting services by year for entry to Table 8A.

Regulatory services in addition to those now existing which are needed to assure effective functioning of the venture are to be entered to lines 514 through 519 of Table 8A. As will be noted from the accompanying reprint of the worksheet, the listing of regulatory services parallels that of the supporting services. Furthermore, the steps involved in estimating needed quantities of the different regulatory services parallel those for the supporting services as outlined above. And as with the quantities of supporting service inputs, the quantities of regulatory service inputs are to be entered by year in the respective columns of the worksheet.

Other expenses items included on lines 523 through 528 of Table 8A relate primarily to the operation of the added infrastructure and plant facilities entered to the upper sections of the table. Such items include facility operation and maintenance, administration and overhead, fuel and energy, and other operating expenses. The quantities for these kinds of expense items can be estimated from the items of capital outlay for infrastructure and facilities entered above and the volumes of use of such facilities to be created by the venture.

In addition to operating expenses directly associated with the added facilities, there may be some additional expenses that should be entered to the OTHER EXPENSES section. If so, they will be calculated and entered in comparable manner. Care should be exercised to insure that all operating expense items needed to be assured of both the direct benefits and the associated benefits credited to the venture have been included. However, care also should be exercised to insure that there is no double counting of expenses previously reflected in the internal cashflow projections or in the operating expense factors for industries linked to the construction or operation of the venture via Tables 1B, 2B and 3B.

Unit Values of Associated Inputs in Table 8B

Unit values for the associated outlay and cost items in Table 8A are to be entered to column S of Table 8B. The project title in cell R472, the identification of the "Other" sources of expense in column N, and the units of measure in column O are transferred automatically when the spreadsheet is recalculated.

Table 8B. Unit Values of Associated Inputs by Class
Project: PANAMA RICE MILL

Type & Source of Cost	Unit of Measure	Average Value ($000)
INFRASTRUCTURE:		
1. Roads & Streets	Miles	2,000
2. Sewers & Drains	Miles	500
3. Utility Services	Units	40
4. Communications	Units	10
5. Information Base	Units	25
6. Other _____	Units	15
PLANT FACILITIES:		
1. Plant Buildings	Number	3,000
2. Warehouses	Number	850
3. Office Buildings	Number	500
4. Mech. & Electrical	Units	200
5. Equipment	Units	15
6. Other _____	Units	15
NON-RECURRING COSTS:		
1. Research & Dev.	Per. Mo.	3
2. Legal & Acctg.	Per. Mo.	4
3. Finance Charges	$1000	0.02
4. Training	Per. Mo.	2
5. Other _____	Per. Mo.	10
6. Other _____	Per. Mo.	1
SUPPORTING SERVICES:		
1. Professional Staff	Per. Mo.	4
2. Supporting Staff	Per. Mo.	2
3. Publications	Number	1
4. Communications	Yearly	3
5. Travel	Per. Mo.	1
6. Other _____	Per. Mo.	5
REGULATORY SERVICES:		
1. Professional Staff	Per. Mo.	3
2. Supporting Staff	Per. Mo.	2
3. Publications	Number	2
4. Communications	Yearly	2
5. Travel	Per. Mo.	1
6. Other _____	Per. Mo.	2
OTHER EXPENSES:		
1. Facility Maint.	Base	8
2. Admin. & Overhead	Units	20
3. Fuel & Energy	Units	11
4. Supplies & Mater.	Units	5
5. Other _____	Units	3
6. Other _____	Units	3

All of the datain the table needs to be entered to the unprotected cells on the lines in column S which contain entries in Table 8A; none of these values are computed by cell formula.

It will be noted that the accompanying Table 8B for the Panama rice mill case contains entries in all cells of column S. However, only those corresponding to nonzero entries in Table 8A are activated. For this reason it is not necessary to modify or erase values in Table 8B that do not relate to relevant quantities for the case at hand. These "dummy" values serve as useful guides to the functioning of the worksheet, and indicate the general magnitude of values that one can expect.

Now let us proceed to discussion of the monetary values for the associated capital outlay and operating expense items to be entered to Table 8B.

Infrastructure facilities costs per mile or other unit of measure in the table are entered to lines 478 to 483 of column S. Unit costs for such items are assembled from builders' qoutes, manufacturers' price lists, engineering estimates and similar sources. Many of the needed unit costs already may have been assembled in connection with capital cost estimates for the internal feasibility analysis of the venture. Care should be taken to be sure that the unit costs entered to the table are up to date, if necessary by applying applicable inflation factors to bring them to current values.

Plant facilities costs per unit are listed on lines 487 through 492 of column S. To be entered are the unit costs for plant buildings, warehouses, office buildings, mechanical and electrical facilities, pieces of equipment and "Other" plant facilities, the latter being identified in cell N492. This information can be assembled from builders' quotations, manufacturers' price lists, etc., and if necessary converted to the units of measure shown in column O of Table 8B. Some of the needed unit costs for this section should be available from the capital cost estimate for the venture.

Non-recurring costs per unit for the items included on lines 496 to 501 of Table 8A are entered to this section of column S. Average unit costs per month for professional services, per $1,000 for financing, per trainee for training, etc. should be readily available from service quotations and published rates in the local area. Listings which are slightly outdated can be brought to current price levels by application of appropriate inflation factors.

Supporting services costs per person month for professional staff and supporting staff, per publication or other quantity measure for publications, and per time period for communications, travel, etc. should be readily available for the local area. If several different unit cost quotations are found, one should select those which are most directly applicable for the specific types of service inputs listed in Table 8A. The unit cost entries for this section go to lines 505 to 510 of column S.

Regulatory services costs per unit for entry to lines 514 to 519 of column S are assembled in the same manner and from comarable sources as those for supporting sources. Quotations which need to be updated can be adjusted by application of appropriate inflation factors.

Other expense unit costs for entry to lines 523 to 528 of column S also should be readily available from local sources. Most probably many of them already have been assembled in connection with the operating cost estimate for the venture. In any case, such costs can be aligned to the quantity measures used for the corresponding items in Table 8A and updated to current price levels in the same manner as is employed for the other items in Table 8B.

Associated Capital Outlay and Cost in Table 8C

Total associated capital outlay and operating costs for the venture under the different types and sources of input are given in Table 8C. All values in this worksheet are computed by cell formula from the entries in Tables 8A and 8B. All cells in the worksheet are protected against accidental overwriting. The formulas used in the computation of Table 8C are illustrated in Appendix II. The project name at the top of the worksheet, the total number of periods in cell AG474, the monetary unit in cell AA475, and the identification of "Other" input items in column Z are transferred automatically when the spreadsheet is recalculated.

It will be noted that Table 8C follows the same organizational pattern as Table 8A, with projected periods represented by successive columns. Because they are determined by cell formula, all values in Table 8C are zero except those on lines containing nonzero entries in Tables 8A.

As illustrated in Appendix II, each value in Table 8C is the product of the number of units of outlay and cost items in Table 8A and the unit values of the inputs in Table 8B. The cell formula for cell AC481 is E481*$P481. The formula for the total value in cell AJ481 is @SUM(AA481..AH481)+AI481*AG$474-7.

Totals by operating function and by projected period are calculated by the worksheet as well. For example, the total infrastructure outlay for the Panama rice mill case in the 2nd period of $35 (000) is the sum of the calculated values in cells AC478 through AC483 (some of which are zero in this case).

Recalculating, Printing and Saving the Worksheets

The worksheets are recalculated by pushing the spreadsheet calculation key, <F9>. Usually one iteration is sufficient. However, to insure that the values obtained are final and stable, it is advisable to make two or three iterations by pushing the <F9> key two or three times in succession.

The worksheets can be printed using the spreadsheet command / P[rint] P[rinter] R[ange] (range specification) A[lign] G[o]. In order to fit each of the worksheets on the standard 8.5-inch by 11-inch paper, one needs to set the printer to 17-pitch font and 8 lines per inch. This can be done before executing the print command using the printer controls, or it can be specified by the appropriate printer string when the spreadsheet print commands are given. It also may be necessary to narrow the left and right margins slightly from the 1-inch default values.

Table 8C. Associated Capital Outlay and Cost by Period (000s)

Project: PANAMA RICE MILL

Type & Source of Cost	Unit = Dollars	1st	2nd	3rd	4th	5th	6th	7th	Remaining Years	Total
		Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
					Total Periods					30			
INFRASTRUCTURE:													
1. Roads & Streets		0	0	0	0	0	0	0	0	0
2. Sewers & Drains		0	0	0	0	0	0	0	0	0
3. Utility Services		0	0	0	0	0	0	0	0	0
4. Communications		0	20	0	0	0	0	0	0	20
5. Information Base		0	0	0	0	0	0	0	0	0
6. Other _____		0	15	0	0	0	0	0	0	15
		0	35	0	0	0	0	0	0	35
PLANT FACILITIES:										
1. Plant Buildings		0	0	0	0	0	0	0	0	0
2. Warehouses		0	0	0	0	0	0	0	0	0
3. Office Buildings		0	0	0	0	0	0	0	0	0
4. Mech. & Electric		0	0	0	0	0	0	0	0	0
5. Equipment		0	0	0	0	0	0	0	0	0
6. Other _____		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
NON-RECURRING COSTS:										
1. Research & Dev.		0	0	0	0	0	0	0	0	0
2. Legal & Acctg.		0	0	8	4	0	0	0	0	12
3. Finance Charges		0	0	0	0	0	0	0	0	0
4. Training		0	0	0	0	0	0	0	0	0
5. Other _____		0	0	0	0	0	0	0	0	0
6. Other _____		0	0	0	0	1	0	0	0	1
		0	0	8	4	1	0	0	0	13
SUPPORTING SERVICES:										
1. Professional Staff		0	8	8	8	8	8	8	8	232
2. Supporting Staff		0	2	2	2	2	2	2	2	58
3. Publications		0	1	1	1	1	1	1	1	29
4. Communications		0	3	3	3	3	3	3	3	87
5. Travel		0	1	1	1	1	1	1	1	29
6. Other _____		0	0	0	0	0	0	0	0	0
		0	15	15	15	15	15	15	15	435
REGULATORY SERVICES:										
1. Professional Staff		0	0	0	0	0	0	0	0	0
2. Supporting Staff		0	0	0	0	0	0	0	0	0
3. Publications		0	0	0	0	0	0	0	0	0
4. Communications		0	0	0	0	0	0	0	0	0
5. Travel		0	0	0	0	0	0	0	0	0
6. Other _____		0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
OTHER EXPENSES:										
1. Facility Maint.		0	8	8	8	8	8	8	8	232
2. Admin. & Overhead		0	0	0	0	0	0	0	0	0
3. Fuel & Energy		0	0	0	0	0	0	0	0	0
4. Supplies & Mater.		0	0	0	0	0	0	0	0	0
5. Other _____		0	3	3	3	3	3	3	3	87
6. Other _____		0	0	0	0	0	0	0	0	0
		0	11	11	11	11	11	11	11	319

The column and row designations for the printed worksheets are inserted with the spreadsheet border command. If one wants these to be printed with the worksheets so that they appear like those reprinted above, then the default commands accompanying the ASSOCBEN spreadsheet can be used. If one does not want them to appear on the printed worksheets, then the borders should be removed with the spreadsheet C[lear] B[orders] command.

When printing a series of worksheets such as Table 8A, Table 8B and Table 8C, it is necessary to recalculate the spreadsheet after each worksheet is printed. Then when the font, line spacing, and margin settings are made, printing is done with standard spreadsheet print commands. For example, Table 8C is printed by typing / P[rint] P[rinter] R[ange] 8C <return> A[lign] G[o].

The three worksheets for the case of interest are saved to an updated disk file by the spreadsheet F[ile] S[ave] command. Before executing this command, one should press the <F9> key to recalculate the spreadsheet. The save command is / F[ile] S[ave] B:ASSOC1ST (or other desired filename) <return>. If the file is saved as ASSOCBEN, the original spreadsheet data for the Panama rice mill case will be lost by overcopying. When a different filename is specified, both the original case and the new case will remain intact. If the spreadsheet is saved under a name other than ASSOCBEN, the new name needs to be entered when next retrieving the spreadsheet, e.g., RUN ASSOCBEN ASSOC1ST <return>.

SECTION XII

COMPUTATION OF ASSOCIATED RATE OF RETURN ON CAPITAL INVESTMENT

After completion of the eight sets of worksheets for the associated economic impacts of the venture of interest on the economic environment of the area, the remaining steps of the impact analysis are (1) development of a schedule of projected total cashflow of associated impacts over the economic horizon for the venture, (2) transfer of the schedule of combined capital outlay for the venture to the cashflow schedule, (3) computation of the Associated Rate of Return on total capital investment (ARR) for the venture, (4) completion of sensitivity analysis to determine response of the ARR to differing values of specified kinds of economic impact, and (5) interpretation and use of the findings.

The first of these steps is completed internally by recalculation of the electronic spreadsheet, making use of the cell formulas in Table 9, Projected Cash Flow of Associated Benefits and Costs. The second involves entry of previously-developed capital outlay estimates for the venture to the appropriate section of the cashflow schedule, either manually of by the spreadsheet transfer command, / F[ile] C[ombine] A[dd] N[amed-Range. Computation of the ARR is accomplished by using the completed cashflow schedule with the companion feasibility analysis software package.[1] Sensitivity analysis is accomplished with the scaler feature of the same software. Interpretation and use of the findings involves relating the results of the impact analysis to those of the internal feasibility analysis, and developing recommendations and plans based on the combined findings.

Each of these five steps is illustrated in sequence in the following pages, using the Panama rice mill case as example.

Cashflow of Associated Benefits and Costs in Table 9

The projected cashflow of associated benefits and costs for the venture is included in Tables 9A and 9B, occupying cells AK1..AT113 in the spreadsheet. The upper section of the cashflow included in Table 9A incorporates the table title and column headings for both sections of the cashflow. The project title shown in cell AP2 is transferred automatically when the spreadsheet is recalculated. The values in columns AL through AP are reserved for latter transfer of period identification and the capital outlay projections for the venture from the previous internal feasibility cashflow, as explained below. Employment benefits are transferred by cell formula from Table 5C to column AQ. Training benefits

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[1] Phillips, Richard. IRR Feasibility Analysis Program for Use on MS DOS Microcomputers, Release 2. Special Report No. 20., Food and Feed Grains Institute, Kansas State University, Manhattan. Revised Oct. 1990.

Table 9A. Projected Cash Flow of Associated Benefits and Costs

Project: PANAMA RICE MILL

AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT
Period		Site and Bldings	Plant Equip.	Average Invntry	Other Wrk Cap	Employ. Benefit	Training Benefit	Construct Linkage	Input Linkage
		Output Linkage	Capital Gains	Other Benefit	Capital Outlay	Annual Expense			
0	1992	147000	72000	0	0	0	0	0	0
1	1993	0	0	81600	32700	23500	13000	1520	23479
2	1994	0	0	0	0	23500	13000	0	23479
3	1995	0	0	0	0	23500	13000	0	23479
4	1996	0	0	0	0	23500	13000	0	23479
5	1997	0	0	0	0	23500	13000	0	23479
6	1998	0	0	0	0	23500	13000	0	23479
7	1999	0	0	0	0	23500	13000	0	23479
8	2000	0	0	0	0	23500	13000	0	23479
9	2001	0	0	0	0	23500	13000	0	23479
10	2002	0	72000	0	0	23500	13000	0	23479
11	2003	0	0	0	0	23500	13000	0	23479
12	2004	0	0	0	0	23500	13000	0	23479
13	2005	0	0	0	0	23500	13000	0	23479
14	2006	0	0	0	0	23500	13000	0	23479
15	2007	0	0	0	0	23500	13000	0	23479
16	2008	0	0	0	0	23500	13000	0	23479
17	2009	0	0	0	0	23500	13000	0	23479
18	2010	0	0	0	0	23500	13000	0	23479
19	2011	0	0	0	0	23500	13000	0	23479
20	2012	0	72000	0	0	23500	13000	0	23479
21	2013	0	0	0	0	23500	13000	0	23479
22	2014	0	0	0	0	23500	13000	0	23479
23	2015	0	0	0	0	23500	13000	0	23479
24	2016	0	0	0	0	23500	13000	0	23479
25	2017	0	0	0	0	23500	13000	0	23479
26	2018	0	0	0	0	23500	13000	0	23479
27	2019	0	0	0	0	23500	13000	0	23479
28	2020	0	0	0	0	23500	13000	0	23479
29	2021	0	0	0	0	23500	13000	0	23479
30	2022	-47800	0	-81600	0	0	0	0	0
31	2023					0	0	0	0
32	2024					0	0	0	0
33	2025					0	0	0	0
34	2026					0	0	0	0
35	2027					0	0	0	0
36	2028					0	0	0	0
37	2029					0	0	0	0
38	2030					0	0	0	0
39	2031					0	0	0	0
40	2032					0	0	0	0
41	2033					0	0	0	0
42	2034					0	0	0	0
43	2035					0	0	0	0
44	2036					0	0	0	0
45	2037					0	0	0	0
46	2038					0	0	0	0
47	2039					0	0	0	0
48	2040					0	0	0	0
49	2041					0	0	0	0
50	2042					0	0	0	0

are transferred in the same manner from Table 4C to column AR. Associated benefits from the construction phase of the venture are transferred by cell formula from Table 1C to column AS. Associated benefits from operational input linkages from Table 2C are transferred by cell formula to column AT in Table 9A.

Employment benefits are transferred from Table 5C to column AQ. The formula for cell AQ12 is $AB$285+$AB$294+$AB$303+$AB$312+$AB$321+$AB$330, for example (see Appendix III for a listing of the cell formulas for Table 9A). Starting with the eleventh period in cell AQ22 the formula becomes @IF($PERIOD3>=$L11, $AI$285+$AI$294+$AI$303+$AI$312+$AI$321+$AI$330,0). The latter formula checks to see whether the total number of periods in the cashflow (from cell AH274 in Table 5C--a named range designated as PERIOD3) is greater than the period number (in column L). If so it applies the formula; if not the period is recognized as beyond the end of the economic horizon for the venture, and a 0 is inserted in the column AQ cell.

Training benefits are transferred from Table 4C to column AR in similar manner. The formula for cell AR12 is $AB265, as shown in Appendix III. Starting with the eleventh period in cell AR22 the formula becomes @IF($PERIOD3>=$L11,$AI265,0). Again the formula inserts 0 if the period in the cashflow is beyond the economic horizon for the venture.

Construction impacts are transferred from Table 1C to column AS of Table 9A. The formula for cell AS12 is $AB$15+$AB$20+$AB$35+$AB$48+$AB$56+$AB$65+$AB$71, for example. Starting with the ninth period in cell AS20, a zero is inserted in all column AS cells on the presumption that all construction impacts for the venture will have been completed by the end of the eighth period.

Operating input impacts are transferred by cell formula from Table 2C to column AT of Table 9A. For example, the formula for cell AT12 is $AB$95+$AB$104+$AB$113+$AB$121+$AB$130+$AB$136. Starting with the eleventh period in cell AT22 the formula becomes @IF($PERIOD3>=$L11,$AI$95+$AI$104+$AI$113+$AI$121+$AI$130+$AI$136,0). This formula checks to see whether the total number of periods in the cashflow (from cell AH84 in Table 2C--a named range designated as PERIOD3) is greater than the period number (in column L). If so it applies the formula; if not the period is recognized as beyond the end of the economic horizon for the venture, and a 0 is inserted in the column AT cell.

The remaining columns of the projected cashflow of associated benefits and costs for the venture are shown in Table 9B. Included are the output linkage impacts in column AM, the capital gains impacts in column AN, the environmental impacts in column AO, the associated capital outlay in column AP, and the associated annual expense in column AQ.

Output linkage impacts are transferred by cell formula from Table 3C to column AM of Table 9B. For example, the formula for cell AM63 is $AB$200. Starting with the eleventh period in cell AM73 the formula becomes @IF($PERIOD3>=$L11, $AI$200,0). This formula checks to see whether the total number of periods in the cashflow (from cell AH144 in Table 3C--a named range designated as PERIOD3) is greater than the period number (in column L). If so it applies the formula;

Table 9B. Projected Cash Flow of Associated Benefits and Costs
Project: PANAMA RICE MILL

	AK	AL	AM Output Linkage	AN Capital Gains	AO Other Benefit	AP Capital Outlay	AQ Annual Expense	AR	AS	AT
63	0	1992	0	0	0	0	0			
64	1	1993	47209	18500	0	35000	26000			
65	2	1994	47209	18500	0	8000	26000			
66	3	1995	47209	18500	0	4000	26000			
67	4	1996	47209	0	18500	1000	26000			
68	5	1997	47209	0	18500	0	26000			
69	6	1998	47209	0	18500	0	26000			
70	7	1999	47209	0	18500	0	26000			
71	8	2000	47209	0	18500	0	26000			
72	9	2001	47209	0	18500	0	26000			
73	10	2002	47209	0	18500	0	26000			
74	11	2003	47209	0	18500	0	26000			
75	12	2004	47209	0	18500	0	26000			
76	13	2005	47209	0	18500	0	26000			
77	14	2006	47209	0	18500	0	26000			
78	15	2007	47209	0	18500	0	26000			
79	16	2008	47209	0	18500	0	26000			
80	17	2009	47209	0	18500	0	26000			
81	18	2010	47209	0	18500	0	26000			
82	19	2011	47209	0	18500	0	26000			
83	20	2012	47209	0	18500	0	26000			
84	21	2013	47209	0	18500	0	26000			
85	22	2014	47209	0	18500	0	26000			
86	23	2015	47209	0	18500	0	26000			
87	24	2016	47209	0	18500	0	26000			
88	25	2017	47209	0	18500	0	26000			
89	26	2018	47209	0	18500	0	26000			
90	27	2019	47209	0	18500	0	26000			
91	28	2020	47209	0	18500	0	26000			
92	29	2021	47209	0	18500	0	26000			
93	30	2022	0	0	0	0	0			
94	31	2023	0	0	0	0	0			
95	32	2024	0	0	0	0	0			
96	33	2025	0	0	0	0	0			
97	34	2026	0	0	0	0	0			
98	35	2027	0	0	0	0	0			
99	36	2028	0	0	0	0	0			
100	37	2029	0	0	0	0	0			
101	38	2030	0	0	0	0	0			
102	39	2031	0	0	0	0	0			
103	40	2032	0	0	0	0	0			
104	41	2033	0	0	0	0	0			
105	42	2034	0	0	0	0	0			
106	43	2035	0	0	0	0	0			
107	44	2036	0	0	0	0	0			
108	45	2037	0	0	0	0	0			
109	46	2038	0	0	0	0	0			
110	47	2039	0	0	0	0	0			
111	48	2040	0	0	0	0	0			
112	49	2041	0	0	0	0	0			
113	50	2042	0	0	0	0	0			

if not the period is recognized as beyond the end of the economic horizon for the venture, and a 0 is inserted in the column AM cell.

Capital gains impacts are transferred from Table 6C to column AN of Table 9B. For example, the formula for cell AN63 is $AB$395. Starting with the tenth period in cell AN72, a zero is inserted in all column AN cells on the presumption that all capital gain (or loss) impacts for the venture will have been completed by the end of the ninth period.

Environmental impacts are transferred from Table 7C to column AO of Table 9B by cell forumlas in the spreadsheet. For example, the formula for cell AO63 is as follows: $AB$415+$AB$424+$AB$433+$AB$442+$AB$451+$AB$460 (see Appendix III for a listing of the cell formulas for Table 9B). Starting with the eleventh period in cell AO73, the formula becomes @IF($PERIOD3>$L11,$AI$415+$AI$424+$AI$433+$AI$442+$AI$451+$AI$460,0). This formula checks to see whether the total number of periods in the cashflow is greater than the period number (in column L). If so it applies the formula; if not the period is recognized as beyond the end of the economic horizon for the venture, and a 0 is inserted in the column AO cell. Associated capital outlay figures for the venture are transferred from the upper section of Table 8C to column AP of Table 9B. For example, the formula for cell AP63 is ($AB$485+$AB$494+$AB503)*1000. The sum of the transferred values are multipled by 1000 because the total values in Table 8C are in units of 1000. Starting with the ninth period in cell AP71, a zero is inserted in all column AP cells on the presumption that all associated capital outlay for the venture will have been incurred by the eighth period.

Associated operating cost figures for the venture are transferred from the lower section of Table 8C to column AQ of Table 9B. For example, the formula for cell AQ63 is ($AB$512+$AB$521+$AB530)*1000. Starting with the eleventh period in cell AQ73, the formula becomes @IF($PERIOD3>$L11,($AI$512+$AI$521+$AI$530)* 1000,0). This formula checks to see whether the total number of periods in the cashflow is greater than the period number (in column L). If so it applies the formula; if not the period is recognized as beyond the end of the economic horizon for the venture, and a 0 is inserted in the column AQ cell.

Transfer of Schedule of Total Capital Outlay for the Venture

The sequence number and identification of the projected periods in the cashflow and the first four columns of data in Table 9A are taken from the corresponding columns in the projected cashflow used to determine the internal feasibility of the venture. They include the period sequence (column AK), the period identification (column AL), site and buildings outlay (column AM), plant equipment outlay (column AN), additions to average inventory (column AO), and other working capital additions (column AP). The values for the Panama rice mill in cells AK12 to AP42 of Table 9A, above, provide an example of such information and how it is organized in the worksheet.

The cell range from AK12 to AP62 of the worksheet is unprotected, so that the capital outlay data for the venture of interest can be entered directly to Table 9A. This can be done manually quite easily for most ventures because of the

limited number of nonzero entries in the capital outlay schedule, as illustrated by the Panama rice mill case. Entries are limited to the construction and start-up periods, the periods of replacement of capital assets, and the capital recovery entries in the last (n+1) period. Alternatively, the capital outlay schedule for the venture of interest can be transferred to Table 9A using the spreadsheet software command F[ile] C[ombine] A[dd] N[amed-Range]. The two options are illustrated in sequence, using the capital outlay schedule for the Panama Rice mill as example.

Manual Transfer

Manual transfer of the capital outlay schedule for the venture of interest is accomplished by typing the values from the cashflow schedule used to run the IRR for the venture to the appropriate cells of Table 9A of the spreadsheet. Using the Panama rice mill schedule as example, the steps for doing so are as follows.

1. Retrieve the spreadsheet if it is not already in computer memory, following the guidelines outlined on pages 5 and 6 in Section I of the manual.

2. Go to Table 9A by typing <F5> 9A <return>.

3. Use the spreadsheet Range Erase commands to remove the existing values in the AK12..AP42 range, i.e., type / R E AK12..AP42 <return>.

4. Use the spreadsheet Data Fill commands to insert the period sequence to column AK, i.e., type / D[ata] F[ill] AK12..AK42 <return> 0 <return> 1 <return> <return>.

5. Use the spreadsheet Data Fill commands to insert the period identification to column AL, i.e., type / D[ata] F[ill] AL12..AL42 <return> 1992 <return> 1 <return> <return>.

6. Enter the capital outlay figures to line 12, i.e., put cursor on cell AM12 and type 147000 <right arrow> 72000 <right arrow> 0 <right arrow> 0 <return>.

7. Enter the working capital figures to line 13, i.e., put cursor on cell AM13 and type 0 <right arrow> 0 <right arrow> 81600 <right arrow> 32700 <return>.

8. Copy the 0 in cell AM13 to the AM14..AP42 range, i.e., put cursor or cell AM13 and type / C <return> <down arrow> . <right arrow to cell AP14> <down arrow to cell AP42> <return>.

9. Enter the mill replacement data to column AN, i.e., put cursor on cell AN22 and type 72000 <return>; put cursor on cell AN32 and type 72000 <return>.

10. Enter the capital recovery values to line 42, i.e., put cursor on cell AM42 and type -47800 <right arrow> <right arrow> -81600 <return>.

11. Press the calculation key, <F9>, to recalculate the spreadsheet.

12. Save the spreadsheet with the changes as entered, i.e., type / F S <return> R[eplace]. Table 9A should now match that shown above.

Transfer with the Spreadsheet File Combine Command

Electronic transfer of the capital outlay schedule for the venture of interest is accomplished by using the spreadsheet commands to combine the outlay schedule from the IRR cashflow for the venture with cashflow of associated benefits and costs. The procedure requires that one know the name and the location of the spreadsheet file containing the IRR cashflow and the range name or cell location of the section of the file to be transferred. In the following example for the Panama rice mill it is assumed that the capital outlay schedule is located in the range A1..F31 of a file named PANRMIRR.WK1 on floppy disk in the A drive. The user transferring the capital outlay schedule for a different venture under study would substitute the range, file name and location appropriate for that case in making the transfer as illustrated.

The steps for making the transfer with the spreadsheet file combine command in case of the Panama rice mill example are as follows.

1. Retrieve the spreadsheet if it is not already in computer memory, following the guidelines outlined on pages 5 and 6 in Section I of the manual.

2. Go to Table 9A by typing <F5> 9A <return>.

3. Use the spreadsheet Range Erase commands to remove the existing values in the AK12..AP42 range, i.e., type / R E AK12..AP42 <return>.

4. Put cursor on cell AK12 of Table 9A and make the file combine command, i.e., type / F[ile] C[ombine] A[dd] N[amed-Range] A1..F31 <return> **A:PANRMIRR.WK1** <return>.

5. Wait for the transfer to be completed.

6. The values in Table 9A after the transfer should match those in the accompanying Table 9A reproduction for the Panama rice mill.

7. Press the calculation key, <F9>, to recalculate the spreadsheet.

8. Save the spreadsheet with the changes as entered, i.e., type / F S <return> R[eplace].

Computation of Associated Rate of Return with IRR Software

After the capital outlay and added working capilal schedule has been transferred to Table 9A of the spreadsheet, the combined cashflow of associated benefits and costs can be used with the IRR feasibility analysis software to compute the Associated Rate of Return on total capital investment in the venture (ARR).[2] That software reads the combined cashflow as a DOS (ASCII) file from specified disk drive, together with keyboard commands in response to monitor prompts, to make the computational run for the ARR and Net Present Associated Values at

[2] Ibid.

alternative discount rates. The combined cashflows in Tables 9A and 9B first are saved as a print files with the spreadsheet software. The two print files are combined and renamed as the data input file for the feasibility analysis software, using the DOS command COPY. Then the data file of associated benefits and costs is used with the with the IRR softare to make the analysis and print the results. The three steps are discussed in sequence.

Saving Print Files of Tables 9A and 9B

While the electronic spreadsheet is still in computer memory after completion of the capital outlay transfer to Table 9A, this table and Table 9B are saved as print files using the spreadsheet print file command. The print files are saved in unformatted form with no borders and left, top and bottom margins of 0. Only the lines of the tables which represent projected periods within the economic horizon of the venture are included in print files.

The specific steps and spreadsheet commands for making the print files are as follows.

1. Type <F9> to recalculate the spreadsheet, and then save the Table 9A cashflow as a print file, i.e., type / P[rint] F[ile] B:9A <return> R[ange] AK12..AT42 <return> O[ptions] M[argins] L[eft] 0 <return> T[op] 0 <return> B[ottom] 0 <return> R[ight] 96 <return> O[ther] U[nformatted] Q[uit] C[lear] B[orders] G[o] Q[uit].

2. Type <F9> to recalculate the spreadsheet, and then save the Table 9B cashflow as a print file, i.e., type / P[rint] F[ile] B:9B <return> R[ange] AK63..AQ93 <return> G[o] Q[uit].

3. Exit the spreadsheet software by typing / Q[uit] Y[es] E[xit].

Combining Files for Associated Rate of Return Analysis

The next step is to copy the 9A and 9B print files to serve as the DATA.IRR file for making the Associated Rate of Return run with the feasibility analysis software. One needs to have available the work disk containing the software program, IRR(ENG).EXE together with one or more HEADERS files and one or more DATA files (or the subdirectory on the hard disk where such files reside). Let us assume that a disk containing these files is in Drive A and the disk containing the two print files just made is in Drive B. Then one would first log to A>, and type DIR <return> to check the files there. If a DATA.IRR file already exists it first should be renamed to a different extension to identify it (e.g., DATA.1ST), and to avoid losing the file by overcopying when the copy command is given.

The headers files on the feasibililty analysis disk should be checked also. The HEADERS file with no extension is the active file containing the default commands for the feasibility analysis run. If a file called HEADERS.ARR or something comparable exists on the disk it can be renamed to HEADERS so that many of the default commands can be used without change. If both a HEADERS and a HEADERS.ARR file exist, then the HEADERS file first should be renamed to another extension (e.g., HEADERS.1ST) so that HEADERS.ARR can be renamed to HEADERS.

When these steps have been done, and with the feasibility analysis disk in Drive A and the disk containing the 9A.PRN and 9B.PRN in Drive B, and logged to Drive A, the DOS copy command is:

COPY B:9A.PRN+9B.PRN DATA.IRR <return>.

Making the Associated Rate of Return Run

With this step completed and still with the feasibility analysis disk in Drive A and logged to that drive, the associated rate of return analysis is initiated by typing IRR(ENG) <return>. Before doing so, however, one's printer should be loaded with 132-column paper or the font set to 17 pitch, because the output from the software will not fit on standard paper with pica or elite font setting.

When the IRR(ENG) <return> command is given, the software will move to a an explanatory screen on the monitor which explains the sequence of steps in program, and instructs to push <return> again to proceed. Next the master menu appears, enabling one to choose one or all of the numbered screens for prompts regarding program commands for the run. For the ARR run of the Panama rice mill case, the proper commands to each screen are as follows:

1. DOLLARS<return>
2. 1.0<return>
3. 0<return>
   1<return>
5. 31.0<return>
6. 2 2 7 2<return>
7. 3<return>
8. 00<return>

<return> again to move to the Subsequent runs menu
   0<return> to accept default option
Title menu: 0<return> to bypass
Execution screen: <Ctrl> P to echo printer and <return> to proceed.

It will be noted that in this example screens 4 and 9 are not called from the master menu. This saves extra keyboard entries by accepting the default values for these items. Anytime a numbered menu is requested, all responses to that screen must be entered, even though the default values are OK. Thus, if the commands at any of these menus is not to be changed from the default values, then that screen is not requested by number.

<u>Output of the Associated Rate of Return Run</u>

Listing of Factors Used in the Run

```
      Unit of Measure for Output Is  DOLLARS
      Number of Times Discounted per Year = 1.0
      "Sunken Investment" Option IS NOT Being Used
      Benefit-Costs Computed at Annual Discount Rates of:
     .15000    .20000    .25000    .30000    .35000    .40000
```

Listing of the Input for the Panama Rice Mill Case

A LISTING OF THE DATA

31.00 1.00 2 2 7 2 3 2 0 0 .110000

Budgeted 100,000 Rice Milling Operation in Panama
A. Total Operation

Period	Site and Bldings	Plant Equip.	Average Invntry	Other Wrk Cap	Employ Benefit	Training Benefit	Const. Linkage	Input Linkage	Output Linkage	Capital Gains	Other Benefit	Capital Outlay	Annual Expense
0 1992	147000.	72000.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 1993	0.	0.	81600.	32700.	23500.	13000.	1520.	23479.	47209.	18500.	0.	35000.	26000.
2 1994	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	18500.	0.	8000.	26000.
3 1995	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	18500.	0.	4000.	26000.
4 1996	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	1000.	26000.
5 1997	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
6 1998	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
7 1999	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
8 2000	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
9 2001	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
10 2002	0.	72000.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
11 2003	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
12 2004	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
13 2005	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
14 2006	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
15 2007	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
16 2008	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
17 2009	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
18 2010	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
19 2011	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
20 2012	0.	72000.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
21 2013	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
22 2014	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
23 2015	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
24 2016	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
25 2017	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
26 2018	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
27 2019	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
28 2020	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
29 2021	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
30 2022	-47800.	0.	-81600.	-32700.	0.	0.	0.	0.	0.	0.	0.	0.	0.

Listing of the ARR Program Output for the Case

INVESTMENT FEASIBILITY ANALYSIS
Budgeted 100,000 Rice Milling Operation in Panama
A. Total Operation

ASSOCIATED RETURN ON TOTAL CAPITAL 28.706 PERCENT

PERIOD NO.	PERIOD IDENT.	INVESTMENT (DOLLARS) FACILITIES	WORKING CAPITAL	TOTAL	ASSOCIATED EFFECTS (DOLLARS) ASSOCIATED BENEFITS	ASSOCIATED COSTS	ASSOCIATED NET BENEFITS	PRESENT VALUE FACTOR	PRESENT VALUES TOTAL INVESTMENT	ASSOCIATED NET BENEFITS
0	1992	219000.	0.	219000.	0.	0.	0.	1.0000	219000.	0.
1	1993	0.	114300.	114300.	127208.	61000.	66208.	.7770	88807.	51441.
2	1994	0.	0	0.	125688.	34000.	91688.	.6037	0.	55350.
3	1995	0.	0.	0.	125688.	30000.	95688.	.4690	0.	44881.
4	1996	0.	0.	0.	125688.	27000.	98688.	.3644	0.	35964.
5	1997	0.	0.	0.	125688.	26000.	99688.	.2831	0.	28226.
6	1998	0.	0.	0.	125688.	26000.	99688.	.2200	0.	21931.
7	1999	0.	0.	0.	125688.	26000.	99688.	.1709	0.	17039.
8	2000	0.	0.	0.	125688.	26000.	99688.	.1328	0.	13239.
9	2001	0.	0.	0.	125688.	26000.	99688.	.1032	0.	10286.
10	2002	72000.	0.	72000.	125688.	26000.	99688.	.0802	5772.	7992.
11	2003	0.	0.	0.	125688.	26000.	99688.	.0623	0.	6209.
12	2004	0.	0.	0.	125688.	26000.	99688.	.0484	0.	4825.
13	2005	0.	0.	0.	125688.	26000.	99688.	.0376	0.	3748.
14	2006	0.	0.	0.	125688.	26000.	99688.	.0292	0.	2912.
15	2007	0.	0.	0.	125688.	26000.	99688.	.0227	0.	2263.
16	2008	0.	0.	0.	125688.	26000.	99688.	.0176	0.	1758.
17	2009	0.	0.	0.	125688.	26000.	99688.	.0137	0.	1366.
18	2010	0.	0.	0.	125688.	26000.	99688.	.0106	0.	1061.
19	2011	0.	0.	0.	125688.	26000.	99688.	.0083	0.	825.
20	2012	72000.	0.	72000.	125688.	26000.	99688.	.0064	463.	641.
21	2013	0.	0.	0.	125688.	26000.	99688.	.0050	0.	498.
22	2014	0.	0.	0.	125688.	26000.	99688.	.0039	0.	387.
23	2015	0.	0.	0.	125688.	26000.	99688.	.0030	0.	301.
24	2016	0.	0.	0.	125688.	26000.	99688.	.0023	0.	233.
25	2017	0.	0.	0.	125688.	26000.	99688.	.0018	0.	181.
26	2018	0.	0.	0.	125688.	26000.	99688.	.0014	0.	141.
27	2019	0.	0.	0.	125688.	26000.	99688.	.0011	0.	110.
28	2020	0.	0.	0.	125688.	26000.	99688.	.0009	0.	85.
29	2021	0.	0.	0.	125688.	26000.	99688.	.0007	0.	66.
30	2022	-47800.	-114300.	-162100.	0.	0.	0.	.0005	-84.	0.
	TOTAL	315200.	0.	315200.	3646472.	802000.	2844472.		313958.	313958.

INTEREST PER CENT	ASSOCIATED BENEFIT RATIO	PRESENT VALUE IN DOLLARS ASSOC. BENEFITS	OUTLAY	BALANCE
15.000	1.818	614680.	338140.	276540.
20.000	1.405	459668.	327074.	132594.
25.000	1.141	363773.	318800.	44973.
30.000	.958	299470.	312463.	-12993.
35.000	.825	253659.	307406.	-53747.
40.000	.724	219492.	303211.	-83720.

ALTERNATIVE:

Base Case.

Sensitivity Analysis with Scaler Factors

Sensitivity analysis to test the effect on the ARR of specified changes in specific impacts is accomplished with the feasibility analysis software by simply multiplying or "scaling" the input data to the IRR program by the appropriate factor or "scaler". For example, to investigate the effect of a 20-percent decrease in projected employment benefits, one simply multiplies the employment benefits data column in the existing data set by 0.80, and reruns the analysis. The IRR(ENG) software accommodates this process by enabling the user to define several different alternative scaling factors to be applied to the one data set used in the analysis. This relieves the analyst of having to build a new data set for each alternative scenario to be tested.

The procedure is to add the necessary information at the end of the data set being used in the analysis. Then the software is alerted to the fact that the analyst expects the alternatives to be analyzed by responding to the "Number of Scale Options Included in this Pass" screen during the software's start-up process.

For each alternative to be tested, the information which must be added to the data set for the "base case" includes the following:

1. Two 132-column footnotes (entered on consecutive lines of 80 and 52 columns, respectively) describing the the alternative.

2. Two lines of scaler numbers which are properly spaced horizontally under the corresponding data columns, one for the first part of the data set (Table 9A), and the other for the second part of the data set (Table 9B).

The following is an example of the information needed to describe an alternative in which the employment benefits are decreased 20 percent beginning in period 5:

No. 1. Employment benefits reduced by 20 percent, starting in Period 5.

All other associated benefits and costs the same as for the base case.

0	5	1	1	1	1	.8	1	1	1
0	5	1	1	1	1	1			

Note that there are two 2-line footnotes followed by two scaler lines. In this case both of the footnotes have one typed line followed by one blank line because the text of the footnote fits within 80 columns. Each of the two scaler lines starts with entries of 0 (in column 3) and 5 (in column 8); the 0 indicates no output data file is to be created, and the 5 indicates that scaling is to start in period 5. The 1s in the scaler lines indicate no change (multiply by 1), while the .8 indicates that the fifth column of data (employment benefits) is to be multiplied by .8.

After footnotes and scaler lines for each of the alternatives desired have been added at the end of the data set, the sensitivity analysis run is made by again typing IRR(ENG) <return>. When the Menu of Computational Instructions appears on the screen, one types 8 to bring up the command for number of scale options, and enters the number of options included in the run (as two-digit integer).

Several options are available for building the data file with the scaler additions. It can be done with word processor software by recalling the DATA.IRR file, typing in the additions at the end of the file, and saving the file with additions as a DOS file under the same name (DATA.IRR). It can be done with spreadsheet software by importing the DOS file, DATA.IRR, making the changes to the worksheet, saving it as a print file, e.g., DATA.PRN, and renaming it to DATA.IRR (with the DOS command, REName). Perhaps one of the simplest ways of doing so is by using the DOS line editor program, EDLIN. The following series of steps illustrates the latter option to conduct sensitivity analysis of two alternatives, one with the 20-percent reduction in employment benefits and the other with an 8-percent reduction in output linkage benefits.

Modification of the DATA.IRR file

1. Logged in Drive A> with feasibility analysis program disk containing the DATA.IRR file in this drive, type EDLIN DATA.IRR <return>, and wait for the EDLIN prompt, End of File, to appear.

2. List the file to check it and determine the last line number of the existing file by typing 1,100 L[ist] <return>.

3. Move to the EDLIN insert mode by typing 63 I[nsert] <return>.

4. Type in the four footnote lines for the first alternative as follows:
   No. 1. Employment benefits reduced by 20 percent, starting in Period 5.
   <return>, and again <return> to insert the blank line.
   All other associated benefits and costs the same as for the base case.
   <return>, and again <return> to insert the fourth blank line.

5. Type in the two scaler lines for the first alternative as follows:
   <2 spaces> 0 <4 spaces> 5 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces>
   1 <7 spaces> .8 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <return>
   <2 spaces> 0 <4 spaces> 5 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces>
   1 <8 spaces> 1 <return>.

6. Type in the four footnote lines for the second alternative as follows:
   No. 2. Output linkage benefits reduced by 8 percent, starting in Period 1
   <return>, and again <return> to insert the blank line.
   All other associated benefits and costs the same as for the base case.
   <return>, and again <return> to insert the fourth blank line.

7. Type in the two scaler lines for the second alternative as follows:
   <2 spaces> 0 <4 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <return>
   <2 spaces> 0 <4 spaces> 1 <6 spaces> .92 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <8 spaces> 1 <return>.

8. Type <Ctrl> C to discontinue the insertions.

9. Save the file by typing E[nd].

The file is now saved as the new DATA.IRR. The old file with which the scale exercise started is saved on the A drive by EDLIN as DATA.BAK. If one would like to keep this original file intact, it can be renamed, e.g., while still logged in A>, type REN DATA.BAK DATA.ARR <return>.

A listing of the last few lines of the existing file plus the scale additions just made is given in Figure 13 on the following page.

Making the Sensitivity Run

If the lower section of the DATA.IRR file now appears like that shown with added input for two scale alternatives, each with four footnote lines followed with two scaler lines, one should be ready for the sensitivity run. The scaler factors should be right justified under the respective columns in the data input file, and there should be no space between the last scaler line for the first alternative and the first footnote line for the second alternative.

If everything checks and still with the feasibility analysis disk in Drive A and logged to that drive, the sensitivity analysis is initiated by typing IRR(ENG) <return>. Before doing so, however, one's printer should be loaded with 132-column paper or the font set to 17 pitch.

When the IRR(ENG) <return> command is given, the software will again move to the an explanatory screen on the monitor, which instructs one to push <return> again to proceed. Next the master menu appears, enabling one to choose the numbered screen desired for inserting program commands for the run. For the sensitivity run, the only selection needed is 8 <return>. When the screen for number of scale options appears, the proper entry row this case is 02 <return>. Then one presses <return> again to move to the subsequent runs menu, types 0 <return> to accept the default option and again 0 <return> to bypass the headers screen. When the execution screen appears, the proper command is <Ctrl> P to echo the output to the printer followed by <return> to proceed to program execution.

The run will take several minutes because it will generate several pages of printed output. First the same output shown above for the base case will be reproduced. Then the software creates a new problem for the first alternative, runs that case and prints the output for it. Finally, the run creates the problem for the second alternative, runs this case and prints its output. There are only two alternatives in this example, but if 25 scaler alternatives had been added, the software would continue in the same manner until cases for each of them had been solved and the results printed for all of them.

.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
21	2013	47209	0	18500	0	26000
22	2014	47209	0	18500	0	26000
23	2015	47209	0	18500	0	26000
24	2016	47209	0	18500	0	26000
25	2017	47209	0	18500	0	26000
26	2018	47209	0	18500	0	26000
27	2019	47209	0	18500	0	26000
28	2020	47209	0	18500	0	26000
29	2021	47209	0	18500	0	26000

No. 1. Employment benefits reduced by 20 percent, starting in Period 5.

All other associated benefits and costs the same as for the base case.

0	5	1	1	1	1	.8	1	1	1
0	5	1	1	1	1	1			

No. 2. Output linkage benefits reduced by 8 percent, starting in Period 1.

All other associated benefits and costs the same as for the base case.

0	1	1	1	1	1	1	1	1	1
0	5	.92	1	1	1	1			

Figure 13. Listing of the Input for Sensitivity Analysis

Results of Sensitivity Analysis for the Panama Rice Mill

The output reproduced on the following pages illustrates results under the two alternatives in case of the Panama rice mill example. The base case output which is produced again in the same run is not repeated.

It will be noted that the Associated Rate of Return for this rice mill example is not very sensitive to the kinds and magnitudes of changes in estimated impacts tested. The 20-percent reduction in estimated employment impacts reduces the ARR for the venture by less than 0.6 of one percent, from 28.706 percent for the base case to 28.130 percent for Alternative No. 1. An 8-percent reduction in the estimated output linkage benefits reduces the ARR by about 1.25 percent per annum (from 28.130 to 27.458), but still leaves one with an attractive over-all indication of the impacts exerted by the venture upon its economic environment.

Listing of the Input for Alternative No. 1

A LISTING OF THE DATA

31.00 1.00 2 2 7 4 2 2 2 0 .110000

Budgeted 100,000 Rice Milling Operation in Panama
A. Total Operation

Period	Site and Bldings	Plant Equip.	Average Invntry	Other Wrk Cap	Employ Benefit	Training Benefit	Const. Linkage	Input Linkage	Output Linkage	Capital Gains	Other Benefit	Capital Outlay	Annual Expense
SCALERS:	1.0000	1.0000	1.0000	1.0000	.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0 1992	147000.	72000.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 1993	0.	0.	81600.	32700.	23500.	13000.	1520.	23479.	47209.	18500.	0.	35000.	26000.
2 1994	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	18500.	0.	8000.	26000.
3 1995	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	18500.	0.	4000.	26000.
4 1996	0.	0.	0.	0.	23500.	13000.	0.	23479.	47209.	0.	18500.	1000.	26000.
5 1997	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
6 1998	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
7 1999	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
8 2000	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
9 2001	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
10 2002	0.	72000.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
11 2003	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
12 2004	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
13 2005	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
14 2006	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
15 2007	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
16 2008	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
17 2009	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
18 2010	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
19 2011	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
20 2012	0.	72000.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
21 2013	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
22 2014	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
23 2015	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
24 2016	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
25 2017	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
26 2018	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
27 2019	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
28 2020	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
29 2021	0.	0.	0.	0.	18800.	13000.	0.	23479.	47209.	0.	18500.	0.	26000.
30 2022	-47800.	0.	-81600.	-32700.	0.	0.	0.	0.	0.	0.	0.	0.	0.

SCALE FACTORS APPLIED TO DATA BEGINNING IN PERIOD 5

Listing of the ARR Program Output for Alternative No. 1

INVESTMENT FEASIBILITY ANALYSIS
Budgeted 100,000 Rice Milling Operation in Panama
A. Total Operation

ASSOCIATED RETURN ON TOTAL CAPITAL 28.130 PERCENT

PERIOD NO.	IDENT.	INVESTMENT (DOLLARS) FACILITIES	WORKING CAPITAL	TOTAL	ASSOCIATED EFFECTS (DOLLARS) ASSOCIATED BENEFITS	ASSOCIATED COSTS	ASSOCIATED NET BENEFITS	PRESENT VALUE FACTOR	PRESENT VALUES TOTAL INVESTMENT	ASSOCIATED NET BENEFITS
0	1992	219000.	0.	219000.	0.	0.	0.	1.0000	219000.	0.
1	1993	0.	114300.	114300.	127208.	61000.	66208.	.7805	89206.	51673.
2	1994	0.	0.	0.	125688.	34000.	91688.	.6091	0.	55848.
3	1995	0.	0.	0.	125688.	30000.	95688.	.4754	0.	45489.
4	1996	0.	0.	0.	125688.	27000.	98688.	.3710	0.	36615.
5	1997	0.	0.	0.	120988.	26000.	94988.	.2896	0.	27505.
6	1998	0.	0.	0.	120988.	26000.	94988.	.2260	0.	21467.
7	1999	0.	0.	0.	120988.	26000.	94988.	.1764	0.	16754.
8	2000	0.	0.	0.	120988.	26000.	94988.	.1377	0.	13076.
9	2001	0.	0.	0.	120988.	26000.	94988.	.1074	0.	10205.
10	2002	72000.	0.	72000.	120988.	26000.	94988.	.0838	6037.	7965.
11	2003	0.	0.	0.	120988.	26000.	94988.	.0654	0.	6216.
12	2004	0.	0.	0.	120988.	26000.	94988.	.0511	0.	4851.
13	2005	0.	0.	0.	120988.	26000.	94988.	.0399	0.	3786.
14	2006	0.	0.	0.	120988.	26000.	94988.	.0311	0.	2955.
15	2007	0.	0.	0.	120988.	26000.	94988.	.0243	0.	2306.
16	2008	0.	0.	0.	120988.	26000.	94988.	.0189	0.	1800.
17	2009	0.	0.	0.	120988.	26000.	94988.	.0148	0.	1405.
18	2010	0.	0.	0.	120988.	26000.	94988.	.0115	0.	1096.
19	2011	0.	0.	0.	120988.	26000.	94988.	.0090	0.	856.
20	2012	72000.	0.	72000.	120988.	26000.	94988.	.0070	506.	668.
21	2013	0.	0.	0.	120988.	26000.	94988.	.0055	0.	521.
22	2014	0.	0.	0.	120988.	26000.	94988.	.0043	0.	407.
23	2015	0.	0.	0.	120988.	26000.	94988.	.0033	0.	317.
24	2016	0.	0.	0.	120988.	26000.	94988.	.0026	0.	248.
25	2017	0.	0.	0.	120988.	26000.	94988.	.0020	0.	193.
26	2018	0.	0.	0.	120988.	26000.	94988.	.0016	0.	151.
27	2019	0.	0.	0.	120988.	26000.	94988.	.0012	0.	118.
28	2020	0.	0.	0.	120988.	26000.	94988.	.0010	0.	92.
29	2021	0.	0.	0.	120988.	26000.	94988.	.0008	0.	72.
30	2022	-47800.	-114300.	-162100.	0.	0.	0.	.0006	-96.	0.
	TOTAL	315200.	0.	315200.	3528972.	802000.	2726972.		314654.	314654.

INTEREST PER CENT	ASSOCIATED BENEFIT RATIO	PRESENT VALUE IN DOLLARS ASSOC. BENEFITS	OUTLAY	BALANCE
15.000	1.766	597309.	338140.	259169.
20.000	1.371	448453.	327074.	121380.
25.000	1.117	356102.	318800.	37302.
30.000	.941	293993.	312463.	-18470.
35.000	.812	249618.	307406.	-57787.
40.000	.714	216434.	303211.	-86778.

ALTERNATIVE:
No. 1. Employment benefits reduced by 20 percent, starting in Period 5.
All other associated benefits and costs the same as for the base case.

Listing of the Input for Alternative No. 2

A LISTING OF THE DATA

31.00 1.00 2 2 7 2 3 2 2 0 .110000

Budgeted 100,000 Rice Milling Operation in Panama
A. Total Operation

Period	Site and Bldings	Plant Equip.	Average Invntry	Other Wrk Cap	Employ Benefit	Training Benefit	Const. Linkage	Input Linkage	Output Linkage	Capital Gains	Other Benefit	Capital Outlay	Annual Expense
SCALERS:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	.9200	1.0000	1.0000	1.0000	1.0000
0 1992	147000.	72000.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 1993	0.	0.	81600.	32700.	23500.	13000.	1520.	23479.	43431.	18500.	0.	35000.	26000.
2 1994	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	18500.	0.	8000.	26000.
3 1995	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	18500.	0.	4000.	26000.
4 1996	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	1000.	26000.
5 1997	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
6 1998	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
7 1999	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
8 2000	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
9 2001	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
10 2002	0.	72000.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
11 2003	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
12 2004	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
13 2005	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
14 2006	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
15 2007	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
16 2008	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
17 2009	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
18 2010	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
19 2011	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
20 2012	0.	72000.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
21 2013	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
22 2014	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
23 2015	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
24 2016	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
25 2017	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
26 2018	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
27 2019	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
28 2020	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
29 2021	0.	0.	0.	0.	23500.	13000.	0.	23479.	43431.	0.	18500.	0.	26000.
30 2022	-47800.	0.	-81600.	-32700.	0.	0.	0.	0.	0.	0.	0.	0.	0.

SCALE FACTORS APPLIED TO DATA BEGINNING IN PERIOD 1

Listing of the ARR Program Output for Alternative No. 2

INVESTMENT FEASIBILITY ANALYSIS
Budgeted 100,000 Rice Milling Operation in Panama
A. Total Operation

ASSOCIATED RETURN ON TOTAL CAPITAL 27.458 PERCENT

PERIOD NO.	IDENT.	INVESTMENT (DOLLARS) FACILITIES	WORKING CAPITAL	TOTAL	ASSOCIATED EFFECTS (DOLLARS) ASSOCIATED BENEFITS	ASSOCIATED COSTS	ASSOCIATED NET BENEFITS	PRESENT VALUE FACTOR	PRESENT VALUES TOTAL INVESTMENT	ASSOCIATED NET BENEFITS
0	1992	219000.	0.	219000.	0.	0.	0.	1.0000	219000.	0.
1	1993	0.	114300.	114300.	123431.	61000.	62431.	.7846	89676.	48982.
2	1994	0.	0.	0.	121911.	34000.	87911.	.6156	0.	54114.
3	1995	0.	0.	0.	121911.	30000.	91911.	.4829	0.	44388.
4	1996	0.	0.	0.	121911.	27000.	94911.	.3789	0.	35962.
5	1997	0.	0.	0.	121911.	26000.	95911.	.2973	0.	28512.
6	1998	0.	0.	0.	121911.	26000.	95911.	.2332	0.	22370.
7	1999	0.	0.	0.	121911.	26000.	95911.	.1830	0.	17551.
8	2000	0.	0.	0.	121911.	26000.	95911.	.1436	0.	13770.
9	2001	0.	0.	0.	121911.	26000.	95911.	.1126	0.	10803.
10	2002	72000.	0.	72000.	121911.	26000.	95911.	.0884	6363.	8476.
11	2003	0.	0.	0.	121911.	26000.	95911.	.0693	0.	6650.
12	2004	0.	0.	0.	121911.	26000.	95911.	.0544	0.	5217.
13	2005	0.	0.	0.	121911.	26000.	95911.	.0427	0.	4093.
14	2006	0.	0.	0.	121911.	26000.	95911.	.0335	0.	3212.
15	2007	0.	0.	0.	121911.	26000.	95911.	.0263	0.	2520.
16	2008	0.	0.	0.	121911.	26000.	95911.	.0206	0.	1977.
17	2009	0.	0.	0.	121911.	26000.	95911.	.0162	0.	1551.
18	2010	0.	0.	0.	121911.	26000.	95911.	.0127	0.	1217.
19	2011	0.	0.	0.	121911.	26000.	95911.	.0100	0.	955.
20	2012	72000.	0.	72000.	121911.	26000.	95911.	.0078	562.	749.
21	2013	0.	0.	0.	121911.	26000.	95911.	.0061	0.	588.
22	2014	0.	0.	0.	121911.	26000.	95911.	.0048	0.	461.
23	2015	0.	0.	0.	121911.	26000.	95911.	.0038	0.	362.
24	2016	0.	0.	0.	121911.	26000.	95911.	.0030	0.	284.
25	2017	0.	0.	0.	121911.	26000.	95911.	.0023	0.	223.
26	2018	0.	0.	0.	121911.	26000.	95911.	.0018	0.	175.
27	2019	0.	0.	0.	121911.	26000.	95911.	.0014	0.	137.
28	2020	0.	0.	0.	121911.	26000.	95911.	.0011	0.	108.
29	2021	0.	0.	0.	121911.	26000.	95911.	.0009	0.	84.
30	2022	-47800.	-114300.	-162100.	0.	0.	0.	.0007	-112.	0.
	TOTAL	315200.	0.	315200.	3536949.	802000.	2734949.		315490.	315490.

INTEREST PER CENT	ASSOCIATED BENEFIT RATIO	PRESENT VALUE IN DOLLARS ASSOC. BENEFITS	OUTLAY	BALANCE
15.000	1.745	589939.	338140.	251800.
20.000	1.348	440880.	327074.	113806.
25.000	1.094	348690.	318800.	29890.
30.000	.918	286888.	312463.	-25575.
35.000	.790	242871.	307406.	-64535.
40.000	.693	210051.	303211.	-93161.

ALTERNATIVE:
No. 2. Output linkage benefits reduced by 8 percent, starting in Period 1.
All other associated benefits and costs the same as for the base case.

Summary and Interpretation of Findings of Impact Analysis

Review of the Concept of Impact Analysis

Economic impact analysis is used to estimate the effects that a given agroindustrial enterprise or development program will have on business activity and peoples' incomes in the area where it is to be located. This kind of study sometimes is described as Associated Rate of Return (ARR) analysis because it considers the associated benefits and associated costs of an endeavor rather than the direct benfits and costs which are used for Internal Rate of Return analysis. These associated impacts do not show up in the projected cashflow of the owners of the venture; instead they accrue to those supplying labor and other resources or goods and services to the enterprise, to those distributing the outputs of the enterprise to end users, to those living in the physical and social environment where the enterprise would go, and to those who own land and other property which will become more (or less) valuable after the enterprise is established.

The associated rate of return (ARR) and related measures, including associated benefit ratio and net present value of associated benefits, provide formal measure of the economic impact of the new venture upon the area where it is located. Other things equal, the higher the ARR the greater the favorable economic impact per unit of capital investment in the venture. Associated rates of return usually will be high for ventures with many strong direct linkages to the economy of the area, especially if the area has underutilized labor and industrial capacity which can handle the added economic activity generated by the venture. For this reason, public planners and others concerned with economic development have strong interests in finding and attracting private ventures which have such linkages. Such action represents an effective way of reducing unemployment and enhancing utilization of existing facilities.

ARR Versus IRR

One should be reminded that economic impact analysis and the ARR are different and distinct from internal feasibility analysis and the IRR. Internal rate of return measures the earning rate of capital investment to the owners of the venture. Associated rate of return measures the rate of return on that investment in terms of associated economic impact--benefit which accrues to the economic community rather than to the owners of the venture. Because the two measures are based on the same schedule of total capital outlay for the venture, and are mutually exclusive, they are additive. Thus, the ARR for the Panama rice mill base case of 28.706 percent can be added to the IRR for the rice mill, which is 26.329 percent for the chosen alternative, to obtain the estimated total annual benefit rate of return per unit of capital outlay--55.035 percent in this case. This latter measure is called the Social Rate of Return (SRR), and is defined as SRR = IRR + ARR (see page 9, above).

Private investors are motivated by the IRR because it indicates earning power which can be used to purchase raw materials, meet payroll, pay interest and retire debt, pay taxes, and provide for dividends on capital investment. Public officials are motivated by the ARR because it indicates earning power which adds to disposable income, increases asset values and stimulates general economic activity of the area. Private investors who are able to attract public support

will be able to enhance the internal profitability of their investment. Public officials who are able to entice private investment in the public interest will hasten progress toward development goals. A specific venture with known attractive SRR might have a marginal IRR but very attractive ARR. By transferring capital expenditure from the owners of such venture to the public sector, and/or by transferring annual earnings from the public sector to the owners, the IRR can be raised to an attractive level (at the expense of the ARR) to preserve the SRR. Such strategy by a municipality, economic region or state can direct private investment in the public interest and conserve scarce public funds. By the same token, a venture with high IRR but low or negative ARR might be taxed or otherwise penalized by public programs to the point that it becomes infeasible to private investors.

Because of these kinds of interrelationships, private investors do have an interest in the ARR as determined by impact analysis, and public officials do have an interest in the IRR as determined by internal feasibility analysis. With both kinds of information available to all parties, intelligent "negotiation" of transfers of outlays and benefits can lead to sound and significant economic development, the cornerstone of which is private investment that is consistent with public goals.

As with the IRR, the level of ARR needed to be attractive to the public sector depends upon the alternative opportunities. Potential impacts of alternative ventures establish an "opportunity cost" for the associated rate of return in the same manner that alternative investment opportunities establish an "opportunity cost" for the internal rate of return. Any venture with ARR which is greater than the opportunity cost of associated benefits will enhance economic development of the area; any with ARR less than the opportunity cost will detract from the rate of development in the absence of such venture.

Role of Sensitivity Analysis

These statements and considerations assume that both the ARR and the IRR are accurate and certain. This is never the case for any venture, because the cashflows upon which the measures are based are projections of future outlays, incomes and expenses. Hopefully the projections reflect most likely expectations with reasonably high probability of materializing, but no one can be certain about them. Because of this, sensitivity analysis of the kind illustrated above can add significant supplemental information to assist the go or no-go investment decision. Such analysis tests the probable ranges in ARR (and in IRR) as one moves from the worst probable scenario to the best probable scenario with respect to key parameters affecting the rates of return. If the measures remain above the opportunity cost over most all likely events, as in the case of the Panama rice mill example, then the go decision is reinforced. If the measures drop below the opportunity cost when one or more probable alternative events is considered, then a marginal project would be rejected, and even a attractive one under most likely projections could be questioned.

Given its importance in the dynamics of the real world and the ease with which sensitivity analysis can be done using available software, testing the impacts of a number of alternatives affecting the ARR is to be encouraged. The two examples for the Panama rice mill are meant to be illustrative only. They are

not suggested as exhaustive even for this case, much less for other kinds of ventures in which users have interest. More typically, as many as 20 or 25 scaler alternatives will be appropriate, and the number may be more if various combinations of the individual alternatives also represent realistic possibilities which should be tested. With a little imagination, comparative results with several interacting alternatives can be presented in multi-dimensional tables or graphs. Modern spreadsheet software greatly enhances the possibilities and the ease with which such charts can be prepared.

SECTION XIII

CASE EXERCISE TO REVIEW USE OF THE ASSOCBEN SPREADSHEET

This exerise is designed to help the user review ASSOCBEN.WK1, the electronic spreadsheet for computing associated benefits and costs of a venture, and its use for generating the input file for determining the Associated Rate of Return (ARR) in connection with project evaluation. All of the data files you need to make the run are included in the ASSOCBEN spreadsheet and the IRR disk files, so that you can practice with the spreadsheet and review how it operates. The exercise will remind you of how the impact analysis budgets are organized and familiarize you with the spreadsheet formulae, commands and procedures for using the budgets.

The ASSOCBEN.WK1 spreadsheet was created with Release 2 of LOTUS 123; you must have this or a later release of this copyrighted commercial software, or a compatible competitive software package in order to use it. The compiled package described in Section I of the manual does not show the cell formulas, review of which is a part of the present exercise.

Altogether there are 25 tables in the spreadsheet file, ASSOCBEN.WK1. The organization and content of the tables are described in the Table 10, Directory of Tables, which is included with the spreadsheet. The tables are organized into sets for the different sources of economic impacts by the project. They include impacts from (1) inputs used in construction, (2) operational inputs, (3) project outputs, (4) training programs, (5) project employment, (6) enhanced property values, (7) environmental effects, and (8) sources of associated capital outlay and cost. Within each set, impact quantities are contained in the A tables, unit values in the B tables and total values in the C tables. The summary information from the C tables is assembled into the projected cashflow of associated benefits and costs by period over the life of the project (Table 9 of the worksheet).

<u>Retrieve the Spreadsheet and Print Table 10</u>

STEP 1. Insert the Disk Containing the ASSOCBEN.WK1 File in Drive B>, and Bring Up Lotus (or Compatible Spreadsheet Software):

1. With the disk containing the ASSOCBEN.WK1 file in Drive B>, and logged to Drive C>, type 123 <return>.

2. Put the cursor on 123 and press <return>

3. Wait for the blank spreadsheet to appear.

STEP 2. Retrieve the ASSOCBEN.WK1 File:

1. Type / to Bring up the Command Menu

2. Type F[ile] R[etrieve] Esc Esc B: <return> <move cursor to ASSOCBEN.WK1 <return>, and wait for the worksheet to appear.

STEP 3. Print Table 10 in Condensed (17-pitch) Type:

1. Be sure your printer is on and directed to your station

2. Type / P[rint] P[rinter] R[ange] 10 <return> Note: 10 is a named range for the location of Table 10

3. Type O[ther] S[et Up String] \029 <return> Q[uit]

4. Type A[lign] G[o]

5. When printing is finished type P[age] to advance paper to the top of the next page, and then type Q[uit].

STEP 4. Tear Off Your Printed Table 10 to Follow in the Exercise:

1. Tear off your printed Table 10 and review the worksheet organization

2. Keep the directory near by to follow in the remainder of the exercise

3. Press F9 to recalculate the worksheet and remove the CALC in the lower right corner of your screen.

Review Worksheets 1A to 8C

STEP 5. Go to Table 1A and Note Its Organization and Contents:

1. Type F5 1A <return>

2. Use the down arrow key to scan down the table, noting the categories of construction inputs, including Professional Services, Site Preparation, Building Construction, Plant Machinery, Energy Source, Services for Construction and Other Construction Inputs

3. Note the Unit of Measure for each item. For some projects, some of these may need to be modified

4. It will be noted that most of the quantities to be entered to Table 1A will have been worked up in the process of determining the capital outlay schedule for a project

5. Note that the only entries for the Panama Rice Mill case are under Building Construction, items 1, 2, 3 and 4, in the second period. For this project, other construction impacts were either small, or could not be determined accurately.

Step 6. Go to Table 1B and Compare It with Table 1A:

1. Type F5 1B <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 1A

3. Type F5 1B <return> to go to the top of the table again

4. Move cursor down to line 8 and across the columns to see entries of first line of data

5. Note that values in Columns P, Q, S and T are to be assembled from sources such as those from the U. S. and state departments of commerce, and entered manually. The values in Columns R, U, V and W are computed by formula (Note that the cells in these columns are protected by electronic fence so that data cannot be entered to them by mistake and override the formulas)

6. Note that the table is completely filled in with representative values, even though only those on rows 22 to 25 are used for the Panama Rice Mill case. How does a completed table with representative values assist the user in preparing values for impact analysis of his own case?

STEP 7. Go to Table 1C and Note Its Organization and Contents:.

1. Type F5 1C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Tables 1A and 1B

3. Type F5 1C <return> to go to the top of the table again

4. Move cursor down to line 22 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by formula, and are protected by electronic fence; the values in the table are calculated automatically when the F9 key is pushed. Try it!

6. Why are all of the numbers in Table 1C for the rice mill case zeros except those under Building Construction in the 2nd period?

7. Note that the table is longer than 60 lines; this means that we need to set the printer to 8 lines per inch in order to get it all on one printed page.

STEP 8. Go to Table 2A and Note Its Organization and Contents:

1. Type F5 2A <return>

2. Use the down arrow key to scan down the table, noting the categories of operational inputs, including Raw Materials, Production Supplies,

Fuel and Energy, Office Supplies, Services and Subscriptions, and and Other Operational Inputs

3. Note the Unit of Measure for each item is to be completed by the user; units for the rice mill case are entered only for paddy rice purchases, packaging materials, and electrical energy

4. It will be noted that the quantities to be entered to Table 2A will have been worked up in the process of determining the operating cost for a project.

Step 9. Go to Table 2B and Compare It with Table 2A:

1. Type F5 2B <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 2A

3. Type F5 2B <return> to go to the top of the table again

4. Move cursor down to line 88 and across the columns to see entries of first line of data

5. Note that as in Table 1B, the values in Columns P, Q, S and T are to be assembled from sources such as those from the U. S. and state departments of commerce, and entered manually. The values in Columns R, U, V and W are computed by formula (Note that the cells in these columns are protected by electronic fence)

6. Do you understand how the cell formulas work? Consider that for Cell V88, the Cost Factor, for example. The formula reads @IF(S88,T88,0). It says that if there is an entry in Cell S88 (i.e., unused capacity exists in the industry), use the fixed cost factor from Cell T88 in Cell V88; otherwise insert zero to Cell V88 as the cost factor to use in computing associated benefits.

STEP 10. Go to Table 2C and Note Its Organization and Contents:.

1. Type F5 2C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Tables 2A and 2B

3. Type F5 2C <return> to go to the top of the table again

4. Move cursor down to line 88 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by multiplication, and are protected by electronic fence; the values in the table are calculated automatically when the F9 key is pushed

6. Why are all of the numbers from Period 3 onward in Table 2C the same as those for Period 2?

STEP 11. Go to Table 3A and Note Its Organization and Contents:

1. Type F5 3A <return>

2. Scan the table, noting the categories of product output (Milled Rice and Rice Bran) and the unit of measure (Metric Tons) for the rice mill case. The quantities entered are taken directly from the projected operating schedule for the rice mill.

Step 12. Go to Table 3B and Compare It with Table 3A:

1. Type F5 3B <return>

2. Use the down arrow key to scan down the table, and note the market levels--Assembly and Storage, Wholesaling and Transport, Processing and Packaging, Retail Distribution, Other Distribution and Total Distribution--included in the table

3. Note that the products and units of measure are the same at all market levels, matching those in Table 3A

4. Type F5 3B <return> to go to the top of the table again, and note the column headings--Purchase Price, Average Markup, Profit Margin, Excess Capacity, Fixed Cost, Variable Cost, Cost Factor and Unit Benefit

5. Move cursor down to line 148 and across the columns to see entries of first line of data

6. Note that values in Columns P, Q, R, S and T are to be assembled from sources such as those from the U. S. and state departments of commerce, and entered manually. The values in Columns U, V and W are computed by formula. Note also that price entries reflect the average markup as one moves from one distribution level to the next one.

7. Note that the table is completely filled in with representative values, even though only those on rows 148 and 149 in Table 3A are used for the Panama Rice Mill case. Why does Table 3B extend to line 200 when Table 3A only goes to line 155?

STEP 13. Go to Table 3C and Note Its Organization and Contents:.

1. Type F5 3C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 3B

3. Type F5 3C <return> to go to the top of the table again

4. Move cursor down to line 148 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by multiplication, and are protected by electronic fence; the values in the table are calculated automatically when the F9 key is pushed, using the project output quantities from Table 3A

6. How are the quantities in the Total Distribution section of Table 3C computed? Why are no similar totals given in Tables 1C and 2C?

STEP 14. Make a Mental Summarization of These First Three Sets of Tables, and the Sets Yet Remaining:

1. Referring to your Table 10 printout, note that the first three sets of tables deal with product linkages. Sets 1 and 2 deal with linkages through inputs to the project--Set 1 for the construction phase, and Set 2 for the operational stage. Set 3 deals with linkages through project outputs.

2. The next two sets, Set 4 and Set 5, deal with project impacts on human resources; Set 4 measures added income through higher earning power after training; Set 5 measures added income through reduced unemployment and underemployment.

3. The sixth set of tables is in a category by itself; it measures the impact of the project on the market value of land, buildings and other impacted assets.

4. The seventh and eighth sets of tables serve to identify other associate impacts of the project--Set 7 other associated benefits, and Set 8 othe associated costs. Not all projects will have impacts in the categories identified by these last two sets of tables, but some kinds of projects will have major impacts is such areas.

5. Are you gaining a better understanding of project impact analysis and the measurement of benefits and costs associated with a project? What questions do you have at this point? Shall we proceed?

STEP 15. Go to Table 4A and Note Its Organization and Contents:

1. Type F5 4A <return>

2. Use the down arrow key to scan down the table, noting the functions for which training may be given, including Buying & Receiving, Plant Operations, Packing & Shipping, Marketing & Distribution, Office & Other, and Total Operations.

3. Note that the only entries for the Panama Rice Mill case are under Plant Operations, item no. 3, in the first period. For this

project, pre-service training was not needed for employees in the other functions and classifications.

Step 16. Go to Table 4B and Compare It with Table 4A:

1. Type F5 4B <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 4A

3. Type F5 4B <return> to go to the top of the table again, and give particular attention to the column headings, all of which apply per person year

4. Move cursor down to line 213 and across the columns to see entries of first line of data

5. Note that values in Columns P, R and U are to be assembled from employment reports such as those from the U. S. and state departments of commerce, and entered manually. The values in Columns T, V and W are computed by formula (Note that the cells in these columns are protected by electronic fence so that data cannot be entered to them by mistake and override the formulas)

6. Note that the table is completely filled in with representative values, even though only those on row 224 are used for the Panama Rice Mill case. How does a completed table with representative values assist the user in preparing values for analysis of training impacts for his own case?

STEP 17. Go to Table 4C and Note Its Organization and Contents:.

1. Type F5 4C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Tables 4A and 4B

3. Type F5 4C <return> to go to the top of the table again

4. Move cursor down to line 224 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by formula, and are protected by electronic fence; the values in the table are continuations of a trainee's added earning power each year (until reaching the age of 65), regardless of whether staying on the project or moving to new employment.

6. Why are all of the numbers in Table 4C for the rice mill case zeros except those for skilled labor under Plant Operations?

STEP 18. Go to Table 5A and Note Its Organization and Contents:

1. Type F5 5A <return>

2. Use the down arrow key to scan down the table, noting that the functions included are the same as in Table 4A

3. Note that entries for the Panama Rice Mill case are made under Buying & Receiving, Plant Operations, Packing & Shipping, and Office and Other. Normally all employees projected for the project will be entered to this table. Entries are made in units of person months.

Step 19. Go to Table 5B and Compare It with Table 5A:

1. Type F5 5B <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 5A

3. Type F5 5B <return> to go to the top of the table again, and give particular attention to the column headings, all of which apply per person month

4. Move cursor down to line 278 and across the columns to see entries of first line of data

5. Note that values in Columns P, Q, S and T are to be assembled from employment reports such as those from the U. S. and state departments of commerce, and entered manually. The values in Columns R, U and W are computed by multiplication formula, and are protected by electronic fence.

6. Note that this table too is completely filled in with representative values, even though not all of them are used for the Panama Rice Mill case.

STEP 20. Go to Table 5C and Note Its Organization and Contents:.

1. Type F5 5C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Tables 5A and 5B

3. Type F5 5C <return> to go to the top of the table again

4. Move cursor down to line 280 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by formula, and are protected by electronic fence; the values in the table are

projected added earnings of employees based on existing unemployment and under-employment rates in the area

6. Would employment benefits be larger if the Panama rice mill were located in a more economically depressed area? How much would such benefits be for a project located in an area of full employment?

STEP 21. Go to Table 6A and Note Its Organization and Contents:

1. Type F5 6A <return>

2. Use the down arrow key to scan down the table, noting the categories of impacted property, including Undeveloped Land, Residential Homes, Recreational Units, Motels and Restaurants, and Offices and Other

3. Note property classifications within each category, including those adjacent to the project, and those adjacent to major streets or roads connected to the project. What might be some additional classifications for a project such as an international airport, for example?

4. Note that the only entries for the Panama Rice Mill case are under Undeveloped Land, items 1 and 4, in the second period. For this project, other property value impacts were either small, could not be determined accurately, or were already reflected through added annual incomes.

Step 22. Go to Table 6B and Compare It with Table 6A:

1. Type F5 6B <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 6A

3. Type F5 6B <return> to go to the top of the table again

4. Move cursor down to line 343 and across the columns to see entries of first line of data

5. Note that all values in the table are to be assembled from outside sources and entered manually. These values represent differences in projected real values of the impacted asset with the project compared to without the project. Thus, property in an area of rapid growth which might appreciate $5000 per year for five years without the project and $5100 per year for five years with the project would be entered to the table as $100 per period for five periods.

STEP 23. Go to Table 6C and Note Its Organization and Contents:.

1. Type F5 6C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Tables 6A and 6B

3. Type F5 6C <return> to go to the top of the table again

4. Move cursor down to line 343 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by formula, and are protected by electronic fence; study the formulas carefully. Why do the cell formulas contain an additional term each time one moves one column to the right (say from AB343 to AC343 to AD343)?

6. Why are all of the numbers in Table 6C for the rice mill case zeros except those under Undeveloped Land in the 2nd, 3rd and 4th periods?

STEP 24. Go to Table 7A and Note Its Organization and Contents:

1. Type F5 7A <return>

2. Use the down arrow key to scan down the table, noting the categories of other associated benefits, including Health & Safety, Recreation, Physical Environment, Time Savings, Infrastructure Benefits, and Other Benefits.

3. Note sources of benefits within each category, including one or more "Other" sources under each category. How important are the kinds of benefits shown in the table? How can they be identified for a specific project? How can they be measured?

4. Note that the only entries for the Panama Rice Mill case are under Infrastructure Aids, items 1, 2 and 3, in the fifth period. Apparently some infrastructural development is to be made at that time which then will be benefited by the rice mill facilities.

Step 25. Go to Table 7B and Compare It with Table 7A:

1. Type F5 7B <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 7A

3. Type F5 7B <return> to go to the top of the table again

4. Move cursor down to line 408 and across the columns to see entries of first line of data

5. Note that all values in the table are to be assembled from outside sources and entered manually. These values represent estimated monetary

worth of one unit of the corresponding benefit. For example, the value shown for time saved of professionals on line 435 is $45,000 per person year.

6. Note that this table too is completely filled in with representative values, even though not all of them are used for the Panama Rice Mill case. How can the values included be of assistance to the user who is working up similar projected benefits for his own case?

STEP 26. Go to Table 7C and Note Its Organization and Contents:.

1. Type F5 7C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Tables 7A and 7B

3. Type F5 7C <return> to go to the top of the table again

4. Move cursor down to line 444 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by formula, and are protected by electronic fence; study the formulas carefully, and compare with those in Table 6C. Again, why do the cell formulas contain an additional term each time one moves one column to the right (say from AF444 to AG444 to AH444)?

6. Why are all of the numbers in Table 7C for the rice mill case zeros except those under Infrastructure Aids starting in the 5th period?

STEP 27. Go to Table 8A and Note Its Organization and Contents:

1. Type F5 8A <return>

2. Use the down arrow key to scan down the table, noting the categories of associated capital outlay and costs, including Infrastructure, Plant Facilities, Non-Recurring Costs, Supporting Services, Regulatory Services and Other Expenses. Entries under the first three categories are made in a single period, while those in the last three are recurring annual expenditures

3. Note sources of expenditures within each category, including one or more "Other" sources under each category. Also note the unit of measure for each expenditure. For some projects it may be necessary to modify the unit to more accurately reflect the case. If so, comparable modifications will be made automatically to Tables 8B and 8C.

4. Note that entries for the Panama Rice Mill case are made under four of the categories--the first, third, fourth and sixth ones.

Step 28. Go to Table 8B and Compare It with Table 8A:

1. Type F5 8B <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Table 8A

3. Note that there is only one column of data in the table, the average value per unit for each expenditure item. Note also that the entries are made in 1,000s, so that the values in Table 8C appear in 1,000s as well.

STEP 29. Go to Table 8C and Note Its Organization and Contents:.

1. Type F5 8C <return>

2. Use the down arrow key to scan down the table, and note the structure comparable to that of Tables 8A and 8B

3. Type F5 8C <return> to go to the top of the table again

4. Move cursor down to line 481 and across the columns to see entries of first line of data

5. Note that entries in all columns of the table are computed by multiplication, and are protected by electronic fence.

Review and Print the Cashflow of Associated Benefits and Costs

STEP 30. Go to the Upper Part of Table 9 and Note Its Organization and Structure:

1. Type F5 9A <return>

2. Use the right arrow key to scan the upper part of the table, including the column headings for both the upper and the lower section of the cashflow table

3. Note that first two columns of data include the period sequence and period identification in the format read by the IRR software program

4. Note that the next four columns of data represent capital outlay for the project--the same values for Site and Buildings, Plant Equipment, Average Inventory and Other Working Capital that are included in the projected cashflow used to determine the Internal Rate of Return for the Panama Rice Mill

5. Note that the last four columns of Table 9A contain the data for Employment Benefits, Training Benefits, Construction Input Benefits and Operational Input Benefits

6. Put cursor on Cell AQ12 and note the formula transferring the total employment benefits from Cell AC330, the total line of Table 5C (see your listing of Table 10)

7. Put cursor on Cell AR12 and note the formula transferring the total training benefits from Cell AC265, the total line of Table 4C (again see your listing of Table 10)

8. Put cursor on Cell AS12 and note the formula transferring the total construction input benefits by adding the totals under the separate categories from Table 1C (again see your listing of Table 10)

9. Put cursor on Cell AT12 and note the formula transferring the total operational input benefits by adding the totals under the separate categories from Table 2C (again see your listing of Table 10)

10. Move cursor to period 11 (line 23) and observe the changed formulas in Columns S, T, U and V. The IF statement has been added to place zeros in these columns when the period in Table 9 exceeds the total number of periods for the case (as identified by the named range, PERIODS3 [Table 3C])

11. Move cursor down with the down arrow key until zeros show up in columns S, T, U and V of the table. Does this occur from period 30 onward?

STEP 31. Print this Upper Section of the Cash Flow, Table 9A:

1. Be sure your printer is turned on and directed to your station

2. Type / P P R 9A <return> A C and wait for the table to print

3. Type P to move to the top of the next page and Q to quit the print mode

4. Compare your printout with the reproduction on page 112 in Section XII.

STEP 32. Go to the Lower Part of Table 9 and Note Its Organization and Structure:

1. Type F5 9B <return>

2. Use the right arrow key to scan the upper part of the table of five data columns

3. Note that first two columns of data include the period sequence and period identification in the format read by the IRR software program

4. Note that the next five columns of data represent project output benefits, capital gains benefits, other benefits, capital outlay, and annual expense, respectively (see the second group of column headers on your printout of Table 9A)

5. Put cursor on Cell AM63 and note the formula transferring the total output benefits from Cell AC200, the total line of Table 3C (see your listing of Table 10)

6. Put cursor on Cell AN63 and note the formula transferring the total capital gains benefits from Cell AC395, the total line of Table 6C (again see your listing of Table 10)

7. Put cursor on Cell AO63 and note the formula transferring the total other associated benefits by adding the totals under the separate categories from Table 7C (again see your listing of Table 10)

8. Put cursor on Cell AP63 and note the formula transferring the total associated capital outlay by adding the totals under the separate categories from the upper portion of Table 8C, and multiplying the result by 1000 (again see your listing of Table 10)

9. Put cursor on Cell AQ63 and note the formula transferring the total associated annual cost by adding the totals under the separate categories from the lower portion of Table 8C, and multiplying the result by 1000 (again see your listing of Table 10)

10. Move cursor to period 11 (line 73) and observe the changed formulas in Columns O, P, Q, R and S. The IF statement has been added to place zeros in these columns when the period in Table 9 exceeds the total number of periods for the case (as identified by the named range, PERIODS3 [Table 3C])

11. Move cursor down with the down arrow key until zeros show up in columns O, P, Q, R and S of the table. Does this occur from period 30 onward?

STEP 33. Print this Lower Section of the Cash Flow, Table 9B:

1. Be sure your printer is turned on and directed to your station

2. Type / P P R 9B <return> A G and wait for the table to print

3. Type P to go to the next page and Q to quit the print mode

4. Compare your printout with the reproduction on page 114.

STEP 34. Make a Print File of the Complete Cashflow Table:

1. Type / P F B:CASHFLOW <return>

2. Type R CASHFLOW <return>

3. Type O M L 1 <return> M T 0 <return> M B 0 <return>

4. Type O U Q C B A G and wait for the file to be printed on your disk

5. When completed type Q to leave the print mode

STEP 35. Quit the Spreadsheet Program:

1. Type / Q Y E.

Edit the File and Run the Associated Rate of Return

STEP 36. Use EDLIN to Remove the Zero Lines from the File:

1. Still logged to C>, and with your ASSOC disk still in Drive B>, type EDLIN B:CASHFLOW.PRN <return>

2. When the EDLIN prompt appears on the screen, type 30,52 L <return> to list the lines containing the first section of zeros to be removed

3. Noting the line numbers where the zeros are, type 32,51 D <return> to delete the zero lines

4. Type 25,35 L <return> to list the section of the file where the zeros have been removed, and check to see that all is OK by comparing with your printout of Table 9A

5. List the lines containing the second set of zeros by typing 60,82 L <return>

6. Noting the line numbers where the zeros are, type 63,82 D <return> to delete the zero lines

7. Type 55,70 L <return> to list the section of the file where the zeros have been removed, and check to see that all is OK by comparing with your printout of Table 9B

8. When everything checks, type E to save the edited file and exit EDLIN.

STEP 37. Copy the Edited CASHFLOW.PRN File to Your IRR Run Disk:

1. Place your IRR(ENG) run disk in Drive A>

2. Log to Drive A> and type DIR <return> to check your files

3. If a DATA.IRR file exists, rename it so as not to lose it by overcopying, e.g., type REN DATA.IRR DATA.OLD <return>

4. Copy the new file by typing COPY B:CASHFLOW.PRN DATA.IRR <return>.

STEP 38. Turn on and Set Your Printer to 17-Pitch Type:

1. Turn on your printer and make sure it is directed to your station

2. Set the printer to 17-pitch font.

STEP 39. Rename the Headers File and Run the Associated Rate of Return:

1. Logged to Drive A>, type COPY HEADERS.ARR HEADERS <return>

2. Type IRR(ENG) <return> to start the program

3. Press <return> in response to the first prompt

4. Press <return> to proceed

5. Enter 0 <return> to choose default commands for subsequent runs

6. Enter 0 <return> to accept the default headers

7. Now type <Ctrl> P to echo the program output to your printer, and then press <return> to make the run.

STEP 41. Compare the Results with the Printouts on Pages 120 and 121, and when All OK, Rename the Files for Archive Purposes:

1. Compare the results with the printouts pages 120 and 121 in Section XII

2. If all OK, type <Ctrl> P to turn off the printer echo

3. Rename the DATA.IRR file by typing REN DATA.IRR ASSOCBEN.PRN <return>

4. Rename the HEADERS file by typing REN HEADERS HEADERS.ARR <return>.

AM AN AO AP AQ AR AS AT AU

Table 10. Directory of Worksheet Tables

Number	Title	Location
1A	Quantities of Construction Inputs by Class by Period	A1..K74
1B	Unit Values of Construction Input Linkages by Class	M1..W74
1C	Linkage Benefits from Construction Inputs by Period	Y1..AJ74
2A	Quantities of Raw Materials and Supplies by Class by Period	A81..K139
2B	Unit Values of Operational Input Linkages by Class	M81..W139
2C	Linkage Benefits from Operational Inputs by Period	Y81.AJ139
3A	Quantities of Project Outputs to Be Marketed by Period	A141.K156
3B	Unit Values of Operational Output Linkages by Product	M141.W200
3C	Linkage Benefits from Operational Outputs by Period	Y141.AJ200
4A	Numbers of Persons Trained by Labor Classification by Period	A206.K265
4B	Earning Rates Before and After Training by Classification	M206.W256
4C	Associated Benefits from Training Programs by Period	Y206.AJ265
5A	Numbers of Employees by Labor Classification by Period	A271.K330
5B	Unemployment and Underemployment Benefits by Classification	M271.W330
5C	Net Benefits through Employment Impacts by Period	Y271.AJ330
6A	Land and Property to Be Impacted by Project by Period	A336.K386
6B	Changes in Property Values Due to Venture	M336.W386
6C	Capital Gains Benefits by Period	Y336.AJ396
7A	Environmental Impacts by Kind by Period	A401.K460
7B	Unit Values of Environmental Impacts by Kind	M401.W460
7C	Net Environmental Benefits of Venture by Period	Y401.AJ460
8A	Associated Capital Outlay and Cost by Class by Period	A471.K530
8B	Unit Values of Associated Inputs by Class	M471.V530
8C	Associated Capital Outlay and Cost by Period (000s)	Y471.AJ530
9	Projected Cash Flow of Associated Benefits and Costs	AK1..AT113

APPENDIX I

CELL FORMULAS FOR UNIT VALUE WORKSHEETS

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```
O1: PR 'Table 1B. Unit Values of Construction Input Linkages by Class
O2: PR '                    Project:

R2: PR +$FS2
O4: PR ^Unit of
P4: PR ^Project
Q4: PR ^Industry
R4: PR ^Added
S4: PR ^Exesss
T4: PR ^Fixed
U4: PR ^Variable
V4: PR ^Cost
W4: PR ^Unit
O5: PR ^Measure
P5: PR ^Price
Q5: PR ^Margin
R5: PR ^Profit
S5: PR ^Capacity
T5: PR ^Cost
U5: PR ^Cost
V5: PR ^Factor
W5: PR ^Benefit
O6: PR ^-------
P6: PR ^---
Q6: PR ^---
R6: PR ^---
S6: PR ^---
T6: PR ^---
U6: PR ^---
V6: PR ^---
W6: PR ^---
C8: PR +C8
P8: (F2) U 1
Q8: (F3) U 0.11
R8: (F3) PR +P8*Q8
S8: (F0) U 3000
T8: (F3) U 0.3
U8: (F3) PR @IF(Q8>0,1-(Q8+T8),0)
V8: (F3) PR @IF(S8,T8,0,
W8: (F2) PR +P8*(Q8+V8)
O9: PR +C9
P9: (F2) U 1
Q9: (F3) U 0.097
R9: (F3) PR +P9*Q9
S9: (F0) U 5000
T9: (F3) U 0.12
U9: (F3) PR @IF(Q9>0,1-(Q9+T9),0)
V9: (F3) PR @IF(S9,T9,0)
W9: (F2) PR +P9*(Q9+V9)
```

```
O81: PR 'Table 2B. Unit Values of Operational Input Linkages by Class
O82: PR '                    Project:

R82: PR +$F$2
O84: PR ^Unit of
P84: PR ^Project
Q84: PR ^Industry
R84: PR ^Added
S84: PR ^Excess
T84: PR ^Fixed
U84: PR ^Variable
V84: PR ^Cost
W84: PR ^Unit
O85: PR ^Measure
P85: PR ^Price
Q85: PR ^Margin
R85: PR ^Profit
S85: PR ^Capacity
T85: PR ^Cost
U85: PR ^Cost
V85: PR ^Factor
W85: PR ^Benefit
O86: PR ^-------
P86: PR ^---
Q86: PR ^---
R86: PR ^---
S86: PR ^---
T86: PR ^---
U86: PR ^---
V86: PR ^---
W86: PR ^---
O88: PR +C88
P88: (F2) U 150
Q88: (F3) U 0.03
R88: (F3) PR +P88*Q88
S88: U 0
T88: (F3) U 0.3
U88: (F3) PR @IF(Q88>0,1-(Q88+T88),0)
V88: (F3) PR @IF(S88,T88,0)
W88: (F3) PR +P88*(Q88+V88)
O89: PR +C89
P89: (F2) U 1
Q89: (F3) U 0.097
R89: (F3) PR +P89*Q89
S89: (F0) U 5000
T89: (F3) U 0.12
U89: (F3) PR @IF(Q89>0,1-(Q89+T89),0)
V89: (F3) PR @IF(S89,T89,0)
W89: (F3) PR +P89*(Q89+V89)
```

```
O141: PR 'Table 3B. Unit Values of Operational Output Linkages by Product
O142: PR '                    Project:

R142: PR +$F$2
O144: PR ^Unit of
P144: PR ^Purchase
Q144: PR ^Average
R144: PR ^Profit
S144: PR ^Exesss
T144: PR ^Fixed
U144: PR ^Variable
V144: PR ^Cost
W144: PR ^Unit
O145: PR ^Measure
P145: PR ^Price
Q145: PR ^Markup
R145: PR ^Margin
S145: PR ^Capacity
T145: PR ^Cost
U145: PR ^Cost
V145: PR ^Factor
W145: PR ^Benefit
O146: PR ^-------
P146: PR ^---
Q146: PR ^---
R146: PR ^---
S146: PR ^---
T146: PR ^---
U146: PR ^---
V146: PR ^---
W146: PR ^---
O148: PR +C148
P148: (F1) U 140
Q148: (F3) U 0.04
R148: (F3) U 0.15
S148: (F0) U 3000
T148: (F3) U 0.3
U148: (F3) PR @IF(Q148>0,1-(R148+T148),0)
V148: (F3) PR @IF(S148,T148,0)
W148: (F3) PR +P148*Q148*(R148+V148)
O149: PR +C149
P149: (F1) U 98.5
Q149: (F3) U 0.045
R149: (F3) U 0.14
S149: (F0) U 5000
T149: (F3) U 0.12
U149: (F3) PR @IF(Q149>0,1-(R149+T149),0)
V149: (F3) PR @IF(S149,T149,0)
W149: (F3) PR +P149*Q149*(R149+V149)
```

```
O206: PR 'Table 4B. Earning Rates Before and After Training by Classification
O207: PR '                    Project:

R207: PR +$FS2
O209: PR ^Unit =
P209: PR ^Project
R209: PR ^Prior
T209: PR ^Wage
U209: PR ^Average
V209: PR ^Years of
W209: PR ^Training
M210: PR [W15] 'Function & Clasification
O210: PR ^Man Yr.
P210: PR ^Wage
R210: PR ^Wage
T210: PR ^Increase
U210: PR ^Age
V210: PR ^Benefit
W210: PR ^Benefit
M211: PR [W15] '----------------------
O211: PR ^-------
P211: PR ^---
R211: PR ^---
T211: PR ^---
U211: PR ^---
V211: PR ^---
W211: PR ^---
M212: PR [W15] 'BUYING & RECEIVING:
M213: PR [W15] '  1. Managerial
P213: (,0) U 48000
R213: (,0) U 38000
T213: (,0) PR +P213-R213
U213: U 40
V213: (,1) PR 65-U213
W213: (,0) PR +T213*V213
M214: PR [W15] '  2. Superviory
P214: (,0) U 36000
R214: (,0) U 25000
T214: (,0) PR +P214-R214
U214: U 38
V214: (,1) PR 65-U214
W214: (,0) PR +T214*V214
```

```
O271: PR 'Table 5B. Unemployment and Underemployment Benefits by Classification
O272: PR '                    Project:

R272: PR +$F$2
O274: PR ^Unit =
P274: PR ^Project
Q274: PR ^Unempl.
R274: PR ^Unempl.
S274: PR ^Underemp.
T274: PR ^Exist.
U274: PR ^Underemp.
W274: PR ^Combined
M275: PR [W15] 'Function & Clasification
O275: PR ^Man Mo.
P275: PR ^Wage
Q275: PR ^Rate
R275: PR ^Benefit
S275: PR ^Rate
T275: PR ^Wage
U275: PR ^Benefit
W275: PR ^Benefit
M276: PR [W15] '----------------------
O276: PR ^-------
P276: PR ^---
Q276: PR ^---
R276: PR ^---
S276: PR ^---
T276: PR ^---
U276: PR ^---
W276: PR ^---
M277: PR [W15] 'BUYING & RECEIVING:
M278: PR [W15] '  1. Managerial
P278: (,1) U 4000
Q278: (F3) U 0.22
R278: (,1) PR +P278*Q278
S278: (F3) U 0.3
T278: (,1) U 3200
U278: (,1) PR +S278*(P278-T278)
W278: (,1) PR +R278+U278
M279: PR [W15] '  2. Superviory
P279: (,1) U 3000
Q279: (F3) U 0.15
R279: (,1) PR +P279*Q279
S279  (F3) U 0.23
T279: (,1) U 2700
U279: (,1) PR +S279*(P279-T279)
W279: (,1) PR +R279+U279
```

```
O336: 'Table 6B. Changes in Property Values Due to Venture
O337: '                    Project:

R337: +$F$2
O339: ^Unit of
P339: ^1st
Q339: ^2nd
R339: ^3rd
S339: ^4th
T339: ^5th
U339: ^6th
V339: ^7th
W339: ^8th
M340: [W15] 'Property & Clasification
O340: ^Measure
P340: ^Year
Q340: ^Year
R340: ^Year
S340: ^Year
T340: ^Year
U340: ^Year
V340: ^Year
W340: ^Year
M341: [W15] '----------------------
O341: ^-------
P341: ^---
Q341: ^---
R341: ^---
S341: ^---
T341: ^---
U341: ^---
V341: ^---
W341: ^---
M342: [W15] 'UNDEVELOPED LAND:
O342: +C342
M343: [W15] '  1. Adjoining Project
P343: (,0) U 150
Q343: (,0) U 150
R343: (,0) U 150
S343: (,0) U 0
T343: (,0) U 0
U343: (,0) U 0
V343: (,0) U 0
W343: (,0) U 0
M344: [W15] +A344
M345: [W15] +A345
M346: [W15] '  4. Adjoining Roads
P346: (,0) U 250
Q346: (,0) U 250
R346: (,0) U 250
S346: (,0) U 0
T346: (,0) U 0
U346: (,0) U 0
V346: (,0) U 0
W346: (,0) U 0 .
```

```
O401: PR 'Table 7B. Unit Values of Environmental Impacts by Kind
O402: PR '                    Project:

R402: PR +$FS2
O404: PR ^Unit of
P404: PR ^1st
Q404: PR ^2nd
R404: PR ^3rd
S404: PR ^4th
T404: PR ^5th
U404: PR ^6th
V404: PR ^7th
W404: PR ^Remaining
O405: PR ^Measure
P405: PR ^Year
Q405: PR ^Year
R405: PR ^Year
S405: PR ^Year
T405: PR ^Year
U405: PR ^Year
V405: PR ^Year
W405: PR ^Years
O406: PR ^-------
P406: PR ^---
Q406: PR ^---
R406: PR ^---
S406: PR ^---
T406: PR ^---
U406: PR ^---
V406: PR ^---
W406: PR ^---
O407: PR +C407
P408: (,0) U 100
Q408: (,0) U 150
R408: (,0) U 150
S408: (,0) U 150
T408: (,0) U 150
U408: (,0) U 150
V408: (,0) U 150
W408: (,0) U 150
P409: (,0) U 40
Q409: (,0) U 60
R409: (,0) U 60
S409: (,0) U 60
T409: (,0) U 60
U409: (,0) U 60
V409: (,0) U 60
W409: (,0) U 60
```

```
O471: 'Table 8B. Unit Values of Associated Inputs by Class
O472: '                    Project:

R472: +$F$2
O474: ^Unit of
S474: ^ Average
M475: [W15] 'Type & Source of Cost
O475: ^Measure
S475: ^Value
M476: [W15] '--------------------
O476: ^-------
S476: ^($000)
M477: [W15] 'INFRASTRUCTURE:
S477: ^---
M478: [W15] '  1. Roads & Streets
O478: +C478
S478: (,0) U 2000
M479: [W15] '  2. Sewers & Drains
O479: +C479
S479: (,0) U 500
M480: [W15] '  3. Utility Services
O480: +C480
S480: (,0) U 40
M481: [W15] '  4. Communications
O481: +C481
S481: (,0) U 10
M482: [W15] '  5. Information Base
O482: +C482
S482: U 25
M483: [W15] '  6. Other
N483: [W9] +B483
O483: +C483
S483: U 15
S484: (,0) "-----
M486: [W15] 'PLANT FACILITIES:
M487: [W15] '  1. Plant Buildings
O487: +C487
S487: (,0) U 3000
M488: [W15] '  2. Warehouses
O488: +C488
S488: (,0) U 850
M489: [W15] '  3. Office Buildings
O489: +C489
S489: (,0) U 500
M490: [W15] '  4. Mech. & Electrical
O490: +C490
S490: (,0) U 200
M491: [W15] '  5. Equipment
O491: +C491
S491: U 15
M492: [W15] '  6. Other
N492: [W9] +B492
O492: +C492
S492: U 15
S493: (,0) "-----
M495: [W15] 'NON-RECURRING COSTS:
M496: [W15] '  1. Research & Dev.
O496: +C496
S496: (,0) U 3
M497: [W15] '  2. Legal & Acctg.
O497: +C497
S497: (,0) U 4
```

APPENDIX II

CELL FORMULAS FOR ASSOCIATED IMPACT WORKSHEETS

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1C	Linkage Benefits from Construction Inputs by Period	162
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5C	Net Benefits through Employment Impacts by Period	166
6C	Capital Gains Benefits by Period	167
7C	Net Environmental Benefits of Venture by Period	168
8C	Associated Capital Outlay and Cost by Period	169

```
AA1: PR 'Table 1C. Linkage Benefits from Construction Inputs by Period
AA2: PR '                    Project:

AD2: PR +$FS2
AA4: PR ^ Unit =
AB4: PR '          Linkage Benefits by Period:
AA5: U ' Dollars
AB5: PR ^1st
AC5: PR ^2nd
AD5: PR ^3rd
AE5: PR ^4th
AF5: PR ^5th
AG5: PR ^6th
AH5: PR ^7th
AI5: PR ^8th
AJ5: PR ^Total
AA6: PR ^-------
AB6: PR ^---
AC6: PR ^---
AD6: PR ^---
AE6: PR ^---
AF6: PR ^---
AG6: PR ^---
AH6: PR ^---
AI6: PR ^---
AJ6: PR ^---
AB8: PR @IF($S8>=D8,D8*$W8,(D8-$S8)*$R8+$S8*$W8)
AC8: PR @IF($S8>=E8,E8*$W8,(E8-$S8)*$R8+$S8*$W8)
AD8: PR @IF($S8>=F8,F8*$W8,(F8-$S8)*$R8+$S8*$W8)
AE8: PR @IF($S8>=G8,G8*$W8,(G8-$S8)*$R8+$S8*$W8)
AF8: PR @IF($S8>=H8,H8*$W8,(H8-$S8)*$R8+$S8*$W8)
AG8: PR @IF($S8>=I8,I8*$W8,(I8-$S8)*$R8+$S8*$W8)
AH8: PR @IF($S8>=J8,J8*$W8,(J8-$S8)*$R8+$S8*$W8)
AI8: PR @IF($S8>=K8,K8*$W8,(K8-$S8)*$R8+$S8*$W8)
AJ8: PR @SUM(AB8..AI8)
AB9: PR @IF($S9>=D9,D9*$W9,(D9-$S9)*$R9+$S9*$W9)
AC9: PR @IF($S9>=E9,E9*$W9,(E9-$S9)*$R9+$S9*$W9)
AD9: PR @IF($S9>=F9,F9*$W9,(F9-$S9)*$R9+$S9*$W9)
AE9: PR @IF($S9>=G9,G9*$W9,(G9-$S9)*$R9+$S9*$W9)
AF9: PR @IF($S9>=H9,H9*$W9,(H9-$S9)*$R9+$S9*$W9)
AG9: PR @IF($S9>=I9,I9*$W9,(I9-$S9)*$R9+$S9*$W9)
AH9: PR @IF($S9>=J9,J9*$W9,(J9-$S9)*$R9+$S9*$W9)
AI9: PR @IF($S9>=K9,K9*$W9,(K9-$S9)*$R9+$S9*$W9)
AJ9: PR @SUM(AB9..AI9)

AB14: (F1) PR "-----
AC14: (F1) PR "-----
AD14: (F1) PR "-----
AE14: (F1) PR "-----
AF14: (F1) PR "-----
AG14: (F1) PR "-----
AH14: (F1) PR "-----
AI14: (F1) PR "-----
AJ14: (F1) PR "-----
AB15: PR @SUM(AB8..AB13)
AC15: PR @SUM(AC8..AC13)
AD15: PR @SUM(AD8..AD13)
AE15: PR @SUM(AE8..AE13)
AF15: PR @SUM(AF8..AF13)
AG15: PR @SUM(AG8..AG13)
AH15: PR @SUM(AH8..AH13)
AI15: PR @SUM(AI8..AI13)
AJ15: PR @SUM(AJ8..AJ13)
```

```
AA81: PR 'Table 2C. Linkage Benefits from Operational Inputs by Period
AA82: PR '                    Project:

AD82: PR +$F$2
AA84: PR ^ Unit =
AB84: PR '          Linkage Benefits by Period:
AF84: PR '    Total Periods:
AH84: PR +$K$83
AA85: PR +$AA$5
AB85: PR ^1st
AC85: PR ^2nd
AD85: PR ^3rd
AE85: PR ^4th
AF85: PR ^5th
AG85: PR ^6th
AH85: PR ^7th
AI85: PR ^8th On
AJ85: PR ^Total
AA86: PR ^-------
AB86: PR ^---
AC86: PR ^---
AD86: PR ^---
AE86: PR ^---
AF86: PR ^---
AG86: PR ^---
AH86: PR ^---
AI86: PR ^---
AJ86: PR ^---
AB88: (,0) PR @IF($S88>=D88,D88*$W88,(D88-$S88)*$R88+$S88*$W88)
AC88: (,0) PR @IF($S88>=E88,E88*$W88,(E88-$S88)*$R88+$S88*$W88)
AD88: (,0) PR @IF($S88>=F88,F88*$W88,(F88-$S88)*$R88+$S88*$W88)
AE88: (,0) PR @IF($S88>=G88,G88*$W88,(G88-$S88)*$R88+$S88*$W88)
AF88: (,0) PR @IF($S88>=H88,H88*$W88,(H88-$S88)*$R88+$S88*$W88)
AG88: (,0) PR @IF($S88>=I88,I88*$W88,(I88-$S88)*$R88+$S88*$W88)
AH88: (,0) PR @IF($S88>=J88,J88*$W88,(J88-$S88)*$R88+$S88*$W88)
AI88: (,0) PR @IF($S88>=K88,K88*$W88,(K88-$S88)*$R88+$S88*$W88)
AJ88: (,0) PR @SUM(AB88..AH88)+(AI88*($PERIODS2-7))
AB89: (,0) PR @IF($S89>=D89,D89*$W89,(D89-$S89)*$R89+$S89*$W89)
AC89: (,0) PR @IF($S89>=E89,E89*$W89,(E89-$S89)*$R89+$S89*$W89)
AD89: (,0) PR @IF($S89>=F89,F89*$W89,(F89-$S89)*$R89+$S89*$W89)
AE89: (,0) PR @IF($S89>=G89,G89*$W89,(G89-$S89)*$R89+$S89*$W89)
AF89: (,0) PR @IF($S89>=H89,H89*$W89,(H89-$S89)*$R89+$S89*$W89)
AG89: (,0) PR @IF($S89>=I89,I89*$W89,(I89-$S89)*$R89+$S89*$W89)
AH89: (,0) PR @IF($S89>=J89,J89*$W89,(J89-$S89)*$R89+$S89*$W89)
AI89: (,0) PR @IF($S89>=K89,K89*$W89,(K89-$S89)*$R89+$S89*$W89)
AJ89: (,0) PR @SUM(AB89..AH89)+(AI89*($PERIODS2-7))
AB94: (,0) PR "-----
AC94: (,0) PR "-----
AD94: (,0) PR "-----
AE94: (,0) PR "-----
AF94: (,0) PR "-----
AG94: (,0) PR "-----
AH94: (,0) PR "-----
AI94: (,0) PR "-----
AJ94: (,0) PR "-----
AB95: (,0) PR @SUM(AB88..AB93)
AC95: (,0) PR @SUM(AC88..AC93)
AD95: (,0) PR @SUM(AD88..AD93)
AE95: (,0) PR @SUM(AE88..AE93)
AF95: (,0) PR @SUM(AF88..AF93)
AG95: (,0) PR @SUM(AG88..AG93)
AH95: (,0) PR @SUM(AH88..AH93)
AI95: (,0) PR @SUM(AI88..AI93)
AJ95: (,0) PR @SUM(AJ88..AJ93)
```

```
AA141: PR 'Table 3C. Linkage Benefits from Operational Outputs by Period
AA142: PR '                    Project:

AD142: PR +$F$2
AA144: PR ^ Unit =
AB144: PR '          Linkage Benefits by Period:
AF144: PR '    Total Periods:
AH144: PR +$K$83
AA145: PR +$AA$5
AB145: PR ^1st
AC145: PR ^2nd
AD145: PR ^3rd
AE145: PR ^4th
AF145: PR ^5th
AG145: PR ^6th
AH145: PR ^7th
AI145: PR ^8th On
AJ145: PR ^Total
AA146: PR ^-------
AB146: PR ^---
AC146: PR ^---
AD146: PR ^---
AE146: PR ^---
AF146: PR ^---
AG146: PR ^---
AH146: PR ^---
AI146: PR ^---
AJ146: PR ^---
AB148: (,0) PR @IF($S148>=D148,D148*$W148,(D148-$S148)*$R148+$S148*$W148)
AC148: (,0) PR @IF($S148>=E148,E148*$W148,(E148-$S148)*$R148+$S148*$W148)
AD148: (,0) PR @IF($S148>=F148,F148*$W148,(F148-$S148)*$R148+$S148*$W148)
AE148: (,0) PR @IF($S148>=G148,G148*$W148,(G148-$S148)*$R148+$S148*$W148)
AF148: (,0) PR @IF($S148>=H148,H148*$W148,(H148-$S148)*$R148+$S148*$W148)
AG148: (,0) PR @IF($S148>=I148,I148*$W148,(I148-$S148)*$R148+$S148*$W148)
AH148: (,0) PR @IF($S148>=J148,J148*$W148,(J148-$S148)*$R148+$S148*$W148)
AI148: (,0) PR @IF($S148>=K148,K148*$W148,(K148-$S148)*$R148+$S148*$W148)
AJ148: (,0) PR @SUM(AB148..AH148)+(AI148*($PERIODS3-7))
AB149: (,0) PR @IF($S149>=D149,D149*$W149,(D149-$S149)*$R149+$S149*$W149)
AC149: (,0) PR @IF($S149>=E149,E149*$W149,(E149-$S149)*$R149+$S149*$W149)
AD149: (,0) PR @IF($S149>=F149,F149*$W149,(F149-$S149)*$R149+$S149*$W149)
AE149: (,0) PR @IF($S149>=G149,G149*$W149,(G149-$S149)*$R149+$S149*$W149)
AF149: (,0) PR @IF($S149>=H149,H149*$W149,(H149-$S149)*$R149+$S149*$W149)
AG149: (,0) PR @IF($S149>=I149,I149*$W149,(I149-$S149)*$R149+$S149*$W149)
AH149: (,0) PR @IF($S149>=J149,J149*$W149,(J149-$S149)*$R149+$S149*$W149)
AI149: (,0) PR @IF($S149>=K149,K149*$W149,(K149-$S149)*$R149+$S149*$W149)

AB154: (,0) PR "-----
AC154: (,0) PR "-----
AD154: (,0) PR "-----
AE154: (,0) PR "-----
AF154: (,0) PR "-----
AG154: (,0) PR "-----
AH154: (,0) PR "-----
AI154: (,0) PR "-----
AJ154: (,0) PR "-----
AB155: (,0) PR @SUM(AB148..AB153)
AC155: (,0) PR @SUM(AC148..AC153)
AD155: (,0) PR @SUM(AD148..AD153)
AE155: (,0) PR @SUM(AE148..AE153)
AF155: (,0) PR @SUM(AF148..AF153)
AG155: (,0) PR @SUM(AG148..AG153)
AH155: (,0) PR @SUM(AH148..AH153)
AI155: (,0) PR @SUM(AI148..AI153)
AJ155: (,0) PR @SUM(AJ148..AJ153)
```

```
AA206: PR 'Table 4C. Associated Benefits from Training Programs by Period
AA207: PR '                    Project:
AD207: PR +$F$2
AA209: PR ^ Unit =
AB209: PR '       Training Benefits by Period:
AF209: PR '    Total Periods:
AH209: PR +$K$83
AJ209: PR ^Total
AA210: PR +$AA$5
AB210: PR ^1st
AC210: PR ^2nd
AD210: PR ^3rd
AE210: PR ^4th
AF210: PR ^5th
AG210: PR ^6th
AH210: PR ^7th
AI210: PR ^8th On
AJ210: PR ^(000)
AA211: PR ^-------
AB211: PR ^---
AC211: PR ^---
AD211: PR ^---
AE211: PR ^---
AF211: PR ^---
AG211: PR ^---
AH211: PR ^---
AI211: PR ^---
AJ211: PR ^---
AB213: (,0) PR 0
AC213: (,0) PR +D213*$T213
AD213: (,0) PR +AC213+(E213*$T213)
AE213: (,0) PR +AD213+(F213*$T213)
AF213: (,0) PR +AE213+(G213*$T213)
AG213: (,0) PR +AF213+(H213*$T213)
AH213: (,0) PR +AG213+(I213*$T213)
AI213: (,0) PR +AH213+(J213*$T213)
AJ213: (,0) PR (@SUM(AB213..AH213)+(AI213*($V213-6)))/1000
AB214: (,0) PR 0
AC214: (,0) PR +D214*$T214
AD214: (,0) PR +AC214+(E214*$T214)
AE214: (,0) PR +AD214+(F214*$T214)
AF214: (,0) PR +AE214+(G214*$T214)
AG214: (,0) PR +AF214+(H214*$T214)
AH214: (,0) PR +AG214+(I214*$T214)
AI214: (,0) PR +AH214+(J214*$T214)
AJ214: (,0) PR (@SUM(AB214..AH214)+(AI214*($V214-6)))/1000
AB219: (,0) PR "-----
AC219: (,0) PR "-----
AD219: (,0) PR "-----
AE219: (,0) PR "-----
AF219: (,0) PR "-----
AG219: (,0) PR "-----
AH219: (,0) PR "-----
AI219: (,0) PR "-----
AJ219: (,0) PR "-----
AB220: (,0) PR @SUM(AB213..AB218)
AC220: (,0) PR @SUM(AC213..AC218)
AD220: (,0) PR @SUM(AD213..AD218)
AE220: (,0) PR @SUM(AE213..AE218)
AF220: (,0) PR @SUM(AF213..AF218)
AG220: (,0) PR @SUM(AG213..AG218)
AH220: (,0) PR @SUM(AH213..AH218)
AI220: (,0) PR @SUM(AI213..AI218)
AJ220: (,0) PR @SUM(AJ213..AJ218)
```

```
AA271: PR 'Table 5C. Net Benefits through Employment Impacts by Period
AA272: PR '                    Project:

AD272: PR +$F$2
AA274: PR ^ Unit =
AB274: PR '       Employment Benefits by Period:
AF274: PR '    Total Periods:
AH274: PR +$K$83
AA275: PR +$AA$5
AB275: PR ^1st
AC275: PR ^2nd
AD275: PR ^3rd
AE275: PR ^4th
AF275: PR ^5th
AG275: PR ^6th
AH275: PR ^7th
AI275: PR ^8th On
AJ275: PR ^Total
AA276: PR ^-------
AB276: PR ^---
AC276: PR ^---
AD276: PR ^---
AE276: PR ^---
AF276: PR ^---
AG276: PR ^---
AH276: PR ^---
AI276: PR ^---
AJ276: PR ^---
AB278: (,0) PR +D278*$W278
AC278: (,0) PR +E278*$W278
AD278: (,0) PR +F278*$W278
AE278: (,0) PR +G278*$W278
AF278: (,0) PR +H278*$W278
AG278: (,0) PR +I278*$W278
AH278: (,0) PR +J278*$W278
AI278: (,0) PR +K278*$W278
AJ278: (,0) PR @SUM(AB278..AH278)+(AI278*($PERIODS5-7))
AB279: (,0) PR +D279*$W279
AC279: (,0) PR +E279*$W279
AD279: (,0) PR +F279*$W279
AE279: (,0) PR +G279*$W279
AF279: (,0) PR +H279*$W279
AG279: (,0) PR +I279*$W279
AH279: (,0) PR +J279*$W279
AI279: (,0) PR +K279*$W279
AJ279: (,0) PR @SUM(AB279..AH279)+(AI279*($PERIODS5-7))
AB284: (,0) PR "-----
AC284: (,0) PR "-----
AD284: (,0) PR "-----
AE284: (,0) PR "-----
AF284: (,0) PR "-----
AG284: (,0) PR "-----
AH284: (,0) PR "-----
AI284: (,0) PR "- ---
AJ284: (,0) PR "-----
AB285: (,0) PR @SUM(AB278..AB283)
AC285: (,0) PR @SUM(AC278..AC283)
AD285: (,0) PR @SUM(AD278..AD283)
AE285: (,0) PR @SUM(AE278..AE283)
AF285: (,0) PR @SUM(AF278..AF283)
AG285: (,0) PR @SUM(AG278..AG283)
AH285: (,0) PR @SUM(AH278..AH283)
AI285: (,0) PR @SUM(AI278..AI283)
AJ285: (F0) PR @SUM(AJ278..AJ283)
```

```
AB336: PR 'Table 6C  Capital Gains Benefits by Period
AA337: PR '                    Project:

AD337: PR +$F$2
AA339: PR ^ Unit =
AA340: PR +$AA$5
AB340: PR ^1st
AC340: PR ^2nd
AD340: PR ^3rd
AE340: PR ^4th
AF340: PR ^5th
AG340: PR ^6th
AH340: PR ^7th
AI340: PR ^8th
AJ340: PR ^9th
AA341: PR ^-------
AB341: PR ^---
AC341: PR ^---
AD341: PR ^---
AE341: PR ^---
AF341: PR ^---
AG341: PR ^---
AH341: PR ^---
AI341: PR ^---
AJ341: PR ^---
AB343: (,0) PR +D343*$P343
AC343: (,0) PR (E343*$P343)+(D343*$Q343)
AD343: (,0) PR (F343*$P343)+(E343*$Q343)+(D343*$R343)
AE343: (,0) PR (G343*$P343)+(F343*$Q343)+(E343*$R343)+(D343*$S343)
AF343: (,0) PR (H343*$P343)+(G343*$Q343)+(F343*$R343)+(E343*$S343)+(D343*$T343)
AG343: (,0) PR (I343*$P343)+(H343*$Q343)+(G343*$R343)+(F343*$S343)+(E343*$T343)+(D343*$U343)
AH343: (,0) PR (J343*$P343)+(I343*$Q343)+(H343*$R343)+(G343*$S343)+(F343*$T343)+(E343*$U343)+(D343*$V343)
AI343: (,0) PR (K343*$P343)+(J343*$Q343)+(I343*$R343)+(H343*$S343)+(G343*$T343)+(F343*$U343)+(E343*$V343)+(D343*W343)
AJ343: (,0) PR (K343*$Q343)+(J343*$R343)+(I343*$S343)+(H343*$T343)+(G343*$U343)+(F343*$V343)+(E343*$W343)
AB344: (,0) PR +D344*$P344
AC344: (,0) PR (E344*$P344)+(D344*Q344)
AD344: (F0) PR (F344*$P344)+(E344*$Q344)+(D344*$R344)
AE344: (F0) PR (G344*$P344)+(F344*$Q344)+(E344*$R344)+(D344*$S344)
AF344: (F0) PR (H344*$P344)+(G344*$Q344)+(F344*$R344)+(E344*$S344)+(D344*$T344)
AG344: (F0) PR (I344*$P344)+(H344*$Q344)+(G344*$R344)+(F344*$S344)+(E344*$T344)+(D344*$U344)
AH344: (,0) PR (J344*$P344)+(I344*$Q344)+(H344*$R344)+(G344*$S344)+(F344*$T344)+(E344*$U344)+(D344*$V344)
AI344: (,0) PR (K344*$P344)+(J344*$Q344)+(I344*$R344)+(H344*$S344)+(G344*$T344)+(F344*$U344)+(E344*$V344)+(D344*W344)
AJ344: (,0) PR (K344*$Q344)+(J344*$R344)+(I344*$S344)''H344*$T344)+(G344*$U344)+(F344*$V344)+(E344*$W344)
AB349: (,0) PR "-----
AC349: (,0) PR "-----
AD349: (,0) PR "-----
AE349: (,0) PR "-----
AF349: (,0) PR "-----
AG349: (,0) PR "-----
AH349: (,0) PR "-----
AI349: (,0) PR "-----
AJ349: (,0) PR "-----
AB350: (,0) PR @SUM(AB343..AB348)
AC350: (,0) PR @SUM(AC343..AC348)
AD350: (,0) PR @SUM(AD343..AD348)
AE350: (,0) PR @SUM(AE343..AE348)
AF350: (,0) PR @SUM(AF343..AF348)
AG350: (,0) PR @SUM(AG343..AG348)
AH350: (,0) PR @SUM(AH343..AH348)
AI350: (,0) PR @SUM(AI343..AI348)
AJ350: (,0) PR @SUM(AJ343..AJ348)
```

```
AA401: 'Table 7C. Net Environmental Benefits of Venture by Period
AA402: '                    Project:

AD402: +$FS2
AA404: U '  Unit =
AE404: '     Total Periods:
AG404: +$K$83
AI404: 'Remaining
AJ404: ^Total
Y405: [W13] 'Benefit Type & Source
AA405: +$AA$5
AB405: ^1st
AC405: ^2nd
AD405: ^3rd
AE405: ^4th
AF405: ^5th
AG405: ^6th
AH405: ^7th
AI405: ^Years
AJ405: ^(000)
Y406: [W13] '--------------------
AA406: ^-------
AB406: ^---
AC406: ^---
AD406: ^---
AE406: ^---
AF406: ^---
AG406: ^---
AH406: ^---
AI406: ^---
AJ406: ^---
Y407: [W13] 'HEALTH & SAFETY:
Y408: [W13] '  1. Adult Health
AB408: (,0) +D408*$P408
AC408: (,0) (E408*$P408)+(D408*$Q408)
AD408: (,0) (F408*$P408)+(E408*$Q408)+(D408*$R408)
AE408: (,0) (G408*$P408)+(F408*$Q408)+(E408*$R408)+(D408*$S408)
AF408: (,0) (H408*$P408)+(G408*$Q408)+(F408*$R408)+(E408*$S408)+(D408*$T408)
AG408: (,0) (I408*$P408)+(H408*$Q408)+(G408*$R408)+(F408*$S408)+(E408*$T408)+(D408*$U408)
AH408: (,0) (J408*$P408)+(I408*$Q408)+(H408*$R408)+(G408*$S408)+(F408*$T408)+(E408*$U408)+(D408*$V408)
AI408: (,0) (K408*$P408)+(J408*$Q408)+(I408*$R408)+(H408*$S408)+(G408*$T408)+(F408*$U408)+(E408*$V408)+(D408*W408)
AJ408: (,1) (@SUM(AB408..AH408)+AI408*($PERIODS7-7))/1000
Y409: [W13] '  2. Child Health
AB409: (,0) +D409*$P409
AC409: (,0) (E409*$P409)+(D409*$Q409)
AD409: (,0) (F409*$P409)+(E409*$Q409)+(D409*$R409)
AE409: (,0) (G409*$P409)+(F409*$Q409)+(E409*$R409)+(D409*$S409)
AF409: (,0) (H409*$P409)+(G409*$Q409)+(F409*$R409)+(E409*$S409)+(D409*$T409)
AG409: (,0) (I409*$P409)+(H409*$Q409)+(G409*$R409)+(F409*$S409)+(E409*$T409)+(D409*$U409)
AH409: (,0) (J409*$P409)+(I409*$Q409)+(H409*$R409)+(G409*$S409)+(F409*$T409)+(E409*$U409)+(D409*$V409)
AI409: (,0) (K409*$P409)+(J409*$Q409)+(I409*$R409)+(H409*$S409)+(G409*$T409)+(F409*$U409)+(E409*$V409)+(D409*W409)
AJ409: (,1) (@SUM(AB409..AH409)+AI409*($PERIODS7-7))/1000

AB415: (,0) @SUM(AB408..AB413)
AC415: (,0) @SUM(AC408..AC413)
AD415: (,0) @SUM(AD408..AD413)
AE415: (,0) @SUM(AE408..AE413)
AF415: (,0) @SUM(AF408..AF413)
AG415: (,0) @SUM(AG408..AG413)
AH415: (,0) @SUM(AH408..AH413)
AI415: (,0) @SUM(AI408..AI413)
AJ415: (,1) @SUM(AJ408 .AJ413)
```

```
AA471: PR 'Table 8C. Associated Capital Outlay and Cost by Period (000s)
AA472: PR '                    Project:

AD472: PR +$F$2
AA474: PR '  Unit =
AE474: PR '     Total Periods:
AG474: PR +$K$83
AI474: PR 'Remaining
AA475: PR +$AA$5
AB475: PR ^1st
AC475: PR ^2nd
AD475: PR ^3rd
AE475: PR ^4th
AF475: PR ^5th
AG475: PR ^6th
AH475: PR ^7th
AI475: PR ^Years
AJ475: PR ^Total
AA476: PR ^-------
AB476: PR ^---
AC476: PR ^---
AD476: PR ^---
AE476: PR ^---
AF476: PR ^---
AG476: PR ^---
AH476: PR ^---
AI476: PR ^---
AJ476: PR ^---
AB478: (,0) PR +D478*$S478
AC478: (,0) PR +E478*$S478
AD478: (,0) PR +F478*$S478
AE478: (,0) PR +G478*$S478
AF478: (,0) PR +H478*$S478
AG478: (,0) PR +I478*$S478
AH478: (,0) PR +J478*$S478
AI478: (,0) PR +K478*$S478
AJ478: (,0) PR (@SUM(AA478..AH478)+AI478*($PERIODS8-7))
AB479: (,0) PR +D479*$S479
AC479: (,0) PR +E479*$S479
AD479: (,0) PR +F479*$S479
AE479: (,0) PR +G479*$S479
AF479: (,0) PR +H479*$S479
AG479: (,0) PR +I479*$S479
AH479: (,0) PR +J479*$S479
AI479: (,0) PR +K479*$S479
AJ479: (,0) PR (@SUM(AA479..AH479)+AI479*($PERIODS8-7))
AB484: (,0) PR "-----
AC484: (,0) PR "-----
AD484: (,0) PR "-----
AE484: (,0) PR "-----
AF484: (,0) PR "-----
AG484: (,0) PR "-----
AH484: (,0) PR "-----
AI484: (,0) PR "-----
AJ484: (,1) PR "-----
AB485: (,0) PR @SUM(AB478..AB483)
AC485: (,0) PR @SUM(AC478..AC483)
AD485: (,0) PR @SUM(AD478..AD483)
AE485: (,0) PR @SUM(AE478..AE483)
AF485: (,0) PR @SUM(AF478..AF483)
AG485: (,0) PR @SUM(AG478..AG483)
AH485: (,0) PR @SUM(AH478..AH483)
AI485: (,0) PR @SUM(AI478..AI483)
AJ485: (F0) PR @SUM(AJ478..AJ483)
```

APPENDIX III

CELL FORMULAS FOR CASHFLOW OF ECONOMIC IMPACTS

Number		Page
9A	Projected Cash Flow of Associated Benefits and Costs	172
9B	Projected Cash Flow of Associated Benefits and Costs (Cont.) .	173

```
AM1: 'Table 9. Projected Cash Flow of Associated Benefits and Costs
AM2: '                    Project:

AP2: +$F$2
AM4: "Site and
AN4: '  Plant
AO4: "Average
AP4: '  Other
AQ4: "Employ.
AR4: "Training
AS4: "Construct
AT4: '  Input
AK5: [W3] ' Period
AM5: "Bldings
AN5: "Equip.
AO5: "Invntry
AP5: "Wrk Cap
AQ5: "Benefit
AR5: "Benefit
AS5: "Linkage
AT5: "Linkage
AK6: [W3] ' ------
AM6: "--------
AN6: "------
AO6: "-------
AP6: "-------
AQ6: "-------
AR6: "-------
AS6: "-------
AT6: "-------
AM8: "Output
AN8: "Capital
AO8: '  Other
AP8: "Capital
AQ8: " Annual
AM9: "Linkage
AN9: '  Gains
AO9: "Benefit
AP9: "Outlay
AQ9: "Expense
AM10: '-------
AN10: "-------
AO10: "-------
AP10: "-------
AQ10: "-------
AK12: U [W3] 0
AL12: U [W5] 1992
AM12: U 147000
AN12: U 72000
AO12: U 0
AP12: U 0
AQ12: (F0) +$AB$285+$AB$294+$AB$303+$AB$312+$AB$321-$AB$330
AR12: +$AB$265
AS12: (F0) +$AB$15+$AB$20+$AB$35+$AB$48+$AB$56+$AB$65+$AB$71
AT12: (F0) +$AB$95+$AB104+$AB$113+$AB$121+$AB$130+$AB$136

AK22: U [W3] 10
AL22: U [W5] 2002
AM22: U 0
AN22: U 72000
AO22: U 0
AP22: U 0
AQ22: (F0) @IF($PERIODS3>=$L11,+$AI$285+$AI$294+$AI$303+$AI$312+$AI$321-$AI$330,0)
AR22: @IF($PERIODS3>=$L11,+$AI$265,0)
```

```
AK63: [W3] +AK12
AL63: [W5] +AL12
AM63: (F0) +$AB$200
AN63: +$AB$395
AO63: +$AB$415+$AB$424+$AB$433+$AB$442+$AB$451+$AB$460
AP63: ($AB$485+$AB$494+$AB$503)*1000
AQ63: ($AB$512+$AB$521+$AB$530)*1000
AK64: [W3] +AK13
AL64: [W5] +AL13
AM64: (F0) +$AC$200
AN64: +$AC$395
AO64: +$AC$415+$AC$424+$AC$433+$AC$442+$AC$451+$AC$460
AP64: ($AC$485+$AC$494+$AC$503)*1000
AQ64: ($AC$512+$AC$521+$AC$530)*1000
AK65: [W3] +AK14
AL65: [W5] +AL14
AM65: (F0) +$AD$200
AN65: +$AD$395
AO65: +$AD$415+$AD$424+$AD$433+$AD$442+$AD$451+$AD$460
AP65: ($AD$485+$AD$494+$AD$503)*1000
AQ65: ($AD$512+$AD$521+$AD$530)*1000
AK66: [W3] +AK15
AL66: [W5] +AL15
AM66: (F0) +$AE$200
AN66: +$AE$395
AO66: +$AE$415+$AE$424+$AE$433+$AE$442+$AE$451+$AE$460
AP66: ($AE$485+$AE$494+$AE$503)*1000
AQ66: ($AE$512+$AE$521+$AE$530)*1000
AK67: [W3] +AK16
AL67: [W5] +AL16
AM67: (F0) +$AF$200
AN67: +$AF$395
AO67: +$AF$415+$AF$424+$AF$433+$AF$442+$AF$451+$AF$460
AP67: ($AF$485+$AF$494+$AF$503)*1000
AQ67: ($AF$512+$AF$521+$AF$530)*1000
AK68: [W3] +AK17
AL68: [W5] +AL17
AM68: (F0) +$AG$200
AN68: +$AG$395
AO68: +$AG$415+$AG$424+$AG$433+$AG$442+$AG$451+$AG$460
AP68: ($AG$485+$AG$494+$AG$503)*1000
AQ68: ($AG$512+$AG$521+$AG$530)*1000
AK69: [W3] +AK18
AL69: [W5] +AL18
AM69: (F0) +$AH$200
AN69: +$AH$395
AO69: +$AH$415+$AH$424+$AH$433+$AH$442+$AH$451+$AH$460
AP69: ($AH$485+$AH$494+$AH$503)*1000
AQ69: ($AH$512+$AH$521+$AH$530)*1000
AK70: [W3] +AK19
AL70: [W5] +AL19
AM70: (F0) +$AI$200
AN70: +$AI$395
AO70: +$AI$415+$AI$424+$AI$433+$AI$442+$AI$451+$AI$460
AP70: ($AI$485+$AI$494+$AI$503)*1000
AQ70: ($AI$512+$AI$521+$AI$530)*1000

AK73: [W3] +AK22
AL73: [W5] +AL22
AM73: (F0) @IF($PERIODS3>=$L11,+$AI$200,0)
AN73: 0
AO73: @IF($PERIODS3>=$L11,+$AI$415+$AI$424+$AI$433+$AI$442+$AI$451+$AI$460,0)
AP73: 0
AQ73: @IF($PERIODS3>=$L11,($AI$512+$AI$521+$AI$530)*1000,0)
```