Assistance for Capacity Building Through Enhancing Operation of the National Agricultural Policy Center
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Methodological guidelines for PAM Analysis

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Introduction

This note does not cover the theoretical and analytical rationale of the PAM in the perspective of policy formulation since the topic is largely covered by many other sources, but the document focus on the practical aspects of the analysis. This note intends to provide guidelines on the different steps that have to be followed to actually compute a PAM. The sign 🕮 will be used to make reference to the manual written by Monke and Pearson (Monke and Pearson, 1989), wherever relevant, so the reader can get more details and insight on the various steps of the method and its related implications for economic analysis. For readers who are not familiar with the PAM methodology, a rapid presentation of the rationale of the method is given in Appendix A (🕮 chapter 2 – Introduction to the Policy Analysis Matrix pp 16- 33).

This document draws upon the expertise acquire in the framework of an FAO project providing assistance to the National Agricultural Policy Centre of the Syrian Ministry of Agriculture and Agrarian Reform. It also benefit from various subsectors analysis carried out in other countries, especially on the rice subsector in West Africa. The method presented hereafter is closely linked to an Excel spreadsheet format used to compute a PAM that has been initially developed by Tom Randolph at the West African Rice Development Association in consultation with economists from the former Food Research Institute at Stanford University. A separate guideline has been developed on the utilization of the spreadsheet itself [1]

Other materials used for training purposes are attached in Appendix G.

The method proposed to compute a PAM includes the following actions:

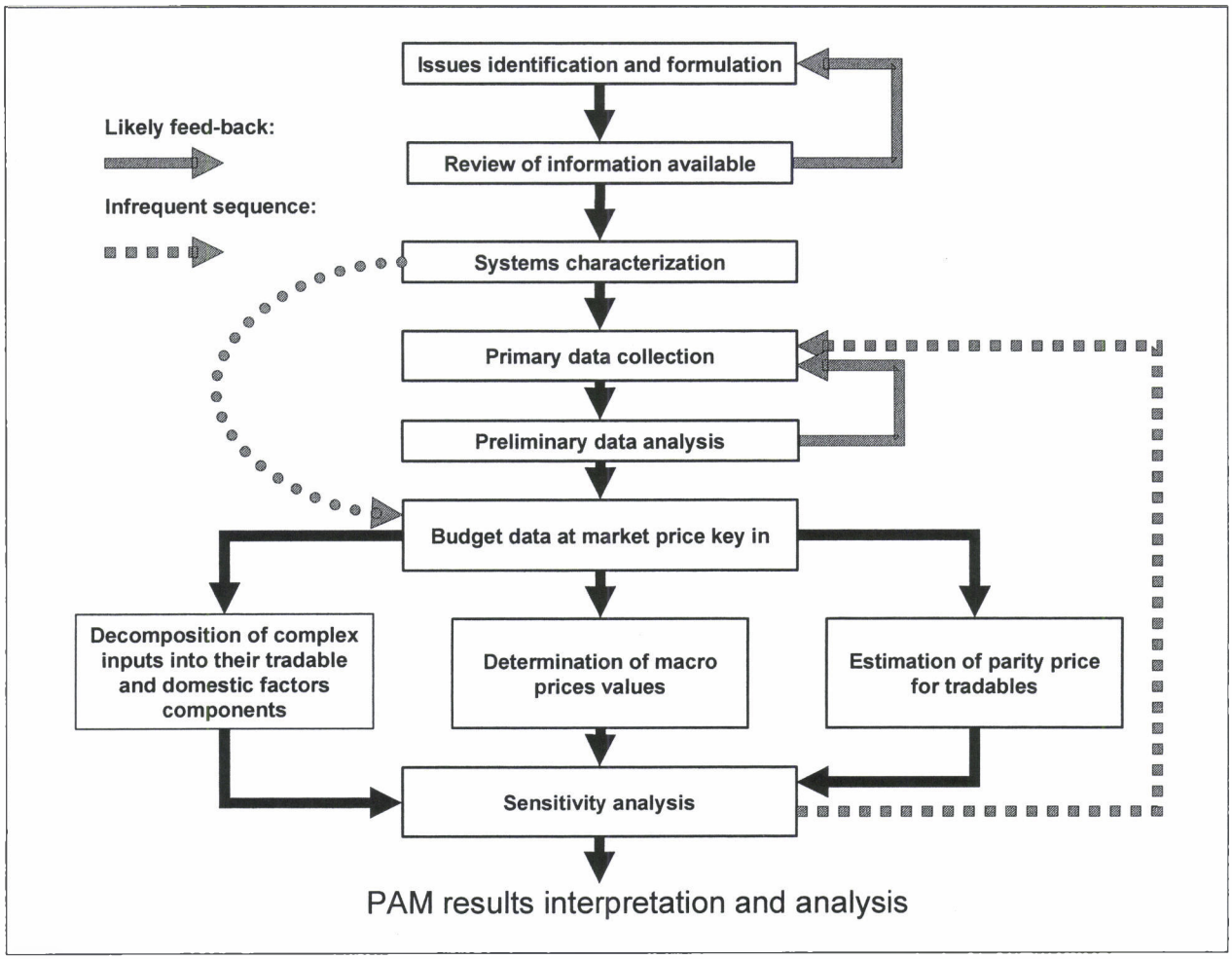
1. Issues identification and formulation
2. Review of information available
3. Systems characterization
4. Primary data collection
5. Preliminary data analysis
6. Budget data at market price key in
7. Decomposition of complex inputs into their tradable and domestic factors components
8. Determination of macro prices values at private and social prices
9. Estimation of parity price for tradables
10. Sensitivity analysis

While actions 1 to 6 have to be implemented as a sequence, actions related to the actual computation of the PAM (7, 8, and 9) can be done in parallel as indicated by Figure 1. As any attempt to represent a complex reality through simplification, the computation of a PAM is an iterative process between a given level of information and the results obtained. Hence, the

[1] F.Lançon, 2005, Guideline for using a PAM template spreadsheet, Projects GCP/SYR/006/ITA and TCP/SYR/29006 (A), Damascus, FAO.

proposed sequence of action indicated possible feed-back aiming at improving the quality of the information base to better respond to the issue addressed. If the quality of the information available at the outset of the process is sufficient, the computation might step over the collection of primary data.

Figure 1 Sequence of operations for PAM computation.



1. Issues identification and formulation:

What are the issues to be addressed by the PAM?

- The identification of the issue addressed, requires an open initial discussion with the targeted end users of the analysis to narrow down and focus the scope of the study in terms of product, geographical area or farming system. This step is also important for ensuring ownership of the results.

- It is important to give attention to the point that the PAM cannot address all issues pertaining to agricultural or food policy formulation; income distribution, changes in demand and consumption, market efficiency and price system, supply response to price incentive are questions that require other set of tools and analytical framework.

- The type of issue addressed are associated with different priorities in terms of systems characterization and organization of the data collection:
    - The assessment of one product with different cropping techniques and location required a more comprehensive and detailed representation of the cropping technique, while information on processing could be limited.
    - Assessment for multiple product, require more resources to covers the downstream part of the commodity chains (including information required for parity prices estimation) and thus a more simplified representation of cropping techniques which may be limited to the basic ecologies (irrigated and rainfed)

- The nature of the main output considered for analysis has an impact on the level of difficulty. The case of an agricultural commodity that is largely traded on an established world market would be easier to handle than an output that is not traded massively of for which there is no international price quotation. The impact of the quality and physico-chemical properties of the product on its price should also be considered. A non traded output is even more difficult to handle since there is no reference to compute its parity price In this case it is important to have a somewhat in-depth knowledge of possible substitutes at the consumers or end-user level, which can be used as a proxy.

- The type and degree of details of the available information should be assessed and used to adjust the scope (product, location wise) to the time and resources allocated to the study.

2. Review of available information:

The review of the available information has a critical importance since it can save time and resources and improve the relevance of the results obtained. The following sources of information have to be investigated and assessed:

- Statistics and figures:

    - *Farm level data*: inventory of available data and degree of details to assess their usefulness in characterizing the different type of systems (breakdown into administrative level, type of cropping systems includes in the nomenclature…). Availability of data on input costs per commodity and cropping system.

    - *Marketing and processing stage*: information on price (farm gate, wholesale stage, quality…). Statistical coverage of marketing and processing activities, Industrial census used for building Input Output table can be useful as far as they cover a detailed enough range of types of industries.

    - *Economic environment*: data on major macro-economic parameters (exchange rate, inflation, interest rate). Information on custom's duties and other taxes. Availability of Input/output table for decomposing input cost.

    - *International economic environment*. Trade flows by commodity to identify major outlets or suppliers in order to define the appropriate geographical reference for the determination of the parity prices. Important to identify sources and information on the prevailing international prices for the determination of the parity price.

    ⇒ The analysis of an entire subsectors including the various technology used at the farm level to produce the agricultural raw commodity and the various types of main final outputs produced from this commodity can only be achieved by computing a PAM for each sub-system associating a given technology for a given output. In this case secondary data (cropped area by major cropping systems, allocation of processing capacity among different processing technologies) will be needed to compute a scale parameter that will be used to estimate the share of each sub-system for the whole system.

    ⇒ The computation of the PAM relies on an accounting framework that provides only a snapshot of a dynamic situation. Time series of the main output prices and yield are needed to assess the robustness of the result obtained for various configurations.

- Review of available literature, on both economic and technical aspects at farm and processing level as well.

- Identification of possible resources persons or institutions to get information on areas that have not been covered by statistical sources or in the available literature (on technical aspects in particular)

3. Systems characterization:

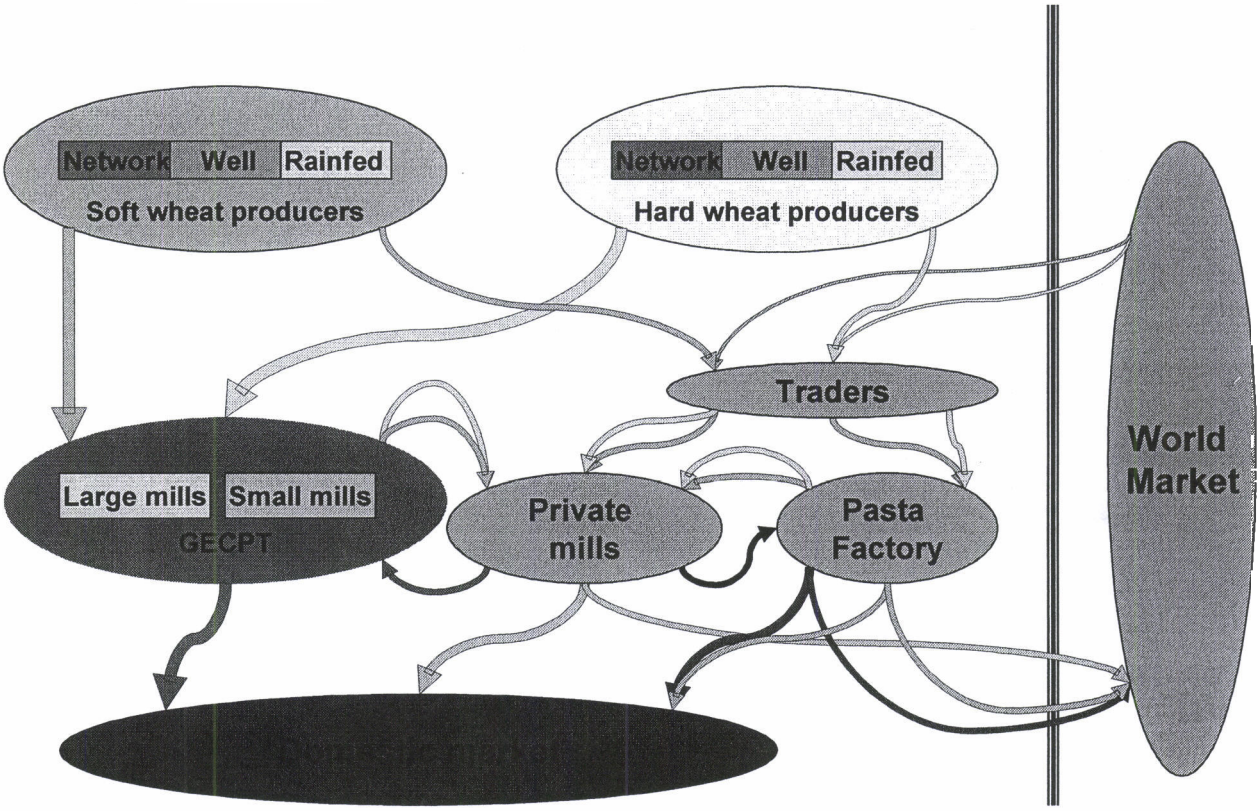
3.1. Information base for characterization

- Depending upon the quality and the coverage of the data and information already available, the commodity systems can be immediately characterized. If the information coverage is not comprehensive enough, there is a need to undertake a rapid commodity chain survey to identify major agents along the commodity chain, before establishing a survey strategy.

- This rapid commodity chain survey, consist in establishing contacts with agents, preferably at one end of the chain and going downstream or upstream to follow the product flows and interviewing the following (or preceding) agent. The discussion should focus on agent located at the centre of the chain (wholesale traders, processors) that are usually very knowledgeable about the structure of the chain, magnitude of supply per location of origin, seasonal variation and so forth. It is recommended to apply the survey on both end to avoid missing any node where the product supplied follow different route and conversely to identify different sources of raw product procurement for agent located on the downstream part of the system.

- The secondary (available) and primary (collected) information should be synthesized under the form of a flowchart of the commodity system (Figure 2); as far as possible an estimation of the respective share of different flows outgoing from one agent to another should be included into this graph.

Figure 2 Example of commodity chain graph for wheat product



Configuration of the graph:

- It is recommended to define in priority the agents of the chains and to clearly differentiate the type of product traded: raw material, intermediate output and final product[2].

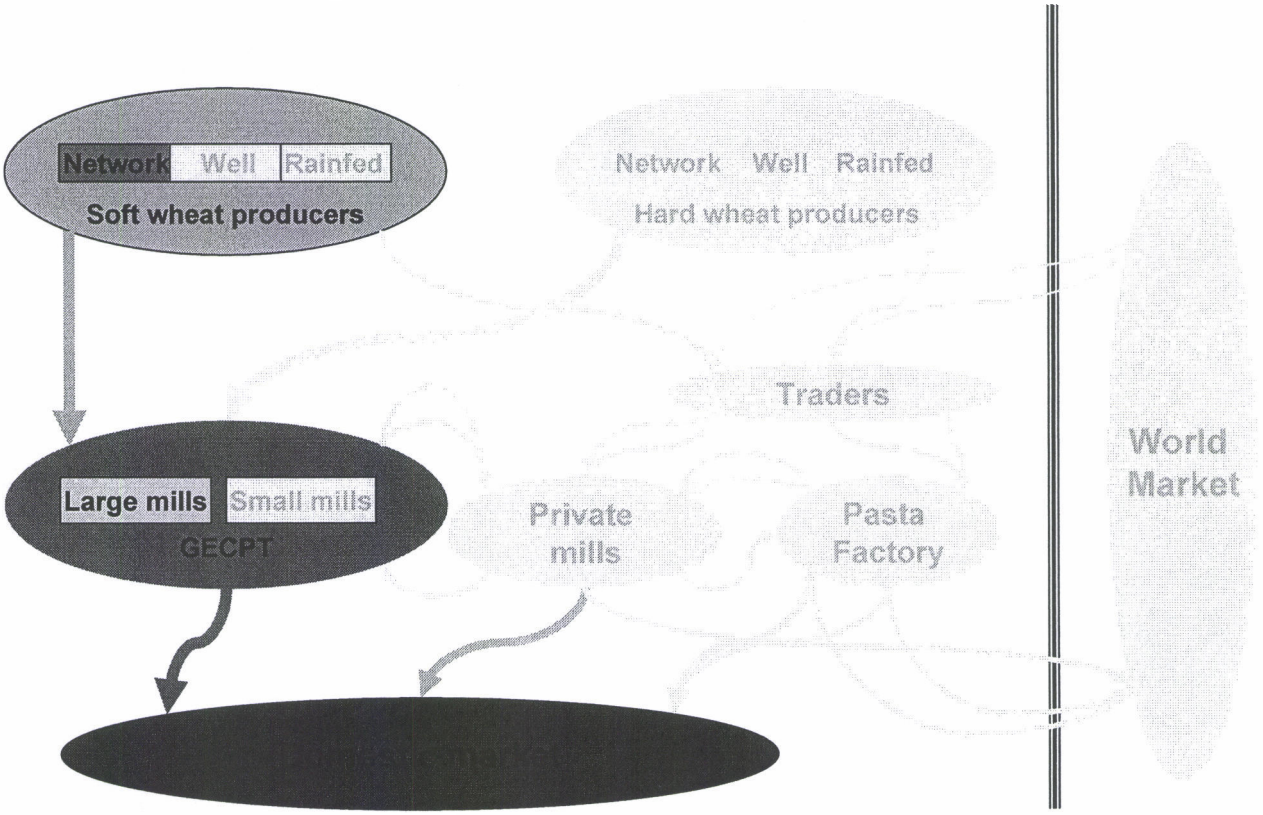
- The graph should be organized in such away that the relative position/hierarchy of the different agents in sequence appears clearly.

3.2. *Definition of the representative systems.*

To reduce the burden and the complexity of the computation it is necessary to subdivide the whole commodity system into segments or representative systems from the producer of the raw material (the farmer) up to the stage in the chain and/or the location where the main final output compete with alternative source of supply, on the domestic market or to the border for product targeting foreign markets. In term of vertical differentiation, it is important to note that the Excel PAM spreadsheet handles a sequence of four agents. It is therefore recommended to adjust the configuration of the representative system within these limits (📖 Chapter 8, pp 134- 137).

[2] The development and revision of the graph can be facilitated by the utilization of drawing tools in PowerPoint Word using the connectors arrows feature.

Figure 3 : Selection of one representative system from the wheat commodity chain



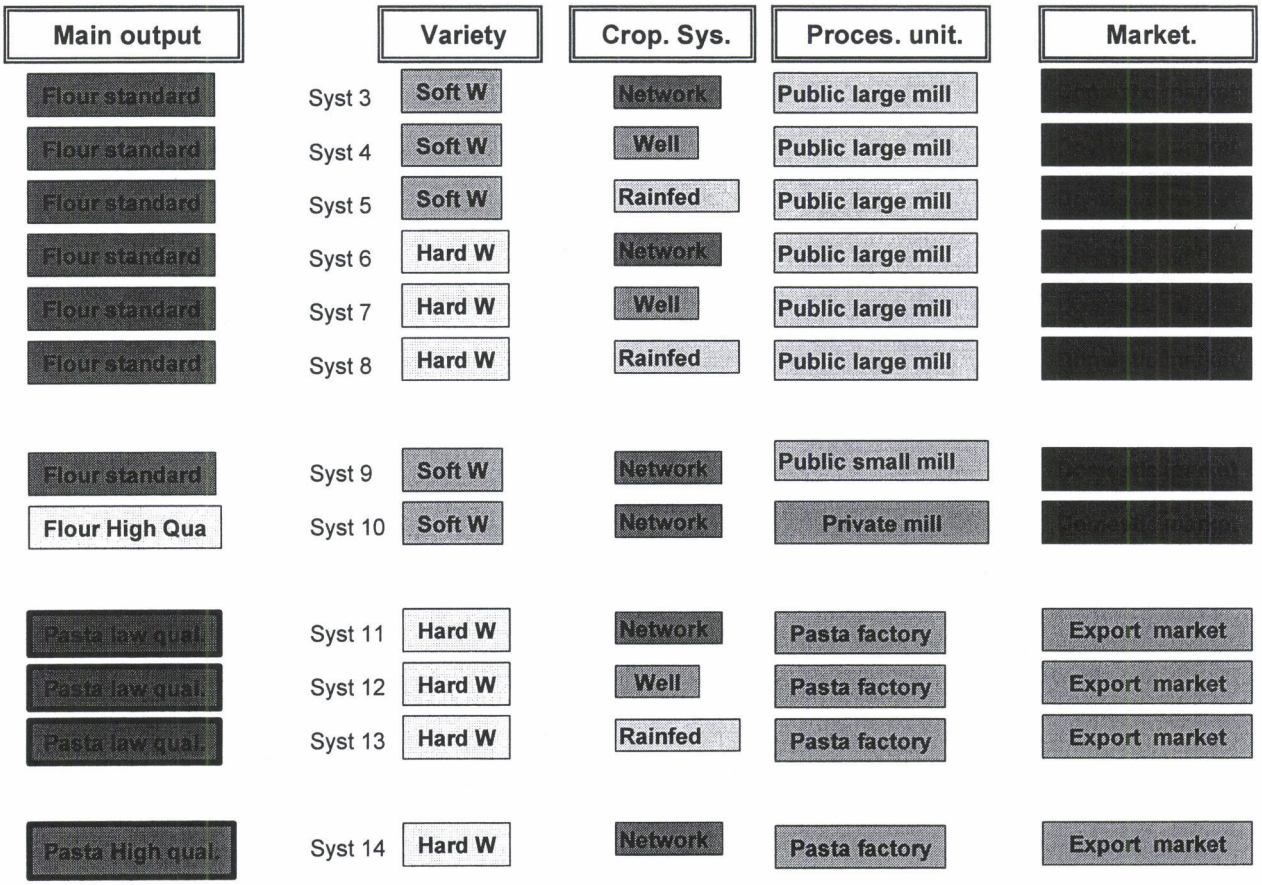
The criteria for the sub-division into representative system should take into account the issue that the PAM is supposed to address in priority. For instance when a raw agricultural product can be processed into different main final outputs, one for the local market and another one exported, but on a market niche, if the main issue is food security it might not be necessary to take the export oriented segment into consideration. If the policy issue is to assess the potential for diversifying the commodity chain outlets, then it is necessary to consider any possible alternative utilization of the raw material.

Among the basic criteria that could be retained:

- Segments corresponding to the major flows of product
- Farm level technology used to produce the raw material at farm level (irrigated, rainfed, chemical input intensive, low input intensive…)
- Processing technology for the main final output (large scale, small scale, source of energy, processing device…)
- Quality of the raw material or of the main final output.
- Location of the production (remote areas, accessible…), processing (rural based or urban base)

- The institutional setting in which the system operate (private entrepreneurs, state company)

Figure 4 Sub-division of the wheat system into representative systems



If one of the objectives is to compare the impact of alternative technology or location it is recommended to limit the number of criteria used and build representative systems that differs only by one characteristic, every others remaining equals. Along the same lines, redundant criteria should be eliminated. For instance, if there is a high correlation between the type of farm cropping technology and the location of the producing areas, one criterion might be left out of the typology.

After the computation of the PAMs for each representative system, aggregated PAMs for one main output can be developed using scale parameters indicating the respective share of each representative systems.

The sub-division into representative systems allows using the same standard budget corresponding to one stage of product flow into different sequence or combination of technologies.

4. Primary Data collection

After reviewing the availability, representativeness of any available data set, additional data may be collected to set up a budget for each agent of the selected representative system. The intensity of the data collection should be adjusted to the targeted issue.

- *Commodity chain perspective*: the data will be collected at the plot level to limit the time needed per farm. If the relevant cropping techniques are already known it may be more efficient to select directly an equal number of plot per cropping technique. The issue of the fixed cost can be overcome by assuming that most of the agricultural operations requiring equipments are provided on a service basis for a fee. In this case it is necessary to collect an additional set of data to establish a typical budget for the operator providing the service to the farmer in order to compute the appropriate ratio of decomposition of the cost into its tradable, labor and domestic factor components.

- *Farming system approach*: In this case the focus is on the whole farm, but attention should be given to the form under which the farm output can be compared to a "parity product" that will be used as the reference to compute the parity price. If an equivalent product is not available - for instance no raw cotton is traded, but lint cotton is traded - it is worth to collect basic information on the costs of processing in order to get the most accurate parity price for the output at farm level, by subtracting the cost of processing from the processed product parity price.

4.1. Primary Data collection methods.

Primary data can be collected through different methods:

- Individual interview with a guideline
- Group interview
- Formal questionnaire.

Each approach will be selected and combined depending upon the time available, the degree of heterogeneity that characterize the population to be surveyed, its openness and the resources allocated to this part of the analysis.

Individual interview can be used for rapid survey, when time is limited and when the targeted population is rather easy to identified and homogonous in term of technology or input/output relation (farmers producing wheat in a given scheme, millers using a specific techniques). The individual interview is also very often the only way to approach agents that would not accept to respond in the context of a more formal survey based on questionnaire with closed and direct questions. This is typically the case for traders, managers of large agro-food industries who are generally reluctant to provide sensitive information.

Grouped interview is a way to improve the representativeness of the information collected without investing more time and resources in the implementation of a formal survey. It can be used for interviewing 4 to 6 agents of the same category and social status. It is principally used for interviewing farmers who are usually less reluctant to discuss openly technical and economic issues for a specific crop. It helps in assessing to what extent a given cultural practices is generic or if it is a particular case. It also facilitates the identification and validation of extreme values for inputs use and output produced.

The implementation of a large survey should be considered only when no secondary data can be used to compute budgets with an acceptable level of reliability. The specific issues related to the implementation of large survey (sampling frame…) goes beyond the scope of this note, however, the following points should be stressed. The implementation of this type of survey presumes that a rather good level of knowledge are available beforehand on the prevailing technologies and agents' practices in order to design questionnaire with a limited number of open questions. Formal surveys are rather more difficult to implement to collect information at the marketing and processing level because of the likely higher reluctance of these agents to provide information under this method.

4.2. Primary Data to be collected.

The collection of the primary data can be done using only interview guidelines or more formal questionnaires. While a questionnaire have the advantage of simplifying the processing of the data collected, they may have a detrimental effect on the quality of the interview. At least, thus type of data collection support should be discarded for the initial contact with the respondent. It is also very important to explain clearly the objective of the study and to indicate that the information obtain will treated as confidential and anonymously analyzed

Whatever the type of support used to assist in collecting the data, the interview might be structured along lines presented in the following sections (📖 Chapter 9 Farm-level budget analysis pp 151-160 and Chapter 10 Postfarm budget analysis pp 171-187):

4.2.1. Identification and description of the technology.

A rather detailed description of the technology or/and sequence of operations needed to get the product allows to list the different types of equipment and inputs needed along the process. This review of the process helps in filling knowledge gap with regard to the technology and it's quite neutral in terms of sensitive information, at least for standard agro-food processing (cereals milling, oilseed crushing…). At the processing stage, it is strongly recommended to combine this part of the interview with a visit of the premises, which allows having a better idea of the conditions under which the product is process. The actual observation of the process also helps in identifying specific equipments and/or inputs that the respondent would have forget to mention.

4.2.2. Technical coefficients.

This first part of the interview should provide a list of the different operations and the related technical coefficients linking the input to the output.

In a commodity chain perspective, different types of inputs and outputs have to be distinguished:

- The *Raw material or commodity in process* is the form under which the selected commodity is purchased from the previous agents in the sequence of flow. Note that there is no commodity in process at the farm level since it is the first link of the chain, (unless the analysis considers the production of seed at the up-stream stage)

- The *Intermediate inputs* are all other goods and services that are needed to produce the output.

- The *Labor* is a specific input that should be recorded separately. A distinction should be made between:
    - skilled labor usually employed on the basis of a formal contract for a given term and subject to the payment of medical insurances and pension fee,
    - casual labor paid on a daily basis without any specific benefit,
    - family labor used by the farm or the firm should that be also recorded.

In terms of output the following distinction are made:

- The *main output* is the form under which the selected commodity is produced/ processed or resale by the agent. At the last stage of the system the main output is the main final output.

- The *by-products* are outputs that are jointly produced during the production/processing of the main output (straw for threshed cereals, seeds for cotton lint, oil cake from oils seed crushing). Note that at the farm level, the production of another commodity with the selected commodity in an intercropped system is not a by-product as both items can be produced separately.

- *Wastes* are all remaining materials that cannot be recycled in the process or sold out. It is important to record them as their disposal might incur specific costs.

It is important to clearly identify if the technical coefficient refer to the quantity of output, or to the quantity of raw commodity processed. For certain operations such as the maintenance of the equipment, the reference would be rather a periodicity or a frequency.

In the case of operations organized by batch, as opposed to a continuous processing, the quantity processed by batch could be used as a common reference to record input/output coefficients. This approach is particularly relevant for marketing operation where the identification of a series of cost can refers to one cycle 'or rotation of purchase/delivery, or purchase/storage and storage/delivery in the case of non perishable product.

The collection of the technical coefficients is facilitated if it is done using the local/ or custom units of measure; this is particularly the case at the farm level for yield estimate. It is however necessary to obtain the conversion between the local or custom units of measure and their metric unit equivalent.

If the output is sold under a packed form (bags, cans, glass jars, Tetrabrik) this cost should be included. Packaging and handling devices (plastic boxes, bags) that are used for several cycles of production should be treated as equipment. For instance a bag handling 50kg of grains might be used for 4 rotations per year and for 3 years; accordingly it purchase value should be divided by 4*3*50= 600 kg and not 50kg.

4.2.3. Output estimation.

Yield could be a highly variable data at the farm level while in general input/output relation are often constant at the processing stage for a given technology; however it important to identify the potential impact of quality/ properties of the raw commodities on the conversion ratio from raw material to the output.

At the processing stage, the estimation of the volume produced could be obtained directly from the manager, but may sometime require to be crosschecked with other methods of estimation. In certain case the respondent will have less difficulty (or reluctance) to indicate the period of the year during which the processing unit operates. Then the volume of production can be estimated on the basis of the total period of activity the throughput (quantity of output per hours or per day). To improve the accuracy of the method, one can distinguish among period of peak activity (when the equipment is used throughout the day with a limited time for maintenance) and period of lower activity.

If the level of capacity utilization is an issue, it should be noted that any industrial process required some time for maintenance and cannot be operated continuously throughout the day or the year. This should be taken into account for the estimation of the maximum processing capacity. Along the same line, it is also important to consider that the level of processing activity is also determined by the availability of the raw material which might be limited to a few months only in the case of perishable commodities.

4.2.4. Degree of specialization.

Farmers, traders and even sometime processors are rarely specialized in one commodity but are involved in several commodity systems. In this case the equipment, or at least part of it, can be shared among different crops or products. It is therefore necessary to estimate the respective share of the common equipment that is used for each crop in order to determine the part of the investments that is used for the commodity analyzed.

At the farm level, it requires a rather comprehensive characterization of the cropping pattern for each plot managed by the farmers. It should be noted that a given equipment is not necessarily used for all the crops produced by the farmer and with the same intensity. Accordingly, it might be easier to considered that mechanized operation are carried out on a

service basis and not by using farmer's own equipment. In this case a complementary survey will carried out to develop a specific budget for the corresponding service.

At the marketing and processing stage if the respondent is not willing or able to provide the corresponding figures, the estimation can be done on the basis of the time allocated by the agent to each commodity. Here also, it should be noted that a given processing line might be used for a specific product. In this case only the value of the infrastructure (buildings) and other fixed costs that are common to the whole set of products should be break down into products' share.

4.2.5. Equipment, input and output values.

Once the list of equipment, inputs and outputs is known, the next step is to get a price or a value for each of them. Note that the recording of the equipment, inputs and outputs list and their corresponding values could be carried out simultaneously depending on the willingness of the respondent to provide all the answers at the same time. A separate discussion, or phase of the interview, on the list of equipment, input, output, on one side, and their respective values on the other side, offers the possibility to cross-check the information provided by the respondents. Splitting inputs records and their values make also possible to discuss about the two groups of information at a different time or with different respondents.

As a general rule with pricing and value, it should be kept in mind that the most important information to obtain from an agents are the technical coefficients, while the corresponding prices and value can be obtained from other sources. For instance, the price of the raw material purchased by processing unit can be obtained from its suppliers. Inversely, the price at which the output is sold might be obtained from the agent purchasing it downstream. The experience teaches that agents are rather open to provide information on common inputs purchases values, while it is more difficult to get value for large investments or main outputs sales.

In any case, it should be kept in mind that the price for raw materials and main outputs are rather volatile, depending on the year, the season and that they are affected by changes in the quality of the product. Therefore, any primary data on prices should be cross checked with secondary sources.

4.2.6. Infrastructure and Equipment valuation.

For durable goods, in principle, the purchase price and the date of the purchase should be recorded in order to compute the actualized value of the equipments value (on the bases of a price index for instance), since the agent's budget should be established for the a given year of reference. Another option is to collect the price of a similar investment at the time of the survey, as far as the technology is not radically different (at least in terms of throughput and quality of the output). Standard depreciation techniques also take into account the salvage value of the equipment at the end of its life-time. It presumes that there is actually a market for second-hand equipments, which might be the case at least for vehicles, generators, pumps but might be less frequent for more specific processing equipments. If the equipment has been

purchased second-hand, attention should be given to the corresponding maintenance costs (lubricant, spare parts, big repairs) that should be higher than in the case of brand new equipment.

Land value is a peculiar asset, the value of which requires a comprehensive analysis of the various alternative uses that could become a specific research topic in itself (📖 Chapter 11 Estimating Social Profitability, pp 207- 209). Still, the interview provides an opportunity to collect information about the custom land rent applied, or the sharecropping rate for land utilization that can be used in the computation of the budget as a proxy for the opportunity cost of the land. For processing activity, the price of the land might be included in the value of the initial investment and associated with an equivalent or higher salvage value to take into account possible land price increase in peri-urban areas depending on the location of the agent.

The *establishment of a tree orchard* in the case of perennial crops should be treated as an investment. The corresponding operations, inputs and value should be recorded separately in order to depreciate these costs along the whole years of fruit production. Like in the case of equipment purchase, the utilization of the current price for input purchase allows to avoid the issue of discounting (📖 Farm-level Budgets and Analysis, pp 163-166).

4.2.7. Time dimension of the process.

While the spatial dimension of the commodity systems linking agents with different location and related transport costs is rather obvious and is easily captured and recorded through agents' interviews, it is also important to take into consideration the costs attached to the time needed to achieve the whole process. These "time costs" are of different natures.

For non-perishable goods it is important to take into consideration any buffer storage at any point of the systems. Information should be collected on the required infrastructure (warehouses, silos), labor (handling, guarding…), inputs (chemicals…). But the cost of storage also include the opportunity cost of the financial capital that is immobilized under the form of raw, intermediate or final output. It therefore important to obtain an estimate of both the average volume and duration of the product stored. If storage occurs at the beginning and at the end of the technical operations performed by the agent, both storage estimate values should be added (📖 Chapter 10 – Postfarm budget analysis pp 175-178).

As a general principle, the time needed to perform a complete process should be recorded in order to input the corresponding coefficient in the PAMs budget. In the case of simple processing operations the time needed to complete the process might be very small (one hour to a few days), the opportunity costs being negligible. In the case of longer process such as farm production the opportunity costs of the capital invested will vary from an agricultural operation to another one. For instance, the value of the capital invested for land preparation will bear a much higher opportunity cost than harvesting operation since the value of the former will be recovered several months later depending on the cropping calendar, whereas output can be sold just after the harvest. Thus, a calendar of agricultural operation should be developed while reviewing the different step of the cultural practice (or collected from ad hoc secondary sources).

A copy of the questionnaires used for collecting information from processing unit is attached in Appendix B as an example.

5. Computing the PAM.

5.1. Preliminary data analysis.

A preliminary version of the budget at market (or observed) prices for each agent can be established before entering the data into the PAM spreadsheet in order to check for data consistency and to reconcile sources of information coming from primary and secondary data. A typical budget is build for each agent.

The budgets should be developed on the basis of a unit of main final output ((kg or ton) for post-harvest operation while the farm level budget is build on a per hectare basis.

Each budget should distinguish the following major blocks of data (Table 1).

- *Fixed input*, where all the equipment and infrastructure subject to depreciation are recorded. The budget can mentioned the life-time the equipment and the share of the equipment allocated to the selected commodity if the equipment is used for other commodities. The value of equipment should be reported on the basis on unit of output, using a "normal" yearly total output as a reference. In certain case, the processing unit will report a very law utilization of its processing capacities which will, of course, increase the fixed costs value per unit of output. If this underutilization of capacity is conjectural - new industries, investment in processing capacity done in view of demand expansion – the analyst might considered using a higher rate of processing capacity utilization. At least a clear distinction should be made between the economic performance of a technology that is adequately used and the issue of the processing capacity utilization. The PAM applied the method of the capital recovery rate to compute the depreciated value of the initial capital invested (📖 Constructing PAMs for Commodity Systems, p139). For the development of preliminary budget a simple linear depreciation of the fixed cost can be applied.

- *Direct labor* includes all the labor used to perform the operation. Family labor used for the farm or the firm should be valorized at its opportunity cost using the custom wage paid on the labor market for an equivalent or similar task. It is important to convert all the labor value from a time reference to an output basis. While several tasks are only paid by the firm when it actually operates (handling...), other tasks might be paid on a yearly basis. In the first case, the labor value per unit of output will be computed on the basis of the daily or hourly throughput of the company (or the quantity marketed for one rotation or cycle of purchase and sale by a trader). In the second case the value of labor per unit of output will be computed using the total output per year.

- *Intermediate inputs* contain all the different goods and services used by the firm to produce the main final output. All the value should be reported on the basis of a unit of major final output, which is quite straightforward in the case of tangible good such as fuel, or fertilizer for instance. For services that are paid on a time basis or that are purchased only at certain point of time (spare parts, maintenance), it is necessary to convert their equivalent value in term of main final output by estimating the corresponding volume of main output produce for a given time.

- *Commodity in process* or the raw material used by the agent, produced or delivered by the previous agent is recorded separately.

- *Revenue*. The budget should mention separately the different type output produced including the main output and by-products.

Table 1 Standard budget structure.

COSTS				
FIXED INPUTS	Life Time	Used-up Value	Cost	Depreciated value
– infrastructure				
– Machine				
– Vehicles				
–				
VARIABLE INPUTS	Unit	Price	Quantity	Total
DIRECT LABOR				
– Handling				
–				
–				
INTERMEDIATE INPUT				
– Energy				
– Chemicals				
– spare parts				
–				
COMMODITY IN PROCESS				
– raw commodity				
TOTAL COSTS				
REVENUES				
– main output sale				
– by product sales				
TOTAL REVENUES				
PROFIT				

In the case of the CAS study implemented with the NAPC, farm level primary data have been collected separately by a team carrying out a study of the farming systems. A specific spreadsheet has been developed to link the format under which the farm data has been collected with the format requested by the PAM spreadsheet (Appendix C). Similarly a specific spreadsheet has been developed to compute preliminary budgets for post-harvest operations (Appendix D).

These preliminary budgets are used to check the consistency of the data collected. Their can be developed from different interview carried out with different agents. If the profit or losses obtained after the completion of the budget do not correspond to the information provided by the respondents or to results mentioned by other studies, it is necessary to review the reliability of the information gathered and eventually to plan complementary field investigations.

These preliminary budgets allow assessing, in particular, the impact of the level utilization of the capacity on the profit achieved, or the effect of the estimation of other initial investment such as the establishment of an orchard.

They also provide a mean to select the best estimate for the price of the raw commodity and the main output. For instance if a commodity is characterized by the co-existence of different variety and/or a high seasonality a weighted average of the price will be computed on the basis of price time series and seasonal pattern of production.

5.2. Budget data at market price key in

The utilization of the PAM spreadsheet is presented in detailed in a separate document. This section will just focus on the information that is needed to complement the budgets already developed per agent in the previous step.

The computation of the PAM will start by entering the budget for each agent. The spreadsheet developed allows handling four agents corresponding to the following stages:

- the production of the raw agricultural product at the farm level,
- the marketing of the agricultural product from the farm to processing,
- the processing of the product,
- the marketing of the processed product.

A copy of the spreadsheet is given in Appendix E

If an agent combined different functions such as marketing and processing it is possible to combine them into on budget. If there are two processing stages, each post-harvest budget (the ones following the farm budget) can be used to compute processing operations.

Once the preliminary budgets have been entered into the spreadsheet, the following operation should be performed.

5.3. Decomposition of complex inputs into their tradable and domestic factors component.

The PAM analytical framework rely on the distinction between tradables and non tradables; tradables being goods and services that can be internationally traded, while non-tradables are domestic factors used to produce a given output (in short labor and capital). While the main final output corresponds to a tradable, the decomposition of the cost items among tradable and non-tradable is more complex.

With the computation format adopted in the PAM spreadsheet, this decomposition is done by inputting a coefficient that is applied to each cost item (Table 2).

The allocation of the direct labor is simple as the corresponding values are entirely inputted into direct labor section of the budget. The only distinction made is between non qualified labor (casual labor) and qualified labor employed on the basis of formal contract. For goods

that can be considered as "pure" tradable, such as fertilizer or fuel, the entire value is decomposed as a tradable input.

The decomposition becomes more complex for intermediate inputs or services that include a part of tradable and domestic factors. For instance in the case of maintenance, the values recorded may include qualified and non-qualified labor used to perform the services, the tools used to work on the machine and the spare parts changed.

Table 2 Decomposition of costs items into tradable and non tradable

Cost items	Value	Decomposition coefficients			
		Non qualified labor	Qualified labor	Capital	Tradable input
DIRECT LABOR					
Handling	100	1.00			
....					
INTERMEDIATE INPUT					
Fertilizer	1000				1.00
maintenance	3000	0.10	0.15	0.20	0.55

The value of these coefficients can be computed from input/output tables produced for national accounting and planning purposes. However, these tables are neither always accessible nor reliable; furthermore they don't always provide a level of desegregation of the national economy that will be detailed enough to derive the coefficients for a specific economic activity. It is therefore necessary to carry out additional computation to estimate these coefficients.

The estimation of the coefficients of decomposition required to develop a specific budget indicating the shares of the different inputs used to provide the service. The detailed rationale for the computation is given in Appendix F. An example of such computation is given in Table 3 which is a copy of the spreadsheet format developed to assist in computing the decomposition coefficients.

Additional computations required to estimate the coefficients of decomposition should be limited to the inputs that represent a significant share of the total costs; a rule of thumb is to avoid investing in additional computation if they represent less than 5% of the total costs. In order to save the time and the cost needed for additional investigations the same coefficients can be used for different inputs of similar nature like for instance transportation and mechanized agricultural operations. When the additional investigations are too costly, the best option is to estimate the share of tradable and non-tradable on the basis of educated guess.

Table 3 : Decomposition of variable costs into tradable and non-tradable content.

Rate of return market	0.08										
Equipment depreciation											
Item	Equipment value	Annual capacity	Capacity needed for activity	Unit of capacity	Life time (year)	Used up portion	Residual value	Ad valorem duty	Fixed duty	Financial cost and import tax	Depreciation
Tractor	450 000	856	856	hour	15	100%	100 000	1.70%		21 493	27 397
Total										21 493	27 397

Coefficient of decomposition										
	Value at market price	Coefficient				Value				Coefficient check
		L NQ	L Q	K	TI	L NQ	L Q	K	TI	
Fixed cost										
Equipment cost TI depreciation	27 397				1	0	0	0	27 397	1
Equipment Financial cost	21 493			1		0	0	21 493	0	1
Variable cost										
Driver	49 933	1				49 933	0	0	0	1
Maintenance labor	6 000		1			0	6 000	0	0	1
Spare parts	12 000	0.05	0.05	0.1	0.8	600	600	1 200	9 600	1
Fuel	41944	0.05	0.05	0.1	0.8	2 097	2 097	4 194	33 555	1
						0	0	0	0	0
						0	0	0	0	0
Total	158 767	**0.33**	**0.05**	**0.17**	**0.44**	52 630	8 697	26 888	70 552	1

5.4. Determination of macro prices values at private and social prices

The computation of the PAM takes into account the effect of several macro-economic variables on the profitability of the subsectors or production system analyzed. For each macro-economic domain either two values are required – one at private price and one at social price – or an indicator of the distortion that prevail between the situation at private price (the current market and policy situation) and the one that would exist at social price (no macro-economic distortions induced by the government policy or by market imperfections). This note will not provide an extensive discussion on the computation of these values and coefficients. The reader could refer to the literature mentioned as a reference. In practical terms the information could be obtained either from resources persons that are knowledgeable in this domain or from reports produced by institutions in charge of macro-policy formulation or monitoring at the national level (Planning Bureau, Central Bank) or international level (International Monetary Fund, World Bank, development Bank at the regional level, OECD…).

The following variables are needed:

- Private and social exchange rate or a an indicator of the prevailing condition (📖, Chapter 11 – Estimating social profitability, pp 196-199)
- Private and social interest rate or an indicator of the prevailing level of distortion (📖, Chapter 11 – Estimating social profitability, pp 199-203)

- An indicator of the prevailing level of distortion on the labor market, and in the case of the spreadsheet format an indicator of labor cost increase between casual labor and labor employed under formal contract (📖, Chapter 11 – Estimating social profitability, pp 204-207).

- An indicator of the prevailing distortion on the value of the capital invested due to subsidy or tax on investment (📖, Chapter 11 – Estimating social profitability, pp 199-203).

5.5. Estimation of parity price for tradables.

5.5.1. Tradable input social price

The social price for tradable are computed by adjusting the market prices (observed price) collected for the establishment of agents' budget.

For tradable inputs that are actually traded, the current market price is adjusted with respect to trade tariffs, by deducting the value corresponding to the enforce tariff from the current market price. Another set of adjustment will be done by adding the value of any subsidy provided within the current policy for the utilization of given input or service. It is important to note that a subsidy may imply either a transfer or money, or can be based on the enforcement of an official price. For inputs that are subject to non tariff barriers (quota), the

social price should be estimated from any international market price and adding to this international price the shipment costs from the location of reference for the international price quotation to the border of the domestic market (the method is similar to the computation of the parity price for the main final tradable output).

For tradable inputs that are note traded (importation or exportation subject to embargo), the parity price should be also computed on the basis of the prevailing international price and the prevailing costs.

5.5.2. Estimation of parity price for main final tradable output

The computation of the social price retained for the tradable output is crucial for the construction of the PAM as indicators of comparative advantage are usually highly sensitive to divergences in revenue at social and private price (📖, Chapter 11 – Estimating social profitability, pp 188-199). The method is rather simple "on the paper". If the purpose is to assess the comparative advantage of a sector substituting its production to import, the CIF price (Cost Insurance Freight) of the same commodity at the country border is the reference for estimating the social price for the tradable output; while for assessing the economic efficiency of an agro-food industry targeting the world market, the FOB price (Free On Board) would be the most appropriate reference. However beyond this rather simple criterion, the practical computations to estimate an appropriate and relevant social price for tradable output are more challenging.

World market price quotations. The first issue is to find a reference for the world market price of the main final output considered. A limited number of product benefits from a regular quotation at the world scale, on the bases of a physical market, or a spot market. This group encompasses major commodities such as cereals and industrial crops (cotton, coffee, cocoa…), for which prices are regularly published for a specific norm or quality of product in selected locations. But it is much more difficult to get the same type of information for elaborated products that are traded within more segmented markets. For instance it is easy to obtain data on soft wheat and durum prices, but there are no equivalent source of information for flour as most of the international wheat flour trade operates under a more segmented market mostly on the on the bases of bi-lateral relations.

Seasonality and price variations. Beyond the availability of price quotation for the selected main final output, a second issue is to get prices for a period long enough to take into account seasonality patterns within a year and variations across years.

Quality of the product. When a formal mechanism is establish to quote prices at the international level, each quotation usually refers to a specific variety and quality of product which does not necessarily match the quality produced by the system analyzed.

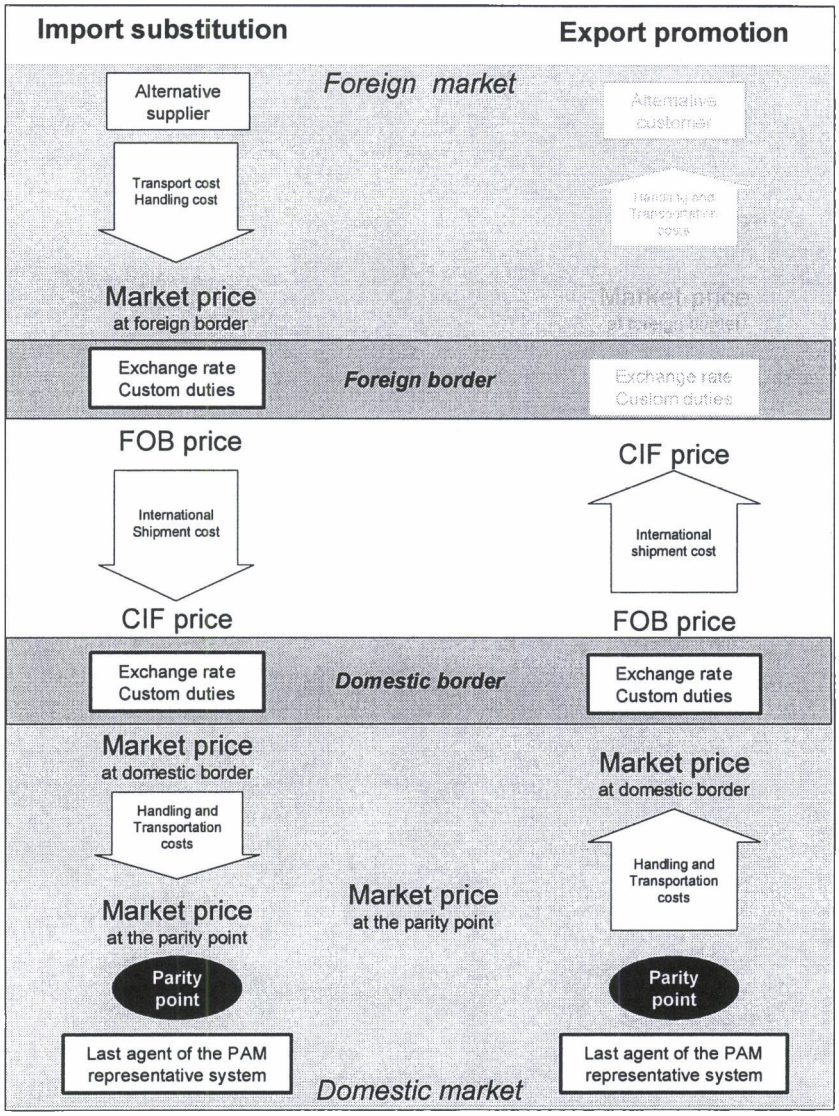
Location of reference and transport cost. Last, but not least, available world market price usually refers to a specific location (for instance FOB US Gulf for US wheat export, London CIF for cotton price quotation). International shipment prices acknowledge a high volatility which is not necessarily only correlated to the distance between export and import points, but

does also take into account the total volume of trade (back and forth) on the commercial route, handling facilities at loading and unloading spot, bulk break-down, type of conditioning (bulk, containers…) and so forth.

In principle all these variables would have to be considered to define the most relevant world market price. In practice, it is difficult to consider all these variables simultaneously and some of them are privileged on the base of the available and accessible information.

In practice it is also more relevant to define a specific trading partners (suppliers or customers) in order to assess the comparative advantages on more tangible grounds rather than to refer to an hypothetical unique and integrated "world market". Figure 5 presents a simplified import and export channels' cost and price structure on the base of which parity price can be computed. The parity price is the conversion of an international price used as a reference into its equivalent value in domestic currency at the parity point, i.e. the last stage of processing, marketing included in the representative system. The international price is used as a base to compute the parity price by adding (import substitution) or subtracting (export promotion) shipment and handling costs and by subtracting export subsidy or import custom duties to get the output social price.

Figure 5 : Import and export channels structures and related price and cost items.



5.6. Sensitivity analysis.

The objective of the sensitivity analysis is to assess the relation between the spreadsheet output variables (DRC, SCB, PAM values) and a selected number of input variables (costs, macro prices and so forth) to check if the value of any input variable have a large effect on the MAP's output variables. Sensitivity analysis should not be assimilated with simulation that relies primarily on economic considerations such as what would be the effect of changes in the tariff on the import of financial profitability of the system ((📖 Chapter 11, Estimating social profitability – Sensitivity Analysis pp 220 -221).

The output variables that are usually taken as a reference in the sensitivity analysis are:

- Financial cost benefit ratio
- Domestic resource cost ratio
- Effective protection coefficient
- Producer subsidy ratio.

The basic variable that by experience have a large effect on the output are:

- Yield
- Parity price for the main output
- Conversion factor from raw to main output at the processing level.
- Exchange rate and conversion factor from nominal exchange rate to real exchange rate.

An analysis of the complete cost structure of the system should be carried out to identify cost item that represent an important share of the total cost (more than 5%). This can be done by making the copy of the budgets on a separate spreadsheet. All the costs from the agents' budgets are copied as value to another sheet. Commodity in process and output should be excluded from the table. The cost of the product under the raw form, i.e. before processing at the farm level or the trader should be converted into their equivalent value in unit of main final output. For instance, raw cotton production cost per hectare should be converted in their lint cotton equivalent by dividing the related cost by the yield and the conversion rate from raw to lint cotton.

A first tool for assessing the sensitivity is provided in the PAM spreadsheet in a specific table providing the market and social value of input variable that correspond to the break even-point (i.e. Profit = 0, or Financial Cost Benefit or Domestic Resource Cost = 1). The break-even point is computed for the yield level, the parity price of the main final output and, the aggregated value of the post-harvest costs and the aggregated value for the whole representative system of the domestic factors costs. The table indicate also the gap between the break-even value and the current value as a percentage of the current value, which can be considered as an indicator of the sensitivity of each variable; the higher the percentage, the more the result of the PAM are sensitive to this variable or group of variable. Table 4 provides an example of this break-even table. It indicates that the current yield level should be increased by 1.72 for the system to have a comparative advantage, while it can still break even at private price for a yield equivalent to 76% of the current yield level.

Table 4 Example of Break-even point table

Variable	Break even value	
	At Market Price *(ratio of current value)*	At Social Price *(ratio of current value)*
Yield:	2.88 *0.76*	6.50 *1.72*
Final Output Price:	13 618.65 *0.25*	91 643.12 *1.88*
Post Harvest Costs	23 806.25 *7.82*	-40 028.07 *-13.51*
Domestic Factors Costs	86 606.34 *1.88*	34 517.13 *0.45*

The sensitivity analysis can be conducted using the Table command in Excel (see to the spreadsheet guideline) allowing building a table of values taken by an output variable for an array of input variables. Specific software compatible with Excel such as @Risk[3] can be used to obtain a more comprehensive assessment of input – outputs variables interaction by looking at the respective impact of a series of input variables that varies simultaneously along a given probability distribution.

The quality (accuracy and reliability) of any variable that have a large effect on the PAMs value should be carefully considered. If any doubts remain about their quality, additional investigation might be carried out to obtain a better estimation of the variable. It can also be used to justify the implementation of complementary studies to improve the reliability of the PAMs. In any case, this should be explicitly reported.

[3] Cf http://www.palisade-europe.com/

6. Tools for the analysis of the results

The elaboration of the PAM per se is achieved with the completion of the key in of the data into the spreadsheet and their validation. The economic analysis of the results goes beyond the scope of this note. It relies on the ability of the analyst to put into perspective the PAM values and the current policy in place in order to underline the potential impact of any policy changes (📖 Chapter 12, pp 226-242). This last section indicates how the table provided in the PAM spreadsheet can assist the analyst and to what extent the spreadsheet can be used to simulate the effect of policy options.

6.1. Tables of results

A commodity has a comparative advantage because it can be profitably produced in an open and competitive environment without generating any additional costs to the entire economy under the form of financial transfer through government policy or under the form of externalities caused by market failures.

The PAM provides straightforwardly a range of indicators for assessing the efficiency and the comparative advantages of a system.

The PAM spreadsheet proposes a table presenting all the indicators computed from the PAM which provide the basic information for the analysis. The interpretation of the value of each indicator is recalled in Appendix A (📖 Chapter 2, Introduction to the Policy Analysis Matrix, pp 16-31).

Table 5 Table of PAM's indicators

INDICATORS	FORMULAS	VALUES
1. FINANCIAL PROFITABILITY	[D = A - B - C]	45 157
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.502
3. SOCIAL PROFITABILITY	[H = E - F - G]	-42 869
4. DOMESTIC RESOURCE COST	[G / (E - F)]	2.240
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	1.682
6. TRANSFERS	[L = I + J + K]	88 026
7. NOMINAL PROTECTION COEFFICIENT (Including by-product)	[A / E]	1.807
7A. NOMINAL PROTECTION COEFFICIENT (Main final output only)	[A* / E*]	2.043
8. EFFECTIVE PROTECTION COEFFICIENT	[(A – B) / (E - F)]	2.622
9. PROFITABILITY COEFFICIENT	[D / H]	-1.053
10. PRODUCERS SUBSIDY RATIO	[L / E]	1.400
11. EQUIV. PRODUCER SUBSIDY	[L / A]	0.775

To further analyze and interpret these values it is necessary to refer back to the PAM table itself and to look in particular at the third line of the table providing the divergences between the value at market prices and the ones at social price. The cell "L" indicating the total value of the transfer (positive if the transfer is in favor of the system analyzed, negative if the transfer is in favor of the rest of the economy) provide an aggregate value or synthetic value

of the policy effect on the financial profitability and the economic efficiency of the system. The respective values of the divergence for the revenue "I"(tradable main final output), tradable input "J" and domestic factors "K" give more insight on the nature of the distortions. For instance, the PAM presented in Table 6 show that the largest share of the divergence are on the tradable output side, while the current policy and market environment result in higher costs for domestic factors (private price) than the one that would prevail without policy intervention or market imperfections (social price). Eventually, the PAM indicates that the current policy has only a minor effect with regards to the tradable inputs component of the systems analyzed.

Table 6 PAM example

	REVENUES	COSTS TRADABLES INPUTS	DOMESTIC FACTORS	PROFITS
PRIVATE PRICES	A 113 619	B 22 924	C 45 538	D 45 157
SOCIAL PRICES	E 62 883	F 28 299	G 77 453	H -42 869
DIVERGENCES	I 50 736	J -5 376	K -31 915	L 88 026

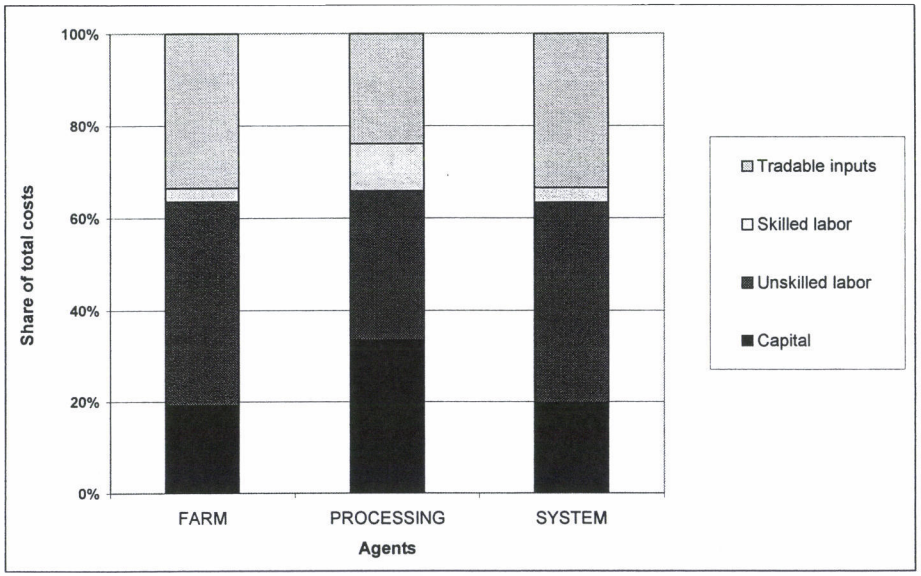
The PAM spreadsheet provides in addition to the PAM a Summary Budget table that can assist the analyst in interpreting the results. This Summary Budget table presents an aggregated budget for each agent with the accounting categories used in the PAM (revenue, tradables, and domestic factors). This Summary Budget is presented at private and social prices, and the corresponding divergences are given for each accounting categories. This table allows to better capture the nature of the divergence for the domestic factors as it provides a break down of the corresponding aggregated value into its labor and capital component. For instance in the example presented in Table 7, the analyst can see the largest share of the divergence on the domestic factors is due to differences in the value of capital cost at private and social prices.

The Summary Budgets also provides a mean to better analyze the structure of the representative systems with respect to the share of the different domestic factors (capital and labor) and, in a commodity chain perspective, looking a the distribution of each accounting categories across the different agents and within each agents. This allows differentiating the impact of policy option on each link, or agent, of the commodity chain. For instance the value of Summary Budgets table plotted in the Figure 6 shows that the capital content of the cost structure is higher at the processing stage than at the farm level. Thus, any policy or market induced distortions on the capital or financial market will have a larger impact on the processing stage than on the farm stage.

Table 7 PAM spreadsheet summary budgets

PRICE SYSTEM	----VALUES AT MARKET PRICE-----						---- VALUE SOCIAL PRICE ----						---DIVERGENCES---					
Agents/level / Items	FARM	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System	FARM	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System	FERME	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System
1.TOTAL REVENUES	86851	41281	68049	54075	68049	113619	59957	59699	62170	48652	62626	62883	26895	-18418	5879	5423	5423	50736
Main final output	41281	41281	54075	54075	54075	54075	59699	59699	48196	48652	48652	48652	-18418	-18418	5879	5423	5423	5423
By-products	258	0	13974	0	13974	14231	258	0	13974	0	13974	14231	0	0	0	0	0	0
2. TOTAL COST	65474	41281	43850	54466	44269	68462	102785	59699	62170	48652	62666	105752	-37311	-18418	-18320	5814	-18397	-37290
A. Commodity in process		41281	41281	54075	41281			59699	59699	48196	59699			-18418	-18418	5879	-18418	0
(tax+, subsidy-)	-45313			0	0	-45313												
B. Tradables	21990	0	621	313	934	22924	27126	0	792	381	1174	28299	-5136	0	-171	-69	-240	-5376
C. Domestic Factors	43484	0	1975	78	2054	45538	75659	0	1719	74	1794	77453	-32175	0	256	4	260	-31915
Unskilled Labor	28947	0	837	20	857	29804	29960	0	835	20	855	30815	-1013	0	2	0	2	-1011
Skilled Labor	1933	0	268	20	287	2220	1720	0	212	16	228	1948	213	0	55	4	59	272
Capital	12604	0	870	39	910	13514	43979	0	672	39	711	44690	-31375	0	199	0	199	-31176
PROFIT BEFORE-TAXES:	21377	0	24199	-391	23780	45157	-42828	0	0	0	0	-42869	64205	0	24199	-391	23820	88026
Direct taxes:	0	0	0	0	0	0												
PROFIT AFTER-TAXES:	21377	0	24199	-391	23808	45157							(positive=tax, negative=subsidy)					

Figure 6 Tradable inputs and domestic factors share per agents



6.2. Simulation of scenario.

The availability of a consistent and integrated data set representing a complete commodity chain, or a subsector, linked to various prices is a strong incitation to use the spreadsheet as a modeling device to asses the impact of prices changes on the performance of the systems analyzed. The analyst should be very cautious in doing so and in presenting the conclusions or recommendation derived from such kind of exercise.

By nature the spreadsheet is a static representation of a given situation and do not allow to simulate how agents would respond to any changes in price value. The scenario can be realistic at least at short term since any economic system has a certain degree of inertia. A cropping decision is made for a season in the case of annual crops and for a longer time horizon in the case of perennial crops or investment in agro-processing units; even though, agents can reduce their involvement in day to day operations if the activity becomes unprofitable. On a longer term, any drastic changes in the input-output price relations will certainly results in more structural changes, such as technical changes, or agents shifting to new activities (📖 Chapter 11, Estimating social profitability – Estimating Input Use of the Commodity System pp 209 -220). The simulation of the effect of new price environment should be carried out with the view of identifying the magnitude of the shock that the system will have to face, or how it will affect each agent, rather than with the perspective of formulating prescriptive recommendation and policy advices.

The simulation can also focus on the technical changes required to increase the productivity of the system. Here also the analyst using the spreadsheet should be cautious and keep in mind that any changes in the value of technical coefficients should be done within the possible range of output for a given technology. Doubling the yield, will require a new combination of production factors (more fertilizer and labor), therefore this simulation can only make sense if the related new combination of tradables and domestic factors are inputted into the spreadsheet. From an economic analytical perspective it should also be recalled that if the simulation concerns a subsectors that absorb a large share of the domestic factors and tradable inputs, this technical change will also lead to a changes in the price of these production factors. For instance, the introduction of a new cropping system using more labor for the production a staple crop may certainly have an impact on the wage level.

7. References

The literature on the PAM is very wide, but most of it focuses on the analytical aspect rather than on the actual computation of the matrix. The list is limited to reference and source of information used within the FAO project:

Monke E.A. and Pearson S.R., 1989, The Policy Analysis Matrix for Agricultural Development, Cornell University Press, Ithaca.

FAO, Agricultural Price policy: Government and the Market, Training Service, Policy Analysis Division, FAO, Training Material for Agricultural Planning 31. (TMAP 31)

The Indonesian Food Policy program web sites contain an extensive list of written materials the PAM (including a pdf file of preliminary version of the Monke and Pearson manual):
http://www.macrofoodpolicy.com/default.htm
http://www.stanford.edu/group/FRI/indonesia/index.html

Appendix A. Summary of Policy Analysis Matrix methodological framework.

The Policy Analysis Matrix (PAM) provides an analytical framework to estimate the comparative advantage of a given productive system. It consists in the comparison of two accounting entities (Income = Input cost + Factors cost + Profit) one being computed for a level of price observed under the current economic conditions (called private prices), while the second entity used the price (social price) that would prevails under perfect market conditions leading to an optimal allocation of resources within the economic system (a situation where the welfare of any economic agent cannot be improved without affecting the welfare of another one). The last line of the matrix is computed by subtracting social values from private values and represents the divergence between the current situation and the optimal situation. Those divergences are due to distortions attributed either, to policy affecting the level of prices (taxes, subsidy), or to market failure (monopoly, externalities) that prevent markets to allocate resources efficiently. Prices prevailing on the world market are taken as the reference for building the accounting entities under social prices.

The Policy Analysis Matrix

	Revenue	Tradable Input	Domestics factors	Profit
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergence	I	J	K	L

For instance, if H>0, a commodity has a comparative advantage because it can be profitably produced in an open and competitive environment without generating any additional costs to the entire economy under the form of financial transfer through government policy or under the form of externalities caused by market failures.

The PAM provides straightforwardly a range of indicators for assessing the efficiency and the comparative advantages of a system.

PAM indicators

Indicators	Formula	Interpretation
1. Financial Profitability (FP)	[D = A - B - C]	Absolute value of the profit generated by the system at private price
2. Financial Cost-Benefit Ratio (FCB)	[C / (A - B)]	Indicator of the competitiveness of the system. If FCB<1, the system is competitive, if FCB>1 the system is not competitive, FP is negative
3. Social Profitability (SP)	[H = E - F - G]	Absolute value of the profit generated by the system at social price.
4. Domestic Resource Cost (DRC)	[G / (E - F)]	Indicator of the comparative advantage of the system. If DRC<1, the system have a comparative advantage, meaning that we use less value of Domestic Factors (labor, capital…) than the added generated (VA= E-F), if DRC>1 the system have no comparative advantage, SP is negative
5. Social Cost-Benefit Ratio (SCB)	[(F + G) / E]	Another indicator for measuring the comparative advantage of the system. It takes into account the full cost of production (F + G) instead of the Domestic factors only. It is a more appropriate ratio to rank the relative position of different systems when they have a different cost structure (i.e. tradable and non-tradable), because the DRC is biased in favor of system that have a high content in tradable.
6. Transfers	[L = I + J + K]	Absolute value of the transfer between the economy and the system
7. Nominal Protection Coefficient (NPC)	[A / E]	Indicate the level of protection for the main output, if NPC> 1, the system benefit from a protection, if NPC<1 the system is taxed.
8. Effective Protection Coefficient (EPC)	[(A - B) / (E - F)]	Indicate the total level of protection taking into account the effect of the policy on the private value of the tradable output and tradable input.
9. Profitability Coefficient (PC)	[D / H]	Measure the impact of the policy on the profitability of the system. If PC>1, the system benefit from a net transfer from the economy, if PC<1, the economy benefit from a net transfer from the system.
10. Producers Subsidy Ratio (PSR)	[L / E]	Indicator of the impact of the policy/market distortion on the increase (+) or reduction (-) of the total revenue of the system at social price. i.e. magnitude of the divergence from the reference situation at social price to the current situation at market price
11. Equiv. Producer Subsidy (ESP)	[L / A]	Indicator of the impact of the policy/market distortion on the increase (+) or reduction (-) of the total revenue of the system at market price. Equivalent to the Producer Equivalent Subsidy (PSE) as defined by OECD for trade negotiation. If + it is producer subsidy, if – its consumer subsidy.

Appendix B. Example of questionnaire used for the CAS study.

Ministry of Agriculture and Agrarian Reform
NAPC
National Agricultural Policy Center

Comparative Advantage Study

Agricultural product processing questionnaire

Project GCP/SYR/006/ITA – Phase II

Food and Agriculture Organization of the United Nations | Italian Cooperation | Ministry of Agriculture and Agrarian Reform

Final version – October 2003

General information.

Type of processing unit:	
Date of 1st visit to the factory:	
Address/Location:	
Telephone:	
Name of respondent: *(indicate as many as persons met)*	
Year of processing unit establishment:	
Legal status: *(private, public, established under law 10)*	
Observations:	

Identification of types of outputs and share in total production:

Raw material use *For factory processing different type of agricultural product, specify clearly which input is concerned by the interview*	**Main final outputs** (- *differentiate between type of quality, type of packaging...)*	**By-products** Corresponding by-product for each main final outputs *(bran, waist...)*	**Period of production** *(for main final outputs only)*		**Importance of the production** *(for main final outputs only)*		
			Starting month	Ending month	Rank in term of total factory production value *(most important = 1)*	Importance in % of total time of factory operation	Quantity for 2002 *(unit = ton or specify)*

Underline the line of production selected for the interview.

Description of the process:

At this stage it is important to propose to visit the factory to visualize the different operations of the process. Take advantage of this visit to identify equipment used and various inputs consumed in addition to the agricultural raw material such as water, chemical, container, tank, barrel for temporary storage. The visit also provides an opportunity to identify storage capacity for raw material and final output.

Operation *(Reception of the raw material, cleaning, processing, packing, delivery..)*	Comments on operation	Input	Output (s) *(including by-products and waste)*	Equipment used	Other inputs use	
					Type of inputs *Water, Chemical, tank, barrel*	Imported or locally made
Procurement of the raw material:	*If the product is delivered to the factory gate give attention to any reimbursement of the transport cost by the processor. If the processor collect the raw material fill table 0 later*					

Operation *(Reception of the raw material, cleaning, processing, packing, delivery..)*	Comments on operation	Input	Output (s) *(including by-products and waste)*	Equipment used	Other inputs use	
					Type of inputs *Water, Chemical, tank, barrel*	Imported or locally made

Operation *(Reception of the raw material, cleaning, processing, packing, delivery..)*	Comments on operation	Input	Output (s) *(including by-products and waste)*	Equipment used	Other inputs use	
					Type of inputs *Water, Chemical, tank, barrel*	Imported or locally made

Total capacity for the selected output.

A factory may combine different lines of processing based on different technology to produce a similar output. If this is the case, it is important to record the different line of processing available and their capacity

Line of processing	Specialized in a given type or quality of output	Capacity of processing per line		Year of establishment	Period of operations	
		Product *Input or output*	Quantity per hour		Starting month	Ending month

The remaining part of the interview should refer explicitly to the most recent line of processing in particular with regards to variable costs. If the processing lines are based on the same technology it is important to check if the responses refer to one line or the whole set of processing lines.

Technical coefficients from raw material to output(s)

You may distinguish by quality of input. Do not forget to records waste

Input			Output (s)			Time base				
Name	Quantity	Unit of quantity *(ton, kg)*	Name *Product quality* *By product* *Waste*	Quantity	Unit of quantity *(ton, kg)*	Reference product *(Input or Output)*	Quantity of product	Unit of quantity *(ton, kg)*	Quantity of time	Unit of time (**Hours**, days)

Estimation of effective pattern of capacity use.

	Unit	Peak period	Normal	Low	Stop
Period length	month				
Number of days per week	days				
Daily operations (hrs)	Hours				
Number of processing line operating	Unit				

Permanent or long term employees

If the processor has no permanent employee recruited for the whole year, do pay attention to seasonal employees and family members working in the plant. Casual labor paid on a daily basis is recorded in table 0

Function of employee (Technician, accountant..)	Number of employee per function	Time base of the contract *(Weekly, monthly...)*	Wage value per time base *(weekly, monthly)* *(not including pension and other social fee paid by the processor)*	Total value of wage for permanent employee *(if no information given on individual wafge)*	For seasonal labor indicate the duration of the employment	
					Starting month	Ending month
Family members working in the factory as permanent staff						

Casual labor costs for processing

For responses referring to period of processing check if the response if for one line of processing or the totality of the processing lines

Operations *If possible specify for which operation the casual labor is recruited: unloading, packing, unpacking*	Variable cost per item				Reference of payment				
	Function *Handling, operating the machine, driving...*	Number of person	Wage	Tot Value	By volume of product			By period of processing	
					Product *(Input or output)*	Quantity	Unit of Quantity *(Ton, kilogram, pieces of container loaded...)*	Quantity of time	Unit of time *(Hour, days, month)*

Other inputs used for processing

For responses referring to period of processing check if the response if for one line of processing or the totality of the processing lines

Operation	Variable cost per item					Reference of input consumption					How many times input purchase during period of operation
	Input Item	Unit	Qty	Price	Tot Value	By volume of product			By period of processing		
						Product	Quantity	Unit of Quantity	Qty of time	Unit of time	
If possible specify for which operation the input is used	*Chemical, packaging, if used for only one cycle, fuel or energy can be recorded in table0*					*(Input or output)*		*(Ton, kg, pieces of container loaded...)*		*(Hour, days, month)*	

Maintenance costs.

If the maintenance is provided by permanent employee or casual labor directly recruited by the processor record only lubricant and spare parts purchase value. Other wise do specify as possible spare parts and labor cost for services provided from outside. Do distinguish between routine maintenance and exceptional machine failures.

For responses referring to period of processing check if the response if for one line of processing or the totality of the processing lines

Operation	Variable cost per item					Reference of item consumption					How many times spare part purchase during period of operation
	Input Item	Unit	Qty	Price	Tot Value	By volume of product			By period of processing		
						Product *(Input or output)*	Quantity	Unit of Quantity *(Ton, kilogram, pieces of container loaded...)*	Qty of time	Unit of time *(Hour, days, month)*	
Routine maintenance	Labor										
	Lubricant										
	Spare parts										
Big repairs	Labor										
	Spare parts										

Raw material purchase

Raw material type and or quality	Place of purchase *(Farm gate, market, Factory gate)*	Average distance of procurement *(if not purchase at factory gate)*	Transport fee *(if paid by the processor)*	Unloading fee at the factory gate *(if not included in trp fee or labor cost for processing)*	% of total purchase *(in term of volume)*	Frequency of purchase *(Daily, weekly, monthly)*	Price for each quality of raw material in 2002			Storage capacity for all type and quality of raw material	Quantity purchased in 2002
							Average	Minimum	Maximum		
		(km)	*(Sp/ kg - ton)*	*(Sp/ kg - ton)*	%		*(Sp/ kg or ton)*	*(Sp/ kg or ton)*	*(Sp/ kg or ton)*	*Ton*	*Ton*

Average quantity of raw material usually in stock for each processing period.

	Peak period	Normal	Low	Before process operation
Volume Ton				

Detailed costs for raw material purchase

To be filled only if processor is actively involved in purchase for the largest share of the raw material processed. Select the most frequent case for collecting cost based on the source of raw material identified in table 0. Refer to a standard load of raw material purchase. If transport done both with factory truck and for a fee, limit interview for the transport fee case.

Operation	Item	Unit	Unit Price	Quantity	Total value	For which quantity of purchased product	For which distance (when applicable)	Other reference than the one specify beside
Reconnaissance costs	Agent fee	-% of price ton						
	Trader's own travel fees							
Harvesting	Advance payment value	Ton Ha %						
	Cost of harvest labor	Man.day or team						
Packing	Labor (if not included in harvesting cost)							
	Packaging bags *(if not recycled)*							
Loading	Labor							
Transport	Fee							Load capacity of truck
If no trp fee ->	Transport total cost							
	Fuel							
	Driver *(if paid on trip basis)*							
Unloading at the factory	Labor *(if not recorded in before)*							

Fixed costs of processing equipments for the selected processing lines.

Do check if the responses refer to one line of processing or to the totality of the processing lines

Do not forget to considered any container, bags needed by the processor and that are used for more than one cycle of production.

Equipment Machines, containers, bags.	Type or Brand	Quantity	Unit Value	Year of purchase	Life time in years	Value at time of purchase	Replacement value. *Price of the same or similar equipment delivered and installed at the factory as of today*	Used by one processing line or many	
								Yes/No	% of total equipment operation time use for the selected line.

Infrastructure and general equipment

Infrastructure and general equipment	Type/Brand	Own / Rent	Life time	Purchase cost at time of purchase	Current cost if purchase today
Land					
Building					
Water					
Generator					
Vehicles					

Functioning costs

Item	Cost	Period of reference
Energy		
Fuel		
Maintenance of vehicle		
Other General expenditure		

Taxes		

Output, by product and waste sales:

Do not forget to collect information on all output, including waste

Outputs types *Main output, By-product waste*	Position of sale delivery *(Factory gate, wholesaler)*	Average distance of delivery *(if not sell at factory gate)*	Unloading fee at the factory gate *(if not included in trp fee or labor cost for processing)*	Transport fee *(if paid by the processor)*	% of total sale (in term of volume)	Frequency of sale *(Daily, weekly, monthly)*	Average price (2002)			Storage capacity	Quantity sold in 2002
							Average	Minimum	Maximum		
		(km)	*(Sp/ kg or ton)*	*(Sp/ kg or ton)*			*(Sp/ kg or ton)*	*(Sp/ kg or ton)*	*(Sp/ kg or ton)*	*Ton or piece*	*Ton or Piece*

Average quantity of main output usually in stock for each processing period.

	Unit	Peak period	Normal	Low	Stop
Average volume of main output stored	Ton				

Sale average marketing costs.

To be filled only if processor is actively involved purchase in the largest share of its output. Select the most frequent case for resale based on the destination of raw material identified in table 0 0. Try to refer to a standard load of sale. If transport done both with factory truck and for a fee, limit interview for the transport fee case.

Operation	Item	Unit	Unit Price	Quantity	Total value	For which quantity of Processed/ Resale product	For which distance (when applicable)	Other reference than the one specify above
Loading	Labor							
Transport	Fee							Capacity of the truck
If no trp fee ->	Transport total cost							
	Fuel							
	Driver (if paid on trip basis)							
Export cost to FOB *Item to be listed during the interview*	Export declaration fee							
	Whole customs clearing fee							
	Storage cost							
	Handling cost at border							
	Exportation taxes							
FOB to CIF Cost to reach the delivering point in the country of	Freight							
	Insurance							

Operation	Item	Unit	Unit Price	Quantity	Total value	For which quantity of Processed/ Resale product	For which distance (when applicable)	Other reference than the one specify above
destination								

Appendix C. Spreadsheet format for farm data management.

Sheet 1: Data – To transfer the data from the FSS database and compute averages and Coef variation to pinpoint problematic variables

Olive	Average	Coef varia						
Perennial Crops				1	2	3	4	5
Crop				Olive	Olive	Olive	Olive	Olive
Variety				Sourani	Sourani	Sourani	Khderi-neiba	Khaderi
Production year of crop:				32	35	20	18	23
Irrigation type				Rainfed	Rainfed	Rainfed	Rainfed	Rainfed
Mantika				Al-Shogour	Al-Shogour	Al-Shogour	Drekiesh	Drekiesh
Governorate				Idleb (1)	Idleb (1)	Idleb (1)	Tartous (1)	Tartous (1)
Farming systems zone				FSZ 2	FSZ 2	FSZ 2	FSZ 2	FSZ 2
Household type				M	L	L	L	S
GM Number:				0	0	0	0	0
Collected for				1.00	1.00	1.00	1.00	1.00
Responsible:				Firas	Firas	Firas	Firas	Firas
	0 Year			Year	Year	Year	Year	Year
Unit Prices at present	Price			Price	Price	Price	Price	Price
Harvest 1	18.81	7%		18.00	19.00	21.00	19.00	19.00
Harvest 2	0.00	-		0.00	0.00	0.00	0.00	0.00
Crop produce 2	0.00	-		0.00	0.00	0.00	0.00	0.00
TOTAL GROSS OUTPUT	0.00	-		0.00	0.00	0.00	0.00	0.00
Seed/Seedling	15.84	29%		13.00	15.00	15.00	20.00	18.00
Manure m3	394.06	78%		400.00	380.00	500.00	450.00	500.00
Chemical fertilizers:	0.00	-		0.00	0.00	0.00	0.00	0.00
Nitrogen	7.72	27%		8.00	8.00	8.00	8.50	8.50
Phosphate	6.22	70%		9.00	9.00	9.00	0.00	9.00
Potash	4.28	133%		0.00	0.00	0.00	11.50	11.00
Other (liquid)	0.00	-		0.00	0.00	0.00	0.00	0.00
Chemicals:	0.00	-		0.00	0.00	0.00	0.00	0.00
Pesticides	659.38	99%		0.00	0.00	0.00	1 400.00	800.00
Herbicides	15.00	215%		0.00	0.00	0.00	0.00	80.00
Fungicides	381.25	144%		0.00	0.00	0.00	0.00	1 250.00
Machinery:	0.00	-		0.00	0.00	0.00	0.00	0.00
Ploughing	157.14	87%		300.00	300.00	300.00	300.00	0.00
Levelling	66.25	265%		0.00	0.00	0.00	700.00	130.00
Planting	0.00	-		0.00	0.00	0.00	0.00	0.00
Fertilizing	0.00	-		0.00	0.00	0.00	0.00	0.00
Other	31.25	273%		0.00	0.00	0.00	0.00	0.00
Harvesting	0.00	-		0.00	0.00	0.00	0.00	0.00
Hired labor:	0.00	-		0.00	0.00	0.00	0.00	0.00
Land preparation	107.24	124%		375.00	375.00	375.00	62.50	50.00
Levelling	31.77	155%		0.00	0.00	0.00	0.00	120.00
Planting	91.20	95%		263.00	263.00	263.00	50.00	75.00
Fertilization	37.06	45%		50.00	50.00	50.00	57.00	40.00
Chemicals	18.56	131%		0.00	0.00	0.00	50.00	25.00
Irrigation	6.25	273%		0.00	0.00	0.00	0.00	0.00
Cultivating/weeding	3.56	400%		0.00	0.00	0.00	57.00	0.00
Harvesting	28.44	27%		25.00	25.00	25.00	35.00	25.00
Pruning	64.22	5%		63.00	63.00	63.00	65.00	62.50
Post-harvesting	0.00	-		0.00	0.00	0.00	0.00	0.00
Animal Draft	21.38	179%		0.00	0.00	0.00	87.00	0.00
Packing materials	42.19	31%		50.00	50.00	50.00	45.00	45.00
Transport to.....	59.38	83%		50.00	50.00	50.00	50.00	50.00
Water Requirements	0.00	-		0.00	0.00	0.00	0.00	0.00

Sheet 2: Unit price– extracting the prices from the Data sheet to facilitate their utilization in other sheet of the file.

Unit Prices at present		
Harvest 1	18.81	7%
Harvest 2	0.00	-
Crop produce 2	0.00	-
TOTAL GROSS OUTPUT	0.00	-
Seed/Seedling	15.84	29%
Manure m3	394.06	78%
Chemical fertilizers:	0.00	-
Nitrogen	7.72	27%
Phosphate	6.22	70%
Potash	4.28	133%
Other (liquid)	0.00	-
Chemicals:	0.00	-
Pesticides	659.38	99%
Herbicides	15.00	215%
Fungicides	381.25	144%
Machinery:	0.00	-
Ploughing	157.14	87%
Levelling	66.25	265%
Planting	0.00	-
Fertilizing	0.00	-
Other	31.25	273%
Harvesting	0.00	-
Hired labor:	0.00	-
Land preparation	107.24	124%
Levelling	31.77	155%
Planting	91.20	95%
Fertilization	37.06	45%
Chemicals	18.56	131%
Irrigation	6.25	273%

Sheet 3 to 6: Sheet used for intermediate extraction of quantity and cost at different stage of the orchard development (Establishment, pre-production, early production and full production stage)

		Type of Produc	Specify here	
Year beginning of period	1			
Year end of period	1			
	Quantity		**Value**	
Harvest 1	0 -		0.00 -	
Harvest 2	0 -		0.00 -	
Crop produce 2	0 -		0.00 -	
TOTAL GROSS OUTPUT	0 -		0.00 -	
Seed/Seedling	17.8125	42%	296.59	60%
Manure	0.241625	131%	117.54	116%
Chemical fertilizers:	0 -		18.12	192%
Nitrogen	1.74375	157%	14.53	158%
Phosphate	0 -		0.00 -	
Potash	0.3125	400%	3.59	400%
Other (liquid)	0 -		0.00 -	
Chemicals:	0 -		0.00 -	
Pesticides	0 -		0.00 -	
Herbicides	0 -		0.00 -	
Fungicides	0 -		0.00 -	
Machinery:	0 -		151.48	152%
Ploughing	0.224519231	227%	59.73	220%
Levelling	0.4	183%	91.75	237%
Planting	0 -		0.00 -	
Fertilizing	0 -		0.00 -	
Other	0 -		0.00 -	
Harvesting	0 -		0.00 -	
Hired labor:	28.62431319	347%	1 660.26	375%
Land preparation	45.80	373%	2 645.60	391%
Levelling	2.22	239%	44.43	239%
Planting	2.57	186%	104.08	184%
Fertilization	0.34 -		19.54 -	
Chemicals	0.00 -		0.00 -	
Irrigation	0.00 -		0.00 -	
Cultivating/weeding	0.00 -		0.00 -	
Harvesting	0.00 -		0.00 -	
Pruning	0.00 -		0.00 -	
Post-harvesting	0.00 -		0.00 -	
Animal Draft	0.3125	400%	27.19	400%
Packing materials	0 -		0.00 -	
Transport to.....	0 -		0.00 -	
Water Requirements	0 -		0.00 -	
Irrigation 1	0 -		0.00 -	
Irrigation 2	0 -		0.00 -	
Irrigation 3	0 -		0.00 -	
Other	0 -		0.00 -	
Other	0 -		0.00 -	
Other	0 -		0.00 -	

Sheet 7: Summary budget fixed cost. Sheet used to compute establishment cost and derive the decomposition coefficient to be inputted in the fixed cost budget block of the Farm budget in the PAM.

	Yearly value			Total period value				Coefficient				Amount			
	Establishment year	Before production period	Early production period	Establishment year	Before production period	Early production period	Total	LNQ	LQ	K	TI	LNQ	LQ	K	TI
umber of year for each period				1	6	3									
Harvest 1	0	0	-4 546	0	0	-13 639	-13 639								
Harvest 2	0	0	0	0	0	0	0								
Crop produce 2	0	0	0	0	0	0	0								
				0	0	0	0								
Seed/Seedling	297	0	0	297	0	0	297	0.05	0.05	0.1	0.80	15	15	30	237
Manure	118	117	251	118	701	752	1 571	0.05	0.05	0.1	0.80	79	79	157	1257
Chemical fertilizers:	18	124	300	18	744	899									
Nitrogen	15	95	177	15	569	531	1 115	0.05	0.05	0.1	0.80	56	56	111	892
Phosphate	0	24	101	0	145	304	450	0.05	0.05	0.1	0.80	22	22	45	360
Potash	4	5	21	4	30	63	97	0.05	0.05	0.1	0.80	5	5	10	78
Other (liquid)	0	0	0	0	0	0	0	0.05	0.05	0.1	0.80	0	0	0	0
Chemicals:	0	0	240	0	0	720									
Pesticides	0	0	204	0	0	613	613	0.05	0.05	0.1	0.80	31	31	61	490
Herbicides	0	0	7	0	0	22	22	0.05	0.05	0.1	0.80	1	1	2	18
Fungicides	0	0	28	0	0	85	85	0.05	0.05	0.1	0.80	4	4	8	68
Machinery:	151	298	352	151	1 788	1 055									
Ploughing	60	298	345	60	1 788	1 036	2 883	0.51	0.04	0.14	0.31	1470	115	404	894
Levelling	92	0	0	92	0	0	92	0.51	0.04	0.14	0.31	47	4	13	28
Planting	0	0	0	0	0	0	0	0.51	0.04	0.14	0.31	0	0	0	0
Fertilizing	0	0	0	0	0	0	0	0.51	0.04	0.14	0.31	0	0	0	0
Other	0	0	6	0	0	19	19	0.51	0.04	0.14	0.31	10	1	3	6
Harvesting	0	0	0	0	0	0	0	0.51	0.04	0.14	0.31	0	0	0	0
Hired labor:				0	0	0									
Land preparation	2 646	0	0	2 646	0	0	2 646	1	0	0	0.00	2646	0	0	0
Levelling	44	297	119	44	1 782	357	2 183	1	0	0	0.00	2183	0	0	0
Planting	104	0	0	104	0	0	104	1	0	0	0.00	104	0	0	0
Fertilization	20	45	69	20	268	207	494	1	0	0	0.00	494	0	0	0
Chemicals	0	2	13	0	11	38	49	1	0	0	0.00	49	0	0	0
Irrigation	0	0	0	0	0	0	0	1	0	0	0.00	0	0	0	0
Cultivating/weeding	0	11	21	0	67	64	131	1	0	0	0.00	131	0	0	0
Harvesting	0	0	585	0	0	1 756	1 756	1	0	0	0.00	1756	0	0	0
Pruning	0	92	422	0	551	1 265	1 816	1	0	0	0.00	1816	0	0	0
Post-harvesting	0	0	0	0	0	0	0	1	0	0	0.00	0	0	0	0
Animal Draft	27	116	128	27	694	385	1 106	0.3	0	0.5	0.20	332	0	553	221
Packing materials	0	0	126	0	0	377	377	0.05	0.05	0.05	0.85	19	19	19	321
Transport to.....	0	0	126	0	0	377	377	0.51	0.04	0.14	0.31	192	15	53	117
Water Requirements	0	0	0	0	0	0	0								
Irrigation 1	0	0	0	0	0	0	0					0	0	0	0
Irrigation 2	0	0	0	0	0	0	0					0	0	0	0
Irrigation 3	0	0	0	0	0	0	0					0	0	0	0
Other	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0	0	0	0
Other	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0	0	0	0
Other	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0	0	0	0
							18 283	0.627	0.020	0.080	0 273	11461	366	1469	4986
							4 644								
Total of all costs	**3 594**	**1 523**	**-904**												
	3 594	9 138	-2 713	10 019											

46 439 per hecatare

value to be reported as initial value of the investment

LNQ	LQ	K	TI	
0.627	0.020	0.080	0.273	1.000

Coefficient to be reported for the decomposition of the fixed cost

Sheet 8: Summary budget variable cost. Combining, sorting and computing the data on a hectare basis in a format directly transferable into the PAM spreadsheet.

		Per hectare		
Item	Unit	Price	Quantity	Total
Direct labor				
Land preparation	hours	0.0	0	0
Levelling	hours	118.7	11	1 327
Planting	hours	0.0	0	0
Fertilization	hours	50.0	20	985
Chemicals	hours	51.3	3	149
Irrigation	hours	0.0	0	0
Cultivating/weeding	hours	41.6	4	182
Harvesting	hours	31.6	966	30 523
Pruning	hours	63.2	121	7 673
Post-harvesting	hours	0.0	0	0
Intermediate input				
Seed/Seedling	kg	0.0	0	0
Manure	kg	580.6	7	3 936
Chemical fertilizers:				
Nitrogen	kg	8.1	436	3 550
Phosphate	kg	8.9	207	1 841
Potash	kg	11.6	27	308
Other (liquid)	kg	0.0	0	0
Chemicals:				
Pesticides	kg	1 114.2	3	3 445
Herbicides	kg	0.0	1	0
Fungicides	kg	0.0	0	0
Machinery:				
Ploughing	hours	220.6	17	3 737
Levelling	hours	0.0	0	0
Planting	hours	0.0	0	0
Fertilizing	hours	0.0	0	0
Other	hours	0.0	0	0
Harvesting	hours	0.0	0	0
Animal Draft	?	41.7	427	17 830
Packing materials	unit	0.0	0	0
Transport to.....	kg	118.7	11	1 327
Water Requirements				
Irrigation 1	cm	50.0	20	985
Irrigation 2	cm	51.3	3	149
Irrigation 3	cm	0.0	0	0
Other	unit	41.6	4	182
Other	unit	31.6	966	30 523
Other	unit	63.2	121	7 673
Harvest 1	kg	18.6	7 196	71 958
Harvest 2	kg	0.0	0	0

Appendix D. Spreadsheet format for post-farm budget data preliminary analysis

Computation — Origine of info

Type of operator: exported orange

Raw material

Name	Average price	price range	
orange navel			quest 2

Main output

	Output name	Amount obtained in kg from 1 ton of raw material			Quantity per t of main output	Average price per t	Price range per t	
main output ->		kg			1000			quest 5
		kg			#DIV/0!			quest 5
		kg			#DIV/0!			quest 5
		kg			#DIV/0!			quest 5
	Based on	0	kg of	orange navel	#DIV/0!	kg of	orange navel	control

Capacity:

Throughput

Amount	Unit	Time ref	Product name	
			orange navel	
#DIV/0!			0	computed

Time refereence is often hour, but not always

Declared annual capacity

Amount	Unit	Time ref	Product	
			0	quest 2

Calculated annual capacity

	Peak	Normal	Low
month			
day			
hours per day			
numb of processing line			

Total number of:		
Month	0	quest 6
Week	0	quest 6
Days	0	quest 6
Hours	0	quest 6

	Peak	normal	low	Total			
in quantity term	#DIV/0!	#DIV/0!		#DIV/0!	T of	0	computed

we assume that one month is 30 days out of which 6/7 is workday

Selected annual capacity by comparing declare and computed

We take as a reference the production of: [ ] **T of** **0 year**

to be discussed and subject to sensitivity analysis

Fixed costs

	Value				Life time	% used for main line	Annual production of main output	Per ton of main output	
	Nominal	Discount rate	Year	Actual					
				0			#DIV/0!	0.0	
				0			#DIV/0!	0.0	quest 14
				0			#DIV/0!	0.0	quest 14
				0			#DIV/0!	0.0	quest 14
				0			#DIV/0!	0.0	quest 14
				0			#DIV/0!	0.0	quest 14
				0			#DIV/0!	0.0	quest 15
Total								0.0	

Reminder
Technical conversion ratio — Number of ton of main output for one ton of raw material: #DIV/0!

Only inform the relevant throughputs in accordance with what the processor interviewed referred to

Throughput	per hour	per day	per week	per month	per year
ton of main output	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Variable costs

	Value per							Value per ton of main output
	hour	day	week	month	year	ton of raw material	ton of main output	
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
								#DIV/0!
Total								#DIV/0!

Raw material value

Quality of raw material	% of total purchase	Average unit price per ton	Contribution to wheighted proce
			0
			0
			0
			0
Total	0		

computed

Wheighted average price per ton of raw 0

Wheighted avearge price per ton of main output #DIV/0!

Total costs

Per ton of main output
#DIV/0!

Outputs value

	Type of output	Value per ton of main output	Per ton of main output	
main output ->	0	0	0.0	computed
	0	#DIV/0!	#DIV/0!	computed
	0	#DIV/0!	#DIV/0!	computed
	0	0		

Total income #DIV/0!

Profit

Per ton of main output	
#DIV/0!	computed

Taxe

Profit after taxes

Appendix E.Example of the Excel PAM spreadsheet format.

Policy Analysis Matrix for representative system

MAIN FINAL OUTPUT: lint cotton
SYSTEM: network irrigated cotton large ginery
REFERENCE YEAR: 2001-2002
VERSION: July 2004

Irrigation	Total cost	Ratio to nominal	Applied ratio	Social in PAM
	9000	2.571	2.6	9378

1	Wages Discrepancies MO-NQ (Unskilled labor): [Wage at social price/wage at market price]
25.0%	Taxes MO-Q (on skilled labor) [% employees contribution and other taxes imposed on workers in the formal sector]
0%	Taxes on K (capital): [% subsidies = -%, % taxe = +%]
	Taxes sur IE (les tradables inputs): [st import]
	ad valorem: [% on value CIF]
	fixed: [amount by unit of product]
1	Discrepancy Exchange rate: [equilibrium exchange rate (reference rate)/nominal exchange rate (market exchange rate)]

BUDGET #1 - FARM LEVEL

FARM MAIN OUTPUT: raw cotton
LENGTH OF PRODUCTION CYCLE: 8months
Budget #1 computed in: sp by Ha of raw cotton
CURRENCY: sp
PRODUCTION UNIT: ton
AREA MEASUREMENT UNIT: Ha
PLOT SIZE: 1

B1. FIXED INPUT	Life Time	Used up Value	Capital Cost Market	Capital Cost Social	Initial Cost	Salvage Value	Capital Recovery rate	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
		1	5.5%	3.0%	0	0	0.000	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
		1	0.0%	0.0%	0	0	0.000	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
TOTAL								0	0	0	0	0	0	0	0	0	0

Wages Discrepancies L-NQ	Taxes on L -Q	K	TI ad valorem	TI fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

Price Before Tax	Salvage Value Before Tax	Coef. Capital Recovery rate	Initial disaggregation of equipment L-NQ	L-Q	K	TI	Control TOTAL
0	0	0.000	0.00	0.00	0.00	0.00	0.00
0	0	0.000			1.00		1.00

social price (before depreciation and import taxes)

BUDGET #1 - FARM LEVEL B1. DIRECT LABOR	Budget information Unit	Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
Land preparation	hours	32	5	1	156	1.00	1.00				156	1.00	0.00			156
Levelling	hours	36	0	1	8	1.00	1.00				8	1.00	0.00			8
Other	hours		0	1	0	1.00	1.00				0	1.00	0.00			0
Sowing & planting	hours	17	50	1	862	0.87	1.00				862	1.00	0.00			862
Fertilization	hours	25	11	1	266	0.87	1.00				266	1.00	0.00			266
Chemicals	hours	45	1	1	42	0.62	1.00				42	1.00	0.00			42
Irrigation	hours	24	122	1	2935	0.75	1.00				2935	1.00	0.00			2935
Weeding	hours	21	230	1	4902	0.81	1.00				4902	1.00	0.00			4902
Harvesting	hours	25	597	1	14810	0.00	1.00				14810	1.00	0.00			14810
Post-harvesting	hours	91	4	1	332	0.00	1.00				332	1.00	0.00			332
		0	0	0	0	0.00	1.00				0	1.00	0.00			0
TOTAL				1019.3308			24313	0	0	0	24313	24313	0	0	0	24313

Wages Discrepancies L-NQ	Taxes on L -Q	K	TI ad valorem	TI fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

BUDGET #1 - FARM LEVEL B1. INTERMEDIATE INPUT	Budget information Unit	Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
Seed/Seeding	kg	12	154.5	1	1810	0.66	0.05	0.05	0.10	0.80	1810	0.05	0.04	0.10	0.79	1768
Manure	kg	660	0.2	1	110	0.66	0.07	0.05	0.17	0.72	111	0.07	0.04	0.17	0.71	109
Chemical fertilizers:	kg		0.0	1	0	0.66	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
Nitrogen	kg	12	584.9	1	6857	0.66	0.05	0.05	0.10	0.80	6857	0.05	0.04	0.10	0.79	6836
Phosphate	kg	9	206.2	1	1864	0.66	0.05	0.05	0.10	0.80	1864	0.05	0.04	0.10	0.79	1820
Potash	kg	12	6.8	1	83	0.66	0.05	0.05	0.10	0.80	83	0.05	0.04	0.10	0.79	81
Other (liquid)	kg	12	20.2	1	250	0.66	0.05	0.05	0.10	0.80	250	0.05	0.04	0.10	0.79	244
Chemicals:	kg		0.0	1	0	0.50	0.05	0.05	0.10	0.80	0	0.05	0.04	0.10	0.00	0
Pesticides	kg	681	0.8	1	525	0.50	0.05	0.05	0.10	0.80	525	0.05	0.04	0.10	0.79	512
Herbicides	kg	929	1.0	1	930	0.50	0.05	0.05	0.10	0.80	930	0.05	0.04	0.10	0.79	906
Fungicides	kg	85	0.9	1	77	1.00	0.05	0.05	0.10	0.80	77	0.05	0.04	0.10	0.79	75
Machinery:				1	0	1.00				0.00	0	0.00	0.00	0.00	0.00	0
Tillage	Hours	274	8.08	1	2215	1.00	0.33	0.05	0.17	0.45	2215	0.33	0.04	0.17	0.55	2411
Levelling	Hours	290	3.84	1	1075	1.00	0.33	0.05	0.17	0.45	1075	0.33	0.04	0.17	0.55	1170
Other	Hours	312	0.66	1	207	1.00	0.33	0.05	0.17	0.45	207	0.33	0.04	0.17	0.55	225
Sowing & planting	Hours	225	0.62	1	140	0.66	0.33	0.05	0.17	0.45	140	0.33	0.04	0.17	0.55	152
Fertilizer appl. 1	Hours	248	31.33	1	7782	0.66	0.33	0.05	0.17	0.45	7782	0.33	0.04	0.17	0.55	8471
Fertilizer appl. 2	Hours			1	0	0.66	0.33	0.05	0.17	0.45	0	0.33	0.04	0.17	0.00	0
Fertilizer appl. 3	Hours			1	0	0.66	0.33	0.05	0.17	0.45	0	0.33	0.04	0.17	0.00	0
Manure application	Hours	500	0.30	1	152	0.66	0.33	0.05	0.17	0.45	152	0.33	0.04	0.17	0.55	166
Herbicide application	Hours	63	6.77	1	426	0.50	0.33	0.05	0.17	0.45	426	0.33	0.04	0.17	0.55	474
Insecticide application	Hours	187	0.36	1	68	0.50	0.33	0.05	0.17	0.45	68	0.33	0.04	0.17	0.55	74
Harvesting	Hours	1.250	0.07	1	89	0.00	0.33	0.05	0.17	0.45	89	0.33	0.04	0.17	0.55	97
Packing and loading	Hours	375	0.12	1	45	0.00	0.33	0.05	0.17	0.45	45	0.33	0.04	0.17	0.55	49
Transport costs	Hours	730	15.00	1	10950	0.00	0.33	0.05	0.17	0.45	10950	0.33	0.04	0.17	0.55	11919
Animal Draft	Day	78	0.58	1	46	1.00	0.40	0.00	0.30	0.30	46	0.40	0.00	0.30	0.29	45
Packing	SP	84	24.23	1	2040	0.00	0.05	0.05	0.05	0.85	2040	0.05	0.04	0.05	0.89	1899
Transport	SP	575	8.81	1	5064	0.00	0.33	0.05	0.17	0.45	5064	0.33	0.04	0.17	0.55	5512
Water Requirements				1	0	1.00					0	0.00	0.00	0.00	0.00	0
Irrigation 1	fc/hectar	3.500	1	1	3500	0.33	0.22	0.05	0.09	0.64	3500	0.57	0.10	0.23	1.77	9376
Water value	SP/cm	3	11.500.00	1	34500	0.33	0.00	0.00	0.00	0.00	0	0.00	0.00	1.00	0.00	34500
Land rent	SP/HA	7.577	1.00	1	7577	1.00	0.00	0.00	1.00	0.00	7577	0.00	0.00	1.44	0.00	10936
Other1		121	1.53	1	184	1.00	0.30	0.20	0.20	0.30	184	0.30	0.16	0.20	0.29	176
Other2		6	0.30	1	2	1.00	0.30	0.20	0.20	0.30	2	0.30	0.16	0.20	0.29	2
		0	0	0	0	1.00				0.00	0	0.00	0.00	0.00	0.00	0
Interest on Revolving Fund	at market	5.5%	33432	0.67	1226				1.00		1226			0.00		0
	at social	3.0%	50721	0.67	1014				0.00		0			1.00		1014
TOTAL		rate	amount	year			10687	2351	15327	26740	55303	12119	2091	53478	32985	100673

Wages Discrepancies L-NQ	Taxes on L -Q	K	TI ad valorem	TI fixed	Exch. Rate
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	23.5%	0	1
1	26%	0%	18.0%	0	1
1	26%	0%	0.0%	0	1
1	26%	0%	-6.0%	0	1
1	26%	0%	0.0%	0	1
1	26%	0%	0.0%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
100673					

BUDGET #1 - FARM LEVEL B1. REVENUES	Unit	Price	Quantity	TOTAL Market	TOTAL Social
raw cotton	ton	13210	3.8	50198	72694
by product	kg	80	3.9	313	313
			0	0	0
TOTAL REVENUES				50511	72907
TOTAL COST				79616	124986
PROFIT (BEFORE TAXES)				-29105	-52079
B1. DIRECT TAXES			0	0	
			0	0	
TOTAL				0	
PROFIT (AFTER TAXES)				-29105	

BUDGET #2 - POST-HARVEST ACTIVITY FARM TO PROCESSOR

SYSTEM network irrigated cotton large ginery

MAIN OUTPUT raw cotton
LENGTH OF PRODUCTION CYCLE:
Budget #2 computed in: sp by ton of raw cotton

CURRENCY sp
PRODUCTION UNIT: ton

CONVERSION RATE
MAIN OUTPUT 1.000
BY-PRODUCT 1.000
Losses (%) 0.0%

B2. FIXED INPUT	Life-Time	Used up Value	Capital Cost Market	Capital Cost Social	Initial Cost	Salvage Value	Capital Recovery rate	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
	0	1	5.5%	3.0%	0	0	0.000	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
	0	1	5.5%	3.0%	0	0	0.000	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
TOTALS								0	0	0	0	0	0	0	0	0	0

Wages Discrepancies L-NQ	Taxes on L -Q	K	-- TI -- ad valorem	fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

Price Before Tax	Salvage Value Before Tax	Coef.Capital Recovery rate	Initial disaggregation of equipment L NQ	L Q	K	TI	Control TOTAL
0	0	0.000			1.00		1.00
0	0	0.000			1.00		1.00

social price (before depreciation and import taxes)

BUDGET #2 - POST-HARVEST ACTIVITY FARM TO PROCESSOR

B2. DIRECT LABOR	Unit	Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
		0	0	0	0	1.00	1.00				0	1.00	0.00			0
		0	0	0	0	1.00	1.00				0	1.00	0.00			0
TOTAL							0	0	0	0	0	0	0	0	0	0

Wages Discrepancies L-NQ	Taxes on L -Q	K	-- TI -- ad valorem	fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

BUDGET #2 - POST-HARVEST ACTIVITY FARM TO PROCESSOR

B2. INTERMEDIATE INPUT	Unit	Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
		0	0	0	0	1.00				1.00	0	0.00	0.00	0.00	0.00	0
		0	0	0	0	1.00				1.00	0	0.00	0.00	0.00	0.00	0
		0	0	0	0	1.00				1.00	0	0.00	0.00	0.00	0.00	0
Interest: on Revolving Fund	*at market*	5.5%	13210	0	0				1.00		0			0.00		0
	at social	3.0%	19104	0	0				0.00		0			1.00		0
TOTAL	*rate*		*amount*	*year*			0	0	0	0	0	0	0	0	0	0

Wages Discrepancies L-NQ	Taxes on L -Q	K	-- TI -- ad valorem	fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

BUDGET #2 - POST-HARVEST ACTIVITY FARM TO PROCESSOR

B2. COMMODITY IN PROCESS	Unité	Prix	Quant	TOTAL	Revolving Fund	TOTAL Market	TOTAL Social
raw cotton	ton	13210	1	13210	1.00	13210	19104
					0.00		
TOTAL						13210	19104

BUDGET #2 - POST-HARVEST ACTIVITY FARM TO PROCESSOR

B2. REVENUES	Unit	Price	Quantity	TOTAL	TOTAL Market	TOTAL Social
raw cotton	ton	13210	1	13210	13210	19104
		0	1	0	0	0
		0	0	0	0	0
TOTAL REVENUES					13210	19104
TOTAL COST					13210	19104
PROFIT (BEFORE TAXES)					0	0
B2. DIRECT TAXES				0	0	
				0	0	
TOTAL					0	
PROFIT (AFTER TAXES)					0	

BUDGET #3 - POST-HARVEST ACTIVITY PROCESSING

SYSTEM network irrigated cotton large ginery

CONVERSION RATE

MAIN OUTPUT lint cotton — CURRENCY sp — MAIN OUTPUT 0.32 — CAPACITY 56160

LENGTH OF PRODUCTION CYCLE: 12 minutes — PRODUCTION UNIT: ton — BY-PRODUCT 0.630 — CAPACITY UTILISATION 100%

Budget #3 computed in: sp by ton of lint cotton — Losses (%) 0.0%

B3. FIXED INPUT	Life-Time	Used up Value	Capital Cost Market	Capital Cost Social	Initial Cost	Salvage Value	Capital Recovery rate	Disaggregation at market price L NQ	L Q	K	TI	TOTAL Market Price	Disaggregation at social price L NQ	L Q	K	TI	TOTAL Social Price
BUILDING	50	1	5.5%	3.0%	1998	0	0.059	0.10	0.03	0.79	0.08	118	0.15	0.04	0.64	0.15	59
MACHINE	20	1	5.5%	3.0%	557	0	0.084	0.03	0.03	0.47	0.47	47	0.04	0.03	0.33	0.60	37
GENERATOR	20	1	5.5%	3.0%	891	0	0.084	0.03	0.03	0.47	0.47	75	0.04	0.03	0.33	0.60	58
Cars normal	15	1	5.5%	3.0%	55	0	0.100	0.03	0.03	1.07	0.47	5	0.04	0.03	1.00	0.64	7
Cars pick up	15	1	5.5%	3.0%	91	0	0.100	0.03	0.03	1.07	0.47	9	0.04	0.03	1.00	0.64	11
Cars large pick up	15	1	5.5%	3.0%	95	0	0.100	0.03	0.03	1.07	0.47	10	0.04	0.03	1.00	0.64	12
Tractors	25	1	5.5%	3.0%	257	0	0.075	0.03	0.03	1.01	0.42	19	0.03	0.03	1.00	0.56	23
Lifter	25	1	5.5%	3.0%	118	0	0.075	0.03	0.03	1.04	0.39	9	0.03	0.03	1.00	0.56	10
	0	1	0.0%	0.0%	0	0	0.000	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
TOTALS								17	9	204	89	291	15	7	133	103	217

Wages Discrepancies L-NQ	Taxes on L -Q	K	TI ad valorem	TI fixed	Exch. Rate
1	26%	0%	30.0%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	14.5%	0	1
1	26%	0%	14.5%	0	1
1	26%	0%	14.5%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	10.0%	0	1
1	26%	0%	0%	0	1

Price Before Tax	Salvage Value Before Tax	Coef.Capital Recovery rate	Initial disaggregation of equipment L NQ	L Q	K	TI	Control TOTAL
1535	0	0.039	0.30	0.10	0.30	0.30	1.00
548	0	0.057	0.05	0.05	0.10	0.80	1.00
876	0	0.057	0.05	0.05	0.10	0.80	1.00
48	0	0.084	0.05	0.05	1.00	0.80	1.90
79	0	0.084	0.05	0.05	1.00	0.80	1.90
63	0	0.084	0.05	0.05	1.00	0.80	1.90
252	0	0.057	0.05	0.05	1.00	0.80	1.90
107	0	0.057	0.05	0.05	1.00	0.80	1.90
0	0	0.000			0.00		0.00

social price (before depreciation and import taxes)

BUDGET #3 - POST-HARVEST ACTIVITY PROCESSING

B3. DIRECT LABOR	Unit	Budget information Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
permanent labour	sp/ton	145.3875	1	1	145	1.00		1.00			145	0.00	0.79			116
casual labour	sp/ton	780.9	1	1	781	1.00	1.00				781	1.00	0.00			781
buildings maintenance	sp/ton	1.125	1	1	1	0.50		1.00			1	0.00	0.79	0.00	0.00	1
machines maintenance	sp/ton	0.5	1	1	1	0.50		1.00			1	0.00	0.79	0.00	0.00	0
furniture maintenance	sp/ton	0.125	1	1	0	0.50		1.00			0	0.00	0.79	0.00	0.00	0
transportation maintenance	sp/ton	0.25	1	1	0	0.50		1.00			0	0.00	0.79	0.00	0.00	0
bags maintenance	sp/ton	52.75	1	1	53	0.50		1.00			53	0.00	0.79	0.00	0.00	42
		0	0	1	0	1.00		1.00			0	0.00	0.79			0
TOTALS							781	200	0	0	981	781	159	0	0	940

Wages Discrepancies L-NQ	Taxes on L -Q	K	TI ad valorem	TI fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

BUDGET #3 - POST-HARVEST ACTIVITY PROCESSING

B3. INTERMEDIATE INPUT	Unit	Budget information Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
packing and wrapping materials for seeds	sp/ton	137.6	1	1	138	0.50	0.05	0.05	0.10	0.30	69	0.05	0.04	0.10	0.24	60
energy	sp/ton	6.4	1	1	6	0.50	0.01	0.03	0.04	0.92	6	0.01	0.02	0.04	1.06	7
fuel	sp/ton	375.3	1	1	375	0.50	0.05	0.10	0.10	0.75	375	0.05	0.08	0.10	1.25	555
water	sp/ton	12	1	1	12	0.50	0.10	0.10	0.40	0.40	12	0.10	0.08	0.40	0.40	12
spare parts	sp/ton	210.1	1	1	210	0.50	0.05	0.05	0.10	0.80	210	0.05	0.04	0.10	0.67	180
Stationery materials	sp/ton	16.5	1	1	17	0.50	0.05	0.05	0.10	0.80	17	0.05	0.04	0.10	0.79	16
materials transportation	sp/ton	0.1	1	1	0	0.50	0.05	0.05	0.10	0.80	0	0.05	0.04	0.10	0.79	0
Different materials	sp/ton	0.2	1	1	0	0.50	0.05	0.05	0.10	0.80	0	0.05	0.04	0.10	0.79	0
Transportation of labors	sp/ton	21.7	1	1	22	0.50	0.05	0.05	0.10	0.80	22	0.05	0.04	0.10	0.98	25
reimbursement of transportation costs to farmers	sp/ton	0	1	1	0	0.50	0.05	0.05	0.10	0.80	0	0.05	0.04	0.10	0.00	0
		0	0	1	0	1.00				1.00	0	0.00	0.00	0.00	0.00	0
Interest on Revolving Fund	*at market*	5.5%	42590	0.25	586				1.00		586			0.00		0
	at social	3.0%	61045	0.25	458				0.00		0			1.00		458
TOTAL		*rate*	*amount*	*year*			39	58	667	532	1297	39	46	539	689	1313

Wages Discrepancies L-NQ	Taxes on L -Q	K	TI ad valorem	TI fixed	Exch. Rate
1	26%	0%	23.5%	0	1
1	26%	0%	-13.0%	0	1
1	26%	0%	-40.0%	0	1
1	26%	0%	0.0%	0	1
1	26%	0%	20.0%	0	1
1	26%	0%	1.0%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	1.7%	0	1
1	26%	0%	-19.0%	0	1
1	26%	0%	-18.0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

BUDGET #3 - POST-HARVEST ACTIVITY PROCESSING

B2. COMMODITY IN PROCESS	Unit	Price	Quant	TOTAL		TOTAL Market	TOTAL Social
raw cotton at ginnery gate	ton	13210	3.125	41281	1.00	41281	59699
					0.00		
TOTAL				41281		41281	59699

BUDGET #3 - POST-HARVEST ACTIVITY PROCESSING

B3. REVENUES	Unit	Price	Quant	TOTAL	TOTAL Market	TOTAL Social
lint cotton	ton	54075	1	54075	54075	48196
seed	ton	6350	1.96875	12502	12502	12502
waste1	ton	13630	0.1	1472	1472	1472
		0	0	0	0	0
TOTAL REVENUES					68049	62170
TOTAL COST					43850	62170
PROFIT (BEFORE TAXES)					24199	0
B3. DIRECT TAXES				0	0	
				0	0	
TOTAL					0	
PROFIT (AFTER TAXES)					24199	

Disaggregation at market price L-NQ	L-Q	K	TI
837	268	870	621

Disaggregation at social price L-NQ	L-Q	K	TI
835	212	672	792

BUDGET #4 - POST-HARVEST ACTIVITY PROCESSING TO WHOLESALE

SYSTEM network irrigated cotton large ginery

MAIN OUTPUT lint cotton | CURRENCY sp | CONVERSION RATE MAIN OUTPUT 1.000

LENGTH OF PRODUCTION CYCLE: | PRODUCTION UNIT: ton | BY-PRODUCT 1.000

Budget #3 computed in: sp by ton of lint cotton | Losses (%) 0.0%

B4. FIXED INPUT	Life-Time	Used up Value	Capital Cost Market	Capital Cost Social	Initial Cost	Salvage Value	Capital Recovery rate	Disaggregation at market price L NQ	L Q	K	TI	TOTAL Market Price	Disaggregation at social price L NQ	L Q	K	TI	TOTAL Social Price
	0	1	0.0%	0.0%	0	0	0.000	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
	0	1	0.0%	0.0%	0	0	0.000	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0
TOTALS								0	0	0	0	0	0	0	0	0	0

Wages Discrepancies L-NQ	Taxes on L -Q	K	--- TI --- ad valorem	fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

Price Before Tax	Salvage Value Before Tax	Coef Capital Recovery rate	Initial disaggregation of equipment L NQ	L Q	K	TI	Control TOTAL
0	0	0.000			1.00		1.00
0	0	0.000			1.00		1.00

social price (before depreciation and import taxes)

BUDGET #4 - POST-HARVEST ACTIVITY PROCESSING TO WHOLESALE

---------Budget information ---------

B4. DIRECT LABOR	Unit	Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
		0	0	0	0	1.00	1.00				0	1.00	0.00			0
		0	0	0	0	0.00	1.00				0	1.00	0.00			0
TOTALS							0	0	0	0	0	0	0	0	0	0

Wages Discrepancies L-NQ	Taxes on L -Q	K	--- TI --- ad valorem	fixed	Exch. Rate
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

BUDGET #4 - POST-HARVEST ACTIVITY PROCESSING TO WHOLESALE

--------- Budget information ---------

B4. INTERMEDIATE INPUT	Unit	Price	Quantity	Freq	TOTAL	Revolving Fund	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
Transportation from ginnery to harbour	sp/ton	391	1	1	391	1.00	0.05	0.05	0.10	0.80	391	0.05	0.04	0.10	0.98	456
		0	0	0	0	0.00				1.00	0	0.00	0.00	0.00	0.00	0
Interest: on Revolving Fund	*at market*	5.5%	54466	0	0				1.00		0			0.00		0
	at social	3.0%	48652	0	0				0.00		0			1.00		0
TOTAL	*rate*		*amount*	*year*			20	20	39	313	391	20	16	39	381	456

Wages Discrepancies L-NQ	Taxes on L -Q	K	--- TI --- ad valorem	fixed	Exch. Rate
1	26%	0%	-18%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1
1	26%	0%	0%	0	1

BUDGET #4 - POST-HARVEST ACTIVITY PROCESSING TO WHOLESALE

B4. COMMODITY IN PROCESS	Unit	Price	Quant	TOTAL		TOTAL Market	TOTAL Social
lint cotton	ton	54075	1	54075	1.00	54075	48196
					0.00		
TOTAL						54075	48196

BUDGET #4 - POST-HARVEST ACTIVITY PROCESSING TO WHOLESALE

B4. REVENUES	Unit	Price	Quant	TOTAL	TOTAL Market	TOTAL Social	
lint cotton	ton	54075	1	54075	54075	48652	48652 <====(parity price of main final output)
		0	0	0	0	0	
TOTAL REVENUES					54075	48652	
TOTAL COST					54466	48652	
PROFIT (BEFORE TAXES)					-391	0	
B4.DIRECT TAXES				0	0		
				0	0		
TOTAL					0		
PROFIT (AFTER TAXES)					-391		

TOTAL	Disaggregation at market price L-NQ	L-Q	K	TI	TOTAL Market Price	Disaggregation at social price L-NQ	L-Q	K	TI	TOTAL Social Price
	20	20	39	313	54466	20	16	39	381	48652
					-391					0

TABLE 1. BUDGET SUMMARY **network irrigated cotton large ginery**

July 2004

UNIT Thaousands sp by Ha

	---VALUES AT MARKET PRICE---						---- VALUE SOCIAL PRICE ----						---DIVERGENCES---					
	FARM	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System	FARM	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System	FERME	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System
1.TOTAL REVENUES	106	50	83	66	83	138	73	73	76	59	76	76	33	-22	7	7	7	62
Main final ouput	50	50	66	66	66	66	73	73	59	59	59	59	-22	-22	7	7	7	7
By-products	0	0	17	0	17	17	0	0	17	0	17	17	0	0	0	0	0	0
2 TOTAL COST	80	50	53	66	54	83	125	73	76	59	76	129	-45	-22	-22	7	-22	-45
A Commodity in process		50	50	66	50			73	73	59	73			-22	-22	7	-22	0
(tax+,subsidy-)	-55	0	0	0	0	-55												
B Tradables	27	0	1	0	1	28	33	0	1	0	1	34	-6	0	0	0	0	-7
C Domestic Factors	53	0	2	0	2	55	92	0	2	0	2	94	-39	0	0	0	0	-39
Unskilled Labor	35	0	1	0	1	36	36	0	1	0	1	37	-1	0	0	0	0	-1
Skilled Labor	2	0	0	0	0	3	2	0	0	0	0	2	0	0	0	0	0	0
Capital	15	0	1	0	1	16	53	0	1	0	1	54	-38	0	0	0	0	-38
PROFIT BEFORE-TAXES:	26	0	29	0	29	55	-52	0	0	0	0	-52	78	0	29	0	29	107
Direct taxes:	0	0	0	0	0	0												
PROFIT AFTER-TAXES:	-29	0	29	0	29	55							(+=tax,-=subsidy)					

UNIT sp by ton of lint cotton

	---VALUES AT MARKET PRICE---						---- VALUE SOCIAL PRICE ----						---DIVERGENCES---					
	FARM	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System	FARM	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System	FERME	Budget #2	Budget #3	Budget #4	POST FARM	Repre. System
1.TOTAL REVENUES	86851	41281	68049	54075	68049	113619	59957	59699	62170	48652	62626	62883	26895	-18418	5879	5423	5423	50736
Main final ouput	41281	41281	54075	54075	54075	54075	59699	59699	48196	48652	48652	48652	-18418	-18418	5879	5423	5423	5423
By-products	258	0	13974	0	13974	14231	258	0	13974	0	13974	14231	0	0	0	0	0	0
2. TOTAL COST	65474	41281	43850	54466	44269	68462	102785	59699	62170	48652	62666	105752	-37311	-18418	-18320	5814	-18397	-37290
A Commodity in process		41281	41281	54075	41281			59699	59699	48196	59699			-18418	-18418	5879	-18418	0
(tax+,subsidy-)	-45313			0	0	-45313												
B Tradables	21990	0	621	313	934	22924	27126	0	792	381	1174	28299	-5136	0	-171	-69	-240	-5376
C Domestic Factors	43484	0	1975	78	2054	45538	75659	0	1719	74	1794	77453	-32175	0	256	4	260	-31915
Unskilled Labor	28947	0	837	20	857	29804	29960	0	835	20	855	30815	-1013	0	2	0	2	-1011
Skilled Labor	1933	0	268	20	287	2220	1720	0	212	16	228	1948	213	0	55	4	59	272
Capital	12604	0	870	39	910	13514	43979	0	672	39	711	44690	-31375	0	199	0	199	-31176
PROFIT BEFORE-TAXES:	21377	0	24199	-391	23780	45157	-42828	0	0	0	0	-42869	64205	0	24199	-391	23820	88026
Dircet taxes:	0	0	0	0	0	0												
PROFIT AFTER-TAXES:	-23935	0	24199	-391	23808	45157							(positive=tax, negative=subsidy)					

Coefficient Farm /Final Product:	1.216
Coefficient Budget #2 /Final Product:	0.320
Coefficient Post-processing /Final product:	1.000

TABLE 2A: POLICY ANALYSIS INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C]	45 157
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0 502
3. SOCIAL PROFITABILITY	[H = E - F - G]	-42 869
4. DOMESTIC RESOURCE COST	[G / (E - F)]	2 240
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	1 682
6. TRANSFERS	[L = I + J + K]	88 026
7. NOMINAL PROTECTION COEFFICIENT (Including by-product)	[A / E]	1 807
7A. NOMINAL PROTECTION COEFFICIENT (Main final output only)	[A* / E*]	2 043
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - F)]	2 622
9. PROFITABILITY COEFFICIENT	[D / H]	-1 053
10. PRODUCERS SUBSIDY RATIO	[L / E]	1 400
11. EQUIV. PRODUCER SUBSIDY	[L / A]	0 775

TABLE 2B: BREAK EVEN POINT

	At Market price	At Social price
	(% of current value)	
Yield	2 86	6 51
	0 75	*1 71*
FINAL OUTPUT PRICE	8917 90	91520 68372
	0 16	*1 88*
POST HARVEST COSTS	24364 89	-39901 54
	8 16	*-13 45*
DOMESTIC FACTORS COSTS	90694 93	34583 92
	1 99	*0 45*

TABLE 3A: POLICY ANALYSIS MATRIX

network irrigated cotton large ginery — Version July 2004

UNIT: sp par Ha

	REVENUES	COSTS: TRADABLES INPUTS	COSTS: DOMESTIC FACTORS	PROFITS
	A	B	C	D
PRIVATE PRICES	138 160	27 875	55 374	54 911
	E	F G	G	H
SOCIAL PRICES	76 466	34 412	94 182	-52 128
	I	J	K	L
DIVERGENCES	61 694	-6 537	-38 808	107 039

TABLE 3A: POLICY ANALYSIS MATRIX

network irrigated cotton large ginery — Version July 2004

UNIT: sp by ton of lint cotton

	REVENUES	COSTS: TRADABLES INPUTS	COSTS: DOMESTIC FACTORS	PROFITS
	A	B	C	D
PRIVATE PRICES	113 619	22 924	45 538	45 157
	E	F	G	H
SOCIAL PRICES	62 883	28 299	77 453	-42 869
	I	J	K	L
DIVERGENCES	50 736	-5 376	-31 915	88 026

Appendix F. Detailed explanation on the computation of the decomposition coefficients.

Computation of tradable input and capital content in equipment.

Value to be depreciated:	Va
Residual value:	Vr
Interest rate:	i
Life-time:	n
Used up portion:	u
Custom duty ad valorem:	Tv
Fixed custom duty:	Tf
Durable Capital:	DC

Depreciation for one year.

$$AM = \frac{\left(\frac{Va - Tf}{(1+Tv)} - \frac{Vr}{(1+i)^n}\right)}{n} \times u$$

Import tax:

$$TI = \frac{Tf + \left(\frac{(Va - Tf)}{(1+Tv)} \times Tv\right)}{n} \times u$$

Financial capital cost:

CF= CD- AM – TI

Example : Motor cultivator

Purchase Price :	8 000 000
Life-time:	5
Residual value:	800 000
Used up portion:	1
Interest rate:	0.06
ad valorem tax :	0.20
Fixed Taxe:	0

$$\text{Depreciation} = \frac{\frac{(8000000 - 0)}{(1+0.20)} - \frac{800000}{(1+0.06)^5}}{5} \times 1 = 1\ 213\ 772$$

$$\text{Import tax} = \frac{0 + \frac{8000000 - 0}{(1+0.20)} \times 0.20}{5} = 266\ 667$$

Financial Capital Cost : 1 757 254 - 1 213 722 - 266667 = 276815

Breakdown of items in domestic factors and tradable inputs

Working capital:

Labor: 400 000
Fuel and Oil: 2 800 000
Maintenance and miscellaneous: 700 000

		Coefficient			Values		
		Labor	Capital	Tradable inputs	Labor	Capital	Tradable inputs
Fixed Cost							
Amortization	1 213 772			1.00	0	0	1 213 772
Import tax	266 667		1.00		0	266 667	0
Financial capital cost	276 815		1.00		0	276 815	0
Variable Cost							
Labor	400 000	1.00			400 000	0	0
Fuel and oil	2 800 000			1.00	0	0	2 800 000
Maintenance and miscellaneous	700 000	0.40	0.20	0.40	280 000	140 000	280 000
Total	5 657 254	0.12	0.12	0.76	680 000	683 482	4 293 772

Appendix G. Training material.

Session 1

Comparative Advantage Study (CAS): an Introduction

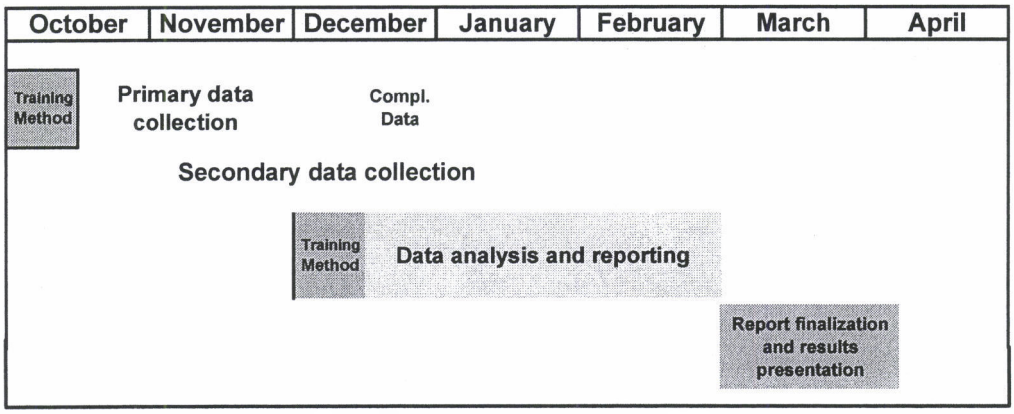
Objective of the CAS

- Assessing the comparative advantages of key commodities produced by the Syrian agro-industries in the perspective of trade liberalization.
- Enhancing the analytical and methodological capacity of the National Agricultural Policy Centre.
- Laying the foundation for a regular monitoring of Syrian agriculture comparative advantage (tool kit).
- Strengthening the quality of the policy dialogue on Syrian Agriculture by supporting the decision- making process.

Study work plan

1. Review, harmonization and adaptation of the methodology
2. Selection of the priority commodities
3. Information collection and update
   - Survey - Primary data collection
   - Update of other source of information - Secondary data.
4. Data analysis and reporting
5. Presentation and discussion of the study results

CAS planning



Organization of the team

Team member	Responsibilities
NAPC DG FAO project coordinator	–Study priorities definition –Overall supervision of the study implementation
International consultants	–Methodological training and backstopping on data collection and analysis –Study report writing –Tool kit development
CAS study team	–Primary data collection –Data analysis –Commodity report preparation
National consultant	–Backstopping in information collection and study implementation

Pre-selected commodities.

Commodity	Type of commodity	Processed product	Institutional setting	Trade	Agent to be surveyed	Main location
Cotton	Industrial	Raw cotton Yarn	Public	Main agricultural export (30%)	Production irrigated Ginnery	Aleppo
Wheat	Food crop	Flour (+ induced effect on bakery performance)	Public and private marginal	Main food crop	Production irrigated production rainfed public mill medium public mill large private miller and trader (need more intensive survey)	Aleppo
Olive	Perennial	Oil	Private	Limited trade Large surplus expected	Producers rainfed Old presses processor hydraulic presses processors continuous system Wholesaler Retailer	Ildeb, Hama, Hom
Tomato	Vegetable	Fresh Concentrate	Private	Potential EU market	Producers green house Producer open field Marketing Processing Exporters	Homs, Tartus, Lattakia, Damascus
Orange	Fruit crop	Fresh Juice	Private	Ban on orange concentrate import Potential Eu market	Production marketing wholesale Fruit juice industry Exporters	Homs, Tartus, Lattakia
Feed/cattle /dairy	Livestock	Milk Beef meat	Private and public	impact of potential trade opening on system performance	Production systems	Hom, Hama, Al Ghab, Damascus

Drop commodities: lentil, potato, pistachio, almond

Methodology review and harmonization

1. **Methodology**
   - Rationale of the PAM - review of basic principle, strength and weaknesses
   - Building the MAP – basic steps to follow and Quick Map exercise
   - Collecting and formatting data for the MAP – Presentation of preliminary version of the spread sheet - Development of budget format – Interview techniques, guidelines and questionnaires.
2. **Rapid application**
   - Data collection on short commodity chain in Damascus
   - Quick analysis of the data.
3. **Validation of data information** collection with various operators
   - Field trip to Aleppo and Lattakia.
   - Finalization of interview guideline and data table format
4. **Planning for primary data collection**

Reference material

- Eric A. Monke and Scott R. Pearson, The Policy Analysis Matrix For Agricultural Development,1989.
- Carlo Cafiero Agricultural Policies in Developing Country, FAO project CGP/SYR/006/ITA – Phase II, July 2002.
- Agricultural price policy: government and the market, Training Materials for Agricultural Planning, N. 31, FAO, 1992.
- Various papers.

Session 2.

Policy Analysis Matrix Rationale

Part 1: PAM History

The concept of comparative advantage (1/3)

- A fundamental concept since the origin of the economic analysis.
  - A.Smith: absolute comparative advantage.
  - D.Ricardo: relative comparative advantage
    - Policy debate on the opening of the English market to foreign wheat import.

The concept of comparative advantage (2/3)

- Example of cloth and wine exchange between Portugal and England

Quantity of labor required for the production of one unit of:

	England	Portugal
Cloth	100	90
Wine	120	80

- In **absolute term** England should import both wine and cloth from Portugal.
- In **relative term** Portugal has advantage in exchanging (importing) cloth from England because it will get a higher relative price (quantity of labor exchange) for its wine in England than in Portugal.

The concept of comparative advantage (3/3)

- Formal representation.
  - Hecksher-Ohlin-Samuelson two – factor models.
  - The "model" does not explain all patterns of trade flows observed (Leontief's paradox)
  - Gradual integration into the conceptual framework of other variables to explain trade flows: human capital, technology – "New trade theory"

Determining factors of comparative advantages

- Natural resources/factors endowment.
- Acquired/changes in factors endowment.
  - Capital
  - Technology/knowledge
  - Specialization and scale of economy

PAM heritage

- PAM has been developed on the basis:
  - Project evaluation methodology combining:
    - Financial analysis (private value of the project output)
    - Economic analysis (social value of the project)
  - International trade theory used to define economic efficiency .

An approach widely used

- Various indicators of efficiency computed with the MAP already defined in the 60's
- A basic tool for monitoring the process of economic and structural adjustment and globalization.
  - The first MAP is developed on the case of Portugal to assess the impact of entering into EU.
- Since the 80's. Focus on agricultural sector in Less Developed Countries and countries in transition to a market based economy:
  - West Africa (Rice) and Indonesia (Corn, Cassava) and other food crops in the 80's
  - Multiplication of study in former Eastern European countries since 1990

Part II: The PAM objectives, structure and outcomes

PAM Objectives (1/2)

- An **analytical framework** for assessing the impact of economic policy on the efficiency of a productions systems (simple or complex):
  - **Competitiveness** of the private entities making up the production systems.
  - **Comparative advantages** (or economic efficiency) of the system to the benefit of the whole economy.
  - **Transfers** to (from) the selected system from (to) the rest of the economy

PAM Objectives (2/2)

- A **tool** for decision making:
  - Assist in formulating alternative policy options.
  - Identify the most viable/robust system for a given policy environment
  - Evaluate the impact of technical changes on the performance of production system (assessment of ex-ante impact or investment)

Efficiency defined within a neo-classical conceptual framework

- The reference is:
  - A market based economic where competition prevails to adjust supply to demand in output and input market;
  - Allowing a specialization of economic agent based on their resources endowment (capital, labor and skill);
  - Leading to a Pareto optimal allocation of resources across the different economic activities

Source of distortions from the optimum

- Impact of economic policy
  - Policy targeting output and factors markets
    - price policy
    - trade policy
    - labor regulation
  - Macro-economic policy
    - Public finance (taxes and subsidies)
    - Monetary policy
      - Exchange rate
      - Interest rate

Source of distortions from the optimum

- Market failures
  - Imperfect competitions
  - Externalities
    - Environmental impact
  - Public goods
  - Risk

Market failures are difficult to estimate, therefore, PAM applied studies usually focus on "policy induced" distortions rather than market failures.

The PAM structure

- The PAM is a system of double-entry bookkeeping set up for a representative production system
- Combine two accounting identities of the difference between revenue and costs
  - One defining differences between revenues and costs at private and social price
  - One measuring the divergence between private and social price.

Classification of accounting entities

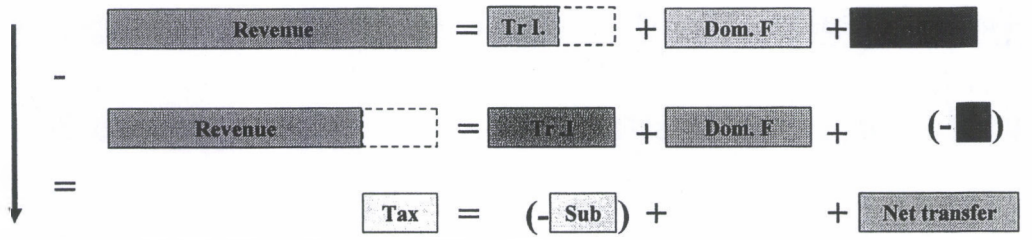
- Tradable – traded
  - Output that can be traded across the border (or competing with imported or exported substitutable good)
  - Input used to produce the output that can be imported even if locally produced
- Domestic factors
  - Labor
  - Capital

A double accounting identities

Revenue and costs at the private (market) price

Revenue and costs at social price

Divergences (effects of policy and market failure)



Summarized into a matrix

	Revenues	Trad. Inp.	Domestic Fac	Profit
Market prices	A	B	C	
Social prices	E	F	G	
Divergences	I	J	K	L

Interpretation of the results

- Absolute level and sign of the accounting entities provide information on:
  - performance of the system at private and social price
  - transfer from (to) the society
- But comparison between systems, across country (region) and time requires the computation of ratios that are not scale, product and/or unit dependent.

Profitability ratio: Competitiveness and Comp. Advantages

	Revenues	Trad. Inp.	Domestic Fac	Profit
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergence	I	J	K	L

Private Cost Ratio = $\frac{C}{A - B}$ **(PRC < 1 the system is competitive)**

Domestic Resource Cost = $\frac{G}{E - F}$ **(DRC > 1 no comparative advantage)**

Comparison across agricultural technology

System 1: Capital intensive

	Revenue	Tradable	Domestic factor	Profit
Market price	100	30	40	30
Social price	80	60	40	20
Divergence	20	-30	0	50

Private cost ratio = 0.6
Domestic Resource Cost Ratio = 2.0

System 2: Labor intensive

	Revenue	Tradable	Domestic factor	Profit
Market price	60	5	30	25
Social price	48	10	30	8
Divergence	12	-5	0	17

Private cost ratio = 0.5
Domestic Resource Cost Ratio = 0.8

Profitability ratio: DRC versus Social Cost Benefit ratio

	Revenues	Trad. Inp.	Dom. Fac	Profit
Private prices	A	B	C	D
Social price	E	F	G	H
Divergences	I	J	K	L

$$\text{Domestic Resource Cost} = \frac{G}{E - F} > 1$$

$$\text{Social Cost Benefit} = \frac{F + G}{E} > 1$$

Divergences: Protection coefficients

	Revenue	Trad. Inp.	Domes Fac	Profit
Private price	A	B	C	D
Social price	E	F	G	H
Divergences	I	J	K	L

Nominal Protection Coef. $= \frac{A}{E}$

Effective Protection Coef $= \frac{A - B}{E - F}$

Divergences: Net transfer

	Revenue	Trad. Inp.	Dom. Fac	Profit
Private price	A	B	C	D
Social price	E	F	G	H
Divergences	I	J	K	L

Subsidy ratio to prod. $= \frac{L}{E}$

PAM indicators and trades agreements

- Focus shift from structural adjustment and reform process per se to the compliance with international agreement
- Range of indicators has been developed by OECD and WTO to measure and monitor support to agriculture.

WTO Indicator Aggregate Measure of Support (AMS)

- The indicator have been developed **to monitor commitments** from member state to reduce **domestic** support to agriculture.
- Take only into account the effect of policy measure that are "trade distorting",(i.e. have an effect on output volume) such as price support, deficiency payment, compared to a reference period (86-88) – a number of policy measures transferring funds to the agriculture are actually excluded from the indicator.
- Indicator subject to harsh criticisms claiming that the indicator is inconsistent (double counting, over counting...) and do not actually account for all support to agriculture

OECD indicators.

- OECD has defined 4 indicators covering the different types of transfer and public investment in agriculture between Producers, consumers (in a broads sense i.e. raw agricultural product user) taxpayer, to agriculture:
  - Producer Support Estimate
  - Consumer Support Estimate
  - General support estimate
  - Total support estimate

  - Producers Support Estimates (PSE) is the annual monetary value of transfers from taxpayer and/or consumers to producers. It corresponds the measure of nominal (private) price support to the agriculture

SRP versus PSE

	Revenue	Trad. Inp.	Dom. Fac	Profit
Private price	A	B	C	D
Social price	E	F	G	H
Divergences	I	J	K	L

$$\text{Subsidy ratio to prod.} = \frac{L}{E}$$

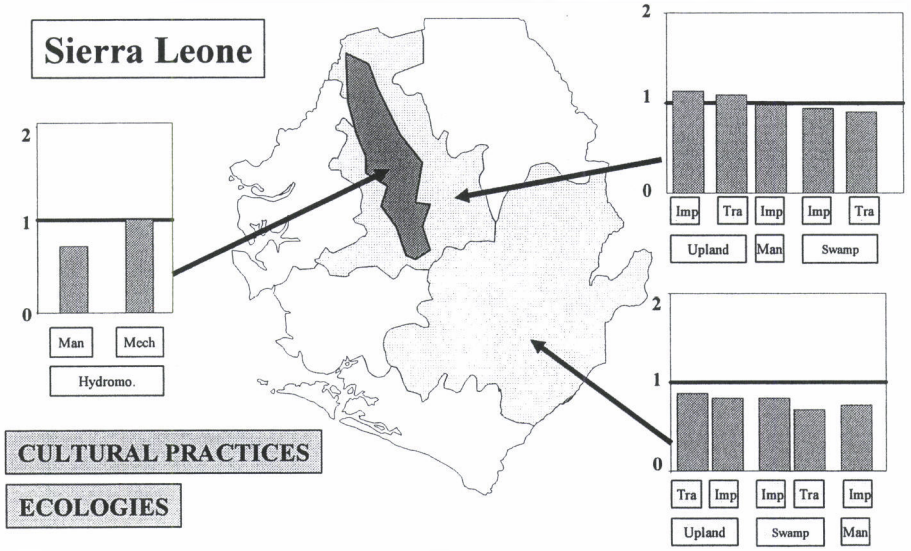
$$\text{Producer Support Estim.} = \frac{L}{A} \times 100$$

Interpretation

- Indicators are not a "definitive" assessment of systems' performances.
- Results should be put into perspective:
  - balance between efficiency and non-efficiency objective (social and spatial equity, support to agro-industrial system transformation)
  - MAP is a tool for policy dialogue.
- Question the validity of the results.
  - Sensitivity analysis to assess the influence of hypothesis and proxy on the bases of which the MAP has been developed.
  - Instability of the world market use as a reference

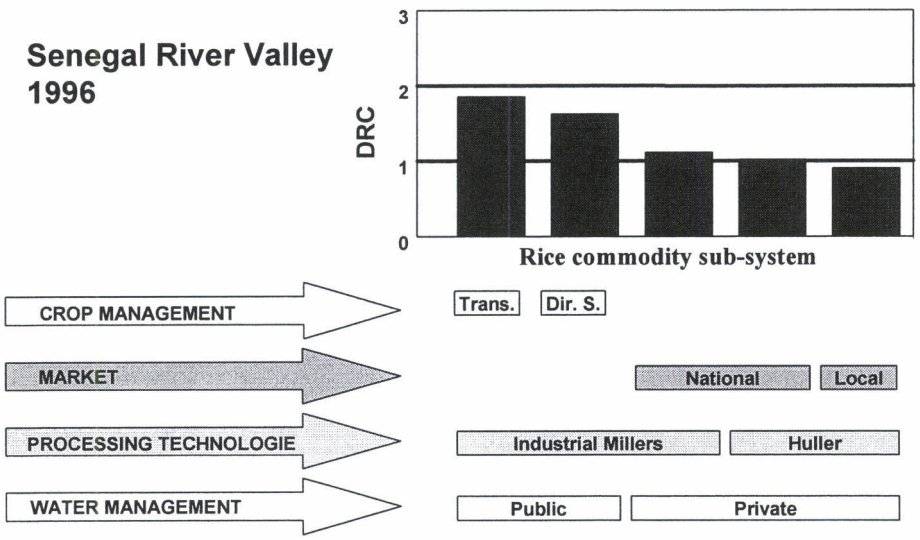
Part III: Application and interpretation

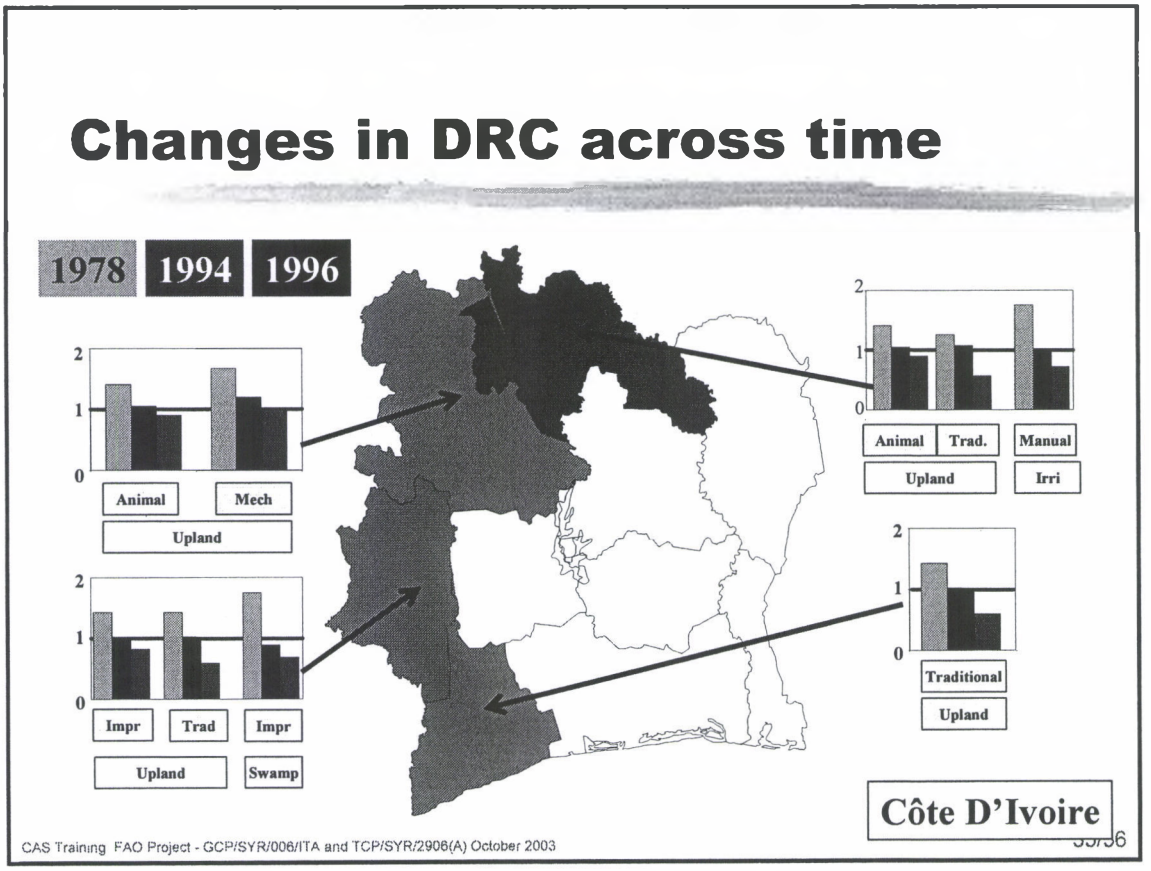
Comparing agricultural technology efficiency

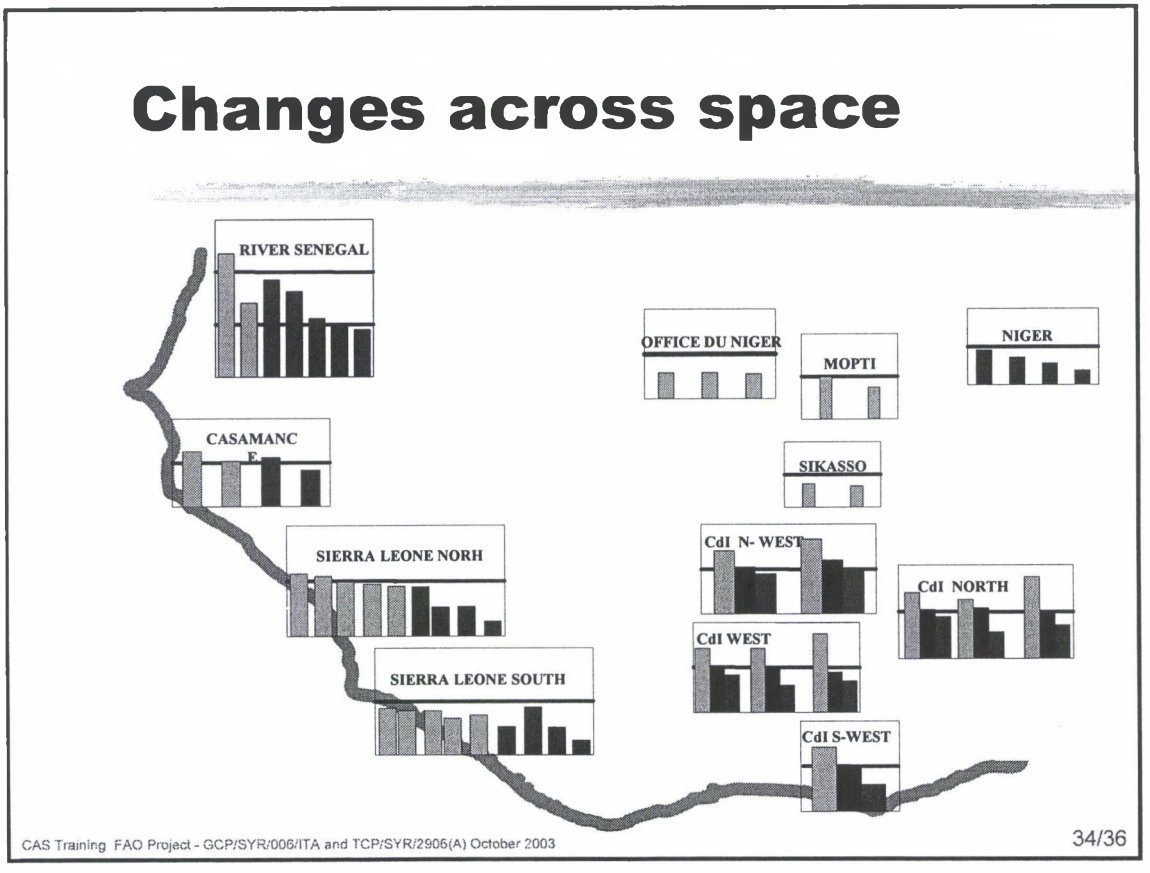


Source: Stanford Rice Study in West Africa, 1981

Comparative advantage are affected by many factors.




Changes in DRC across time
1978
1994
1996
2
1
0
Animal
Mech
Upland
2
1
0
Impr
Trad
Impr
Upland
Swamp
2
1
0
Animal
Trad.
Manual
Upland
Irri
2
1
0
Traditional
Upland
Côte D'Ivoire
CAS Training FAO Project - GCP/SYR/006/ITA and TCP/SYR/2906(A) October 2003
35/36


Changes across space
RIVER SENEGAL
CASAMANCE
SIERRA LEONE NORH
SIERRA LEONE SOUTH
OFFICE DU NIGER
MOPTI
NIGER
SIKASSO
CdI N- WEST
CdI NORTH
CdI WEST
CdI S-WEST
CAS Training FAO Project - GCP/SYR/006/ITA and TCP/SYR/2906(A) October 2003
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Limits and advantages

- Shortcomings from the theoretical background
  - "Ideal perfect market" as the reference
  - Overstate efficiency objectives against non-efficiency objectives in policy formulation.
- Methodological limitations
  - A static approach: no changes in factors allocation or output demand (? with sensitivity analysis).
  - Challenging task for defining social prices

Limits and advantages

- Easiness of utilization compared to econometric or mathematical models
  - Could be develop with a limited set of information
  - Simple computing technique
- Adapted to policy dialogue and formulation.
  - Widely spread
  - Limited "black-box" effect

Session 3

Building the PAM

Plan of the presentation

1. Selection/characterization of representative commodity systems
2. Building budget at private value
3. Social valuation of tradables
4. Social valuation of domestic factors

Part I: Characterization of representative commodity systems

Identification and delineation of the representative system. (1/2)

- Principle and constraint
  - Systems delineation should be consistent with the issue addressed by the study.
  - Should be done in dialogue with potential end-users of the study (policy maker, operators of the agricultural system)
  - Compromise between ideal and detailed characterization on the bases of information, human and time resources available for the study.

Identification and delineation of the representative system. (2/2)

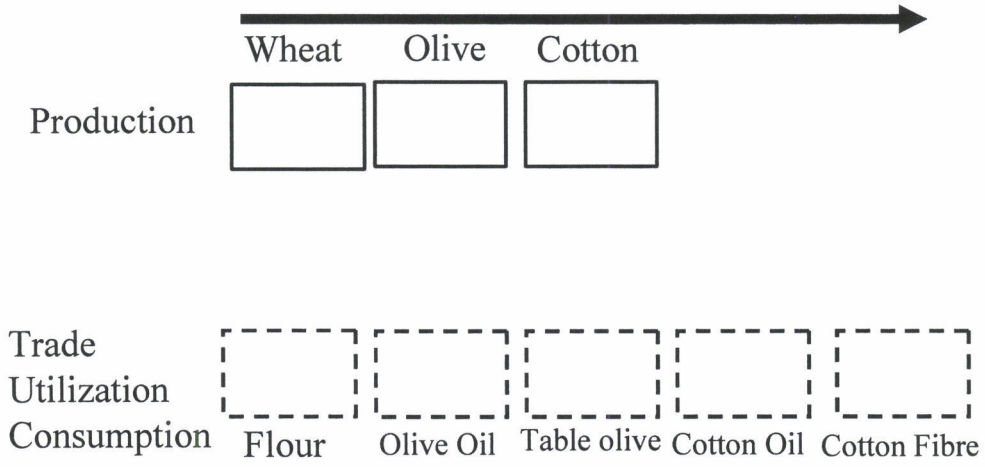
- Focus on a specific product or a family of product (tree crops, industrial crops, food crops...).
- Focus on a set of products belonging to a specific agricultural system/region.
- Focus on investment in infrastructure or the dissemination of a new technology (at the farm level or at the processing level)
- Changes of a regulatory framework (adoption of new law on labor, opening activity to the private sector).

Identification of the representative system : Product (1/5)

- Selection can be based on:
  - Production structure – i.e cropped area
  - Consumption pattern – product share in diet (food security concern)
  - Trade structure – share of export (or import)

→ Preliminary characterization based on available statistics

Identification of the representative system : Product (2/5)



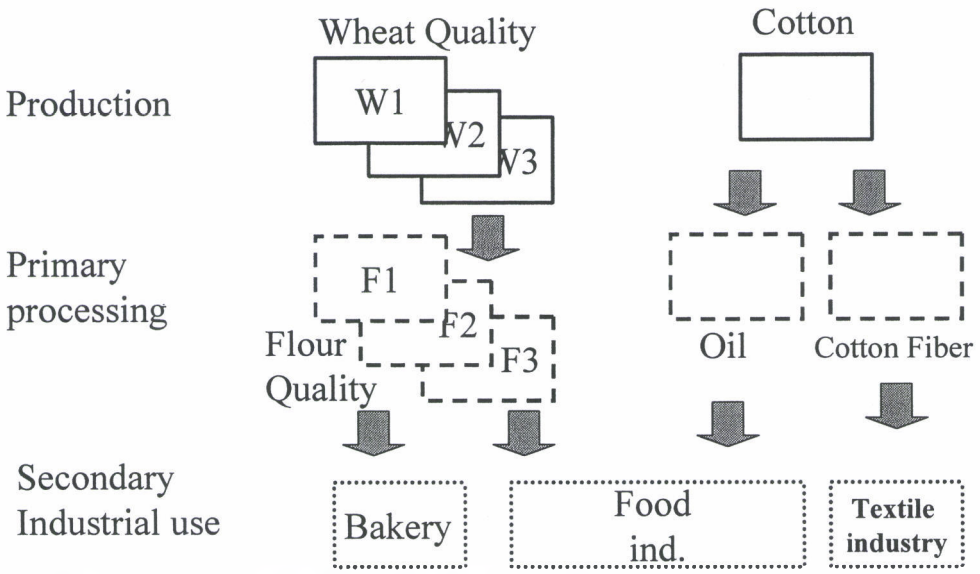
Identification of the representative system : Product (3/5)

- Take into consideration its tradability:
  - Traded/tradable
    - Export promotion
    - Import substitution
  - Non-traded
    - Consider substitution to define a proxy taking into account possible shift at the end user level (agro-food industry/ end consumers).
    - Take the market in a neighboring country as a reference to define a virtual cross-border trade.

Identification of the representative system : Product (4/5)

- Take into account the quality as full determinant of product specification.
- Distinction should be made between the raw product and the form under which it is actually traded ex: olive and olive oil
- Define the stages of processing that will be included in the analysis : raw material, primary processing, second processing.
- It is possible to transform a non-tradable into tradable one by considering the processed form (tradable) a (non-tradable) raw product (from raw cotton to cotton lint)

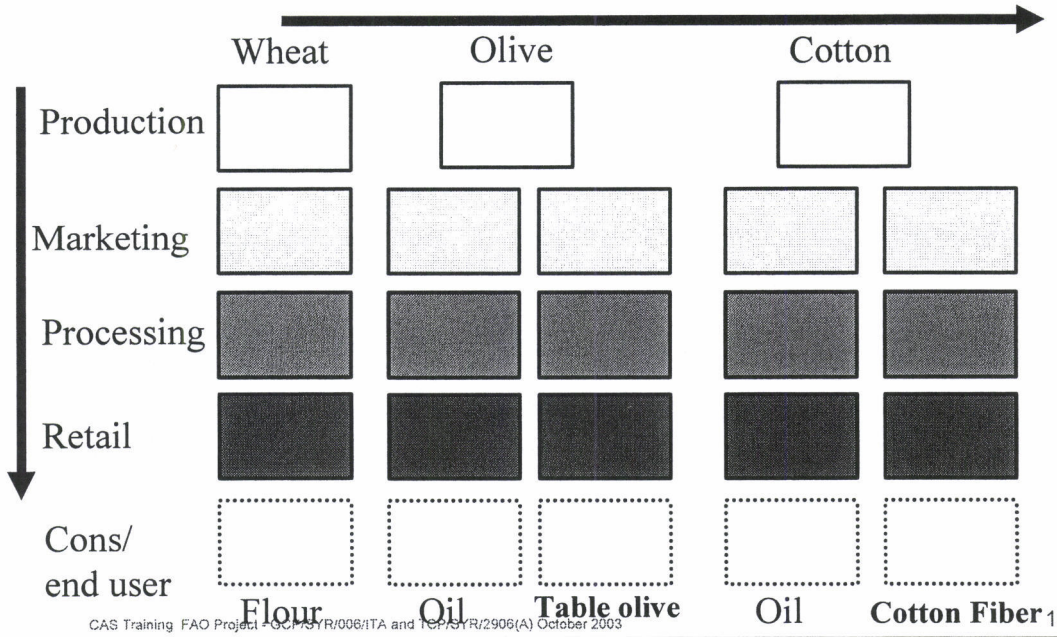
Identification of the representative system : Product (5/5)



Identification of the representative system : activity (1/3)

- It is necessary to take into account the different step from the raw product to the processed marketable, competing product.
- These activities/function are performed by agents.
  - One agent can perform more than one activities
  - An activities can be performed by different agent (large and small-scale operators)

Identification of the representative system : activity (2/3)



Identification of the representative system : activity (3/3)

- Take into account practices and technology:
  - At the farm stage:
    - Rainfed system
    - Irrigated system...
  - At the processing, marketing stage
    - Small-scale processing
    - Industrial processing

Identification of the representative system: simplification

- **Overlapping between:**
  - farming systems and agro-ecological zones
  - processing technology and quality of the product

  ⇨ **allow to reduce the number of characteristics to be taken into account**

- **Function performed by different agents with the same « level » of technology can be grouped to simplify the computation**: i.e transport and marketing can be considered together

- Joint production:
  - Split the system into sub-system with homogenous product as a commodity chain.
  - Consider one of the product as a by-product not included in down stream activities
  - Aggregate and expand the system borders to both line of product – more complex to handle.

- Standard representation take only 4 activities into consideration.

Standard structure of the commodity system

ACTIVITIES	DESCRIPTION
FARM PRODUCTION	Inputs and outputs for production of raw materials (evaluation stops at farm gate)
FARM-TO-PROCESSOR	Commodity moves from farm gate to processing site (may include storage and handling as well as transportation costs)
PROCESSING	Commodity processed into consumer acceptable form (may involve physical transformation or just packing, handling, and quality control)
PROCESSOR-TO-WHOLESALE MARKET	Commodity moved from processing site to nearby wholesale market (where domestic activity is comparable to tradable product)

Part II: Building budget at private value

Computing the 1st Row of the PAM

Searchable areas

	Revenues	Trad. Inp.	Domestic Fac	Profit
Market prices	■	■	■	D
Social prices	E	F	G	H
Divergences	I	J	K	L

■ Given by the accounting identities

■ To be estimated on the bases of activities budget

To be estimated on the bases estimated divergence

The Opportunity Cost Principle

- **The Opportunity Cost Principle:**
  - PAM analysis –based on opportunity cost principle – resource are valued on the bases of the best alternative use.

- private opportunity costs –reflect market choices
  - private opportunity cost of labor
    - hired –market wage rate, plus meals, transportation
    - family –market wage rate –if off-farm jobs available
  - private opportunity cost of land –land rental rate –or land rent equivalent of share-cropping arrangements

- social opportunity costs –reflect foregone national income –
  - social opportunity cost of land planted to a given crop – social profitability of land in best alternative user

Budget organization

- Major budget item (line)
  - Fixed cost value
    - Specific info for capital item on equipment life, salvage value
  - Variable costs value
    - Commodity in process
    - Other tradable input
    - Labor
  - Output value
- Cost presentation (column)
  - Physical term
  - Price per unit
  - Value

Constructing Farm Budgets

- Data for PAM budgets
  - representative –
  - recent year actual, not optimal
  - from average, not best, farmers
  - measure average –not marginal –costs and returns
- Numeraire (Currency unit/ha) –converted to Currency/kg product
- Synthetic budgets (when secondary data are available)
  - based on secondary data syntheses of existing work –
  - not from own field work encourage review of literature –on commodity, region
  - identify missing or conflicting information
  - actual fieldwork – verifies synthetic budgets

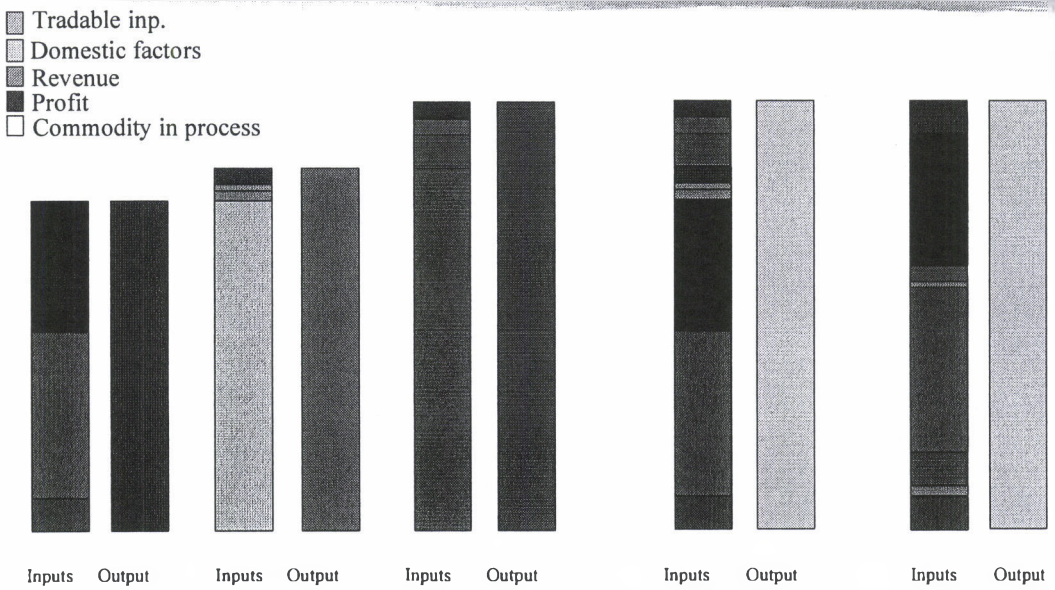
Constructing Post-farm Budgets

- Most principles, procedures – same as in farm budgets
  - activities selected –based on policy issues studied
  - data on revenues,
  - costs – based on opportunity costs
  - all cost data –based on average cost (not marginal)
  - costs begin with synthetic budgets
- use small sample sizes cross check responses –for data accuracy, quality
- post-farm budgets differ from farm budgets –3 ways
  - Numeraire –Currency/kg processed product (post-farm
  - small samples –capture most post-farm actors (limited variability in practice for a given scale of operation)
  - post-farm economies of size and capital costs –important clear definition of the capacity utilization to compute capital depreciation.

Conversion Ratios In the PAM

- Numeraire -Unit of account of the physical output – differs across four activities in PAM commodity system
- choice of single numeraire –commodity system
  - usually processed product –e.g., SP/kg of flour
  - sometimes farm-gate commodity –e.g., SP/hectare of wheat
- Take into account agent practices for data collection:
  - For instance trader may count per trip, day…

Aggregation process: avoid double counting



Part II: Social valuation of tradables

The Social Valuation of Products

	Revenues	Trad. Inp.	Domestic Fac	Profit
Market prices				D
Social prices	E	F	G	H
Divergences	I	J	K	L

Given by the accounting identities

To be estimated on the bases of activities budget

To be estimated on the bases estimated divergence

The Social Valuation of Products

- Social valuations –most challenging analytical task
- Social opportunity costs –rough approximations
- Educated guess for social price estimation is key to PAM analysis
  - basis of calculations of social profit (efficiency)
  - underpin calculations of divergences (policy transfers and market failures)
- Central goal – **show carefully how social valuations are made with explicit reference to the underlying hypothesis.**

Social Prices for Tradable Outputs and Inputs

	Revenues	Trad. Inp.	Domestic Fac	Profit
Market prices				D
Social prices	E	F	G	H
Divergences	I	J	K	L

Given par the accounting identities

To be estimated on the bases of activities budget

To be estimated on the bases estimated divergence

Social Prices for Tradable Outputs and Inputs

- Guidelines for social valuation of tradables
  - same for importable, exportable, outputs, inputs
  - social prices of tradables – given by border prices
- Efficiency –national (not global) concept –distorted world prices thus represent social opportunity
- Tradable social price = **world price** x **exchange Rate** net of transportation cost to the point of parity.

Finding Social Prices for Tradable Outputs and Inputs

- Finding comparable world prices for tradables
  - directly –published international trade statistics
  - trade data –industry groups, donor agencies
  - indirectly –correcting for (measurable) divergences
- Comparable world prices –require adjustments
  - identical location –nearby wholesale market
  - same time period –main harvest season
  - comparable form/quality –e.g., 25% broken rice
- World price comparisons at farm-gate –if few post-farm divergences –find import (export) parity prices

Adjustment of International Prices to Farmgate

F.o.b. Thailand ($/ton)	150.00
Freight & insurance ($/ton)	20.00
C.I.f. Indonesia ($/ton)	170.00
Exchange rate (Rp/$)	9,000
Exchange rate premium (%)	0
Equilibrium rate (Rp/$)	9,000
C.I.f. in domestic currency (Rp/ton)	1,530.00
Transport / handling to wholesale (Rp/kg)	133.00
Value before processing (Rp/kg)	1663.00

Nominal and Real Exchange Rate

- Converting world price into social price expressed in national currency require the use of an appropriate exchange rate, the Real Exchange Rate. Two methods:
- Considering divergence between inflation rate with trading partners (theory of PPP)
- Taking distortion due to the taxes on import and export compared to the situation without taxes.
- Multiple exchange rate regime and barrier to access to foreign currency.

→ Requires specific investigation and expert opinion
→ Multiple exchange rate can be used as an indicator of the distortion.

Social Prices for Nontradable Outputs

- Social valuation of nontradable outputs
  - no border prices exist for non-tradables
  - correct private prices –for effects of divergences (distorting policies, market failures) –if possible
- Estimation of social prices for nontradable outputs
  - correct private prices (A) for identifiable divergences (I) –find social prices (E) as residuals
  - proxy –seek price of close substitute commodity
  - proxy –find price of nontradable in neighboring country

Decomposition of Nontradable Input Costs

- Nontradable inputs –no comparable world prices
  - Decompose nontradable input costs –into tradable input and domestic factor costs –private and social
  - Disaggregating nontradables –full PAM, very costly – avoid unless input accounts for > 5% total costs
- Rapid approximations –decomposing non-tradables
  - Use national input-output tables –allocate labor, capital shares of nontradables –residual to tradables
  - Use operational rule of thumb –allocate one-third of nontradable costs each to capital, labor, tradables

Decomposition of Nontradable Input Costs

Example tractor service used for ploughing

		Coefficient			Values		
		Labor	Capital	Tradable inputs	Labor	Capital	Tradable inputs
Fixed Cost							
Amortization	1 213 772			1	0	0	1 213 772
Import tax	266 667		1		0	266 667	0
Financial capital cost	276 815		1		0	276 815	0
Variable Cost							
Labor	400 000	1			400 000	0	0
Fuel and oil	2 800 000			1	0	0	2 800 000
Maintenance and miscellaneous	700 000	0.4	0.2	0.4	280 000	140 000	280 000
Total	5 657 254	0.12	0.12	0.76	680 000	683 482	4 293 772

Social Prices for Domestic factors

	Revenues	Trad. Inp.	Domestic Fac	Profit
Market prices	■	■	■	D
Social prices	E	F	G	H
Divergences	I	J	K	L

■ Given par the accounting identities

■ To be estimated on the bases of activities budget

To be estimated on the bases estimated divergence

Approach to Studying Factor Markets

- consider, separately, the markets for labor, capital, and land
- assume factors are not fully tradable internationally – prices are set domestically –no international factor prices
- find social prices for factors (G) by adjusting private factor prices (C) for divergences (K)
  - use divergences identity: (C –G) = K
  - find G = (C –K)

Fragmentation in Factor Markets

- fragmentation –separation of factor sub-markets –immobility, no free entry/exit
- immutable fragmentation –regional land markets
- causes of fragmentation in factor markets
  - market imperfections –institutions, information policy distortions

Empirical Study of Factor Markets

- consider each factor market separately
- search for likely market failures
- study impacts of distorting policies
- identify extent of fragmentation

Factor Price Determination

- demand for factors –varies with factor and output prices and with factor productivity
- supply of factors –determined by individual decisions to provide labor (labor-leisure trade-off), capital, or land services
- factor market equilibrium –price determined simultaneously by demand for and supply of each factor

Estimation of Factor Prices

- observe private market prices
- identify extent and causes of fragmentation
  - natural –immutable
  - market failures –changeable, if better institutions
  - distortions –policy induced
- compare factor prices across fragments
- check freedom of entry/exit in fragments

Estimation of Private and Social Wage Rates

- classify by categories –gender, age, skill
- search for market failures, policy distortions
- correct market wage rates for divergences
  - market failures
    - monopsonies or oligopsonies –few hiring
    - firms effectiveness of trade unions –in raising wages
  - distorting policies
    - effectiveness of minimum wage laws
    - pension and health insurance taxes

Estimation of Private Interest Rates

- private interest rates –sources of credit
  - family savings (farm, off-farm) –lowest
  - formal credit market (banks) –moderate
  - informal credit market (kiosks) –higher
  - money lenders (local) –highest
- subsidized credit –rarely representative

Estimation of Social Interest Rates

- classify capital by categories
  - working capital –covers cash production costs
  - investment capital –service longer then 1 year
- capital market failures usually widespread – private interest rate thus a poor approximation
- use arbitrary rule of thumb –from social retums to capital in other countries

Estimation of Social Land Rental Rates

- land in agricultural production –immobile –fixed factor –value depends on productivity
- social valuation of land –social profit (H) from best alternative use of land (with land costs excluded) –land a fixed factor
- in PAM analysis –social profit (H) estimated as returns to land and management –unless alternatives studied

Session 4

Quick PAM exercise

NAPC Training Syria – October 2003

Commodity systems budgets per agents/functions

1. Rainfed rice producer. For 1 ha of paddy the farmer spent per cropping season 7 000 AU (Accounting Unit) in fences to protect his fields from predators, he uses for 7000 AU of tools. His labor cost is at 128000 AU and he spends for 20000 AU in seeds. He get an average yield of 1.2t/ha.

2. The lowland irrigated rice farmer. For 1 ha he the equivalent of 18000 AU for irrigation infrastructure et 20000 AU of tools. He spent 250000 AU of manpower per cropping season. He bought for 20000 AU of seeds, 37000 AU of NPK and 30000 AU of herbicide. He also paid fro 10000 of taxes on revenue. He get an average yield of 2.5 t/ha

3. Paddy is parboiled before being processed into rice. For parboiling farmer's wife is using a parboiling tank of a 80 kg capacity of paddy. This tank cost about 156 AU for each cycle of parboiling. She spends 780 AU for purchasing fuel wood and its labor cost about 988 AU for one cycle.

4. Paddy dehulling into rice. The parboiled paddy is milled at small-scale workshop. For 11 t of paddy processed per month the cost are as follow: 128 739 AU for the machine depreciation and 1 430 AU for the depreciation of the building. The miller should spent 50 065 in AU, 92 978 AU in fuel, 14 304 AU for maintenance and 10 728 AU for various expenses.

5. Shipment of rice to the urban market. It is done with a truck of a 10 ton capacity. For 2000 km we count for 150 000 AU for the depreciation of the truck, 100 000 AU for labor, 500 000 AU for the fuel and 100 000 AU for maintenance and other expenses. The distance between the miller workshop and the urban market is about 200 km.

The market paddy price is 250 AU/kg and the market price for the rice is at 600 AU. Rice border price FOB is at 500 AU.

All capital good (except building) and maintenance services bear a tax of 15%. Fuel tax is 30% ad valorem. The investment in irrigation is getting a subvention of 30% while all chemical input are subsidized at a rate of 50%.

You can get 0.65 kg of rice from 1 kg of parboiled paddy.

1. Building the budget for the rainfed rice commodity chain from the producer to the urban market.

1.1. Modified the initial budget to get an homogenous unit of reference across all budget in Table 1a, 1b,1c,1d:

- ✓ Budget in ha for the production
- ✓ In ton of rice for the processing and marketing.

1.2. Classify the cost item between tradable and non-tradable item. And complete the table 2 at market price.

- ✓ For the sake of simplification all equipment purchase is considered to be capital.
- ✓ Rice producer budget is in ha
- ✓ Post harvest budget is build in ton of parboiled rice
- ✓ Only one budget will be build for post-harvest operations.

1.3. Compute the value of each budget item in social price. We remind that

In case of tax:

P_M = *Market price*
T_V = *ad valorem tax*
T_U = *tax per unit*

$$P_M = P_R + (P_R.T_V) + T_U$$

$$P_M = P_R(1+T_V) + T_U$$

P_R = *Reference price (Social price)*

$$P_R = \frac{P_M - T_U}{(1+T_V)}$$

In case of a subsidy:

P_M = *Market price*
T_S= *Subvention rate*
T_R= *Fixed amount paid back*

$$P_M = P_R - (P_R.T_S) - T_R$$

$$P_M = P_R(1-T_S) - T_R$$

P_R = *Reference price (Social price)*

$$PR = \frac{P_M + T_R}{(1-T_S)}$$

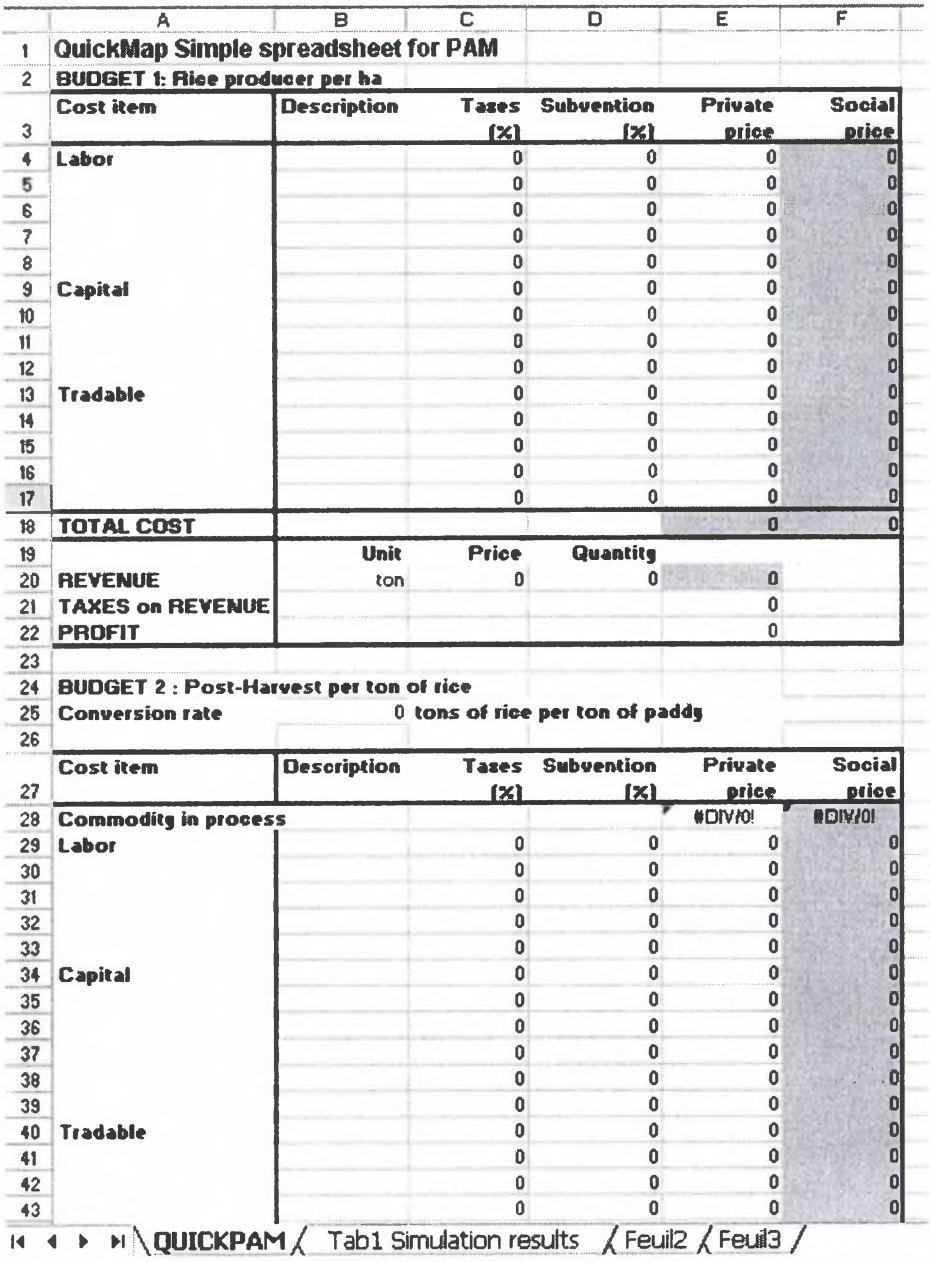
We assume that the social price for paddy is equivalent to sum of cost at social price (the farmer don't get any profit at reference price)

1.4. We the assistance of Table 3, put together revenue, expenditure in tradable good and domestic factor while applying the appropriate conversion from numeraire in ha to a numeraire in ton of paddy and then in ton of rice.

1.5. Complete the MAP with the aggregate corresponding value in Table 4 and compute the various indicators. What do the divergences represent?

2. Utilization of QuickPam spreadsheet.

2.1 Open the file QuickPam.xls, select and copy the sheet called Quick Pam in the same folder and name it Rainfed Pam Sim 0 (standing for simulation 0). Enter the data. Grey cells contained the formula for the automatic computation of the reference prices.



	A	B	C	D	E	F
1	**QuickMap Simple spreadsheet for PAM**					
2	**BUDGET 1: Rice producer per ha**					
3	**Cost item**	**Description**	**Taxes (%)**	**Subvention (%)**	**Private price**	**Social price**
4	**Labor**		0	0	0	0
5			0	0	0	0
6			0	0	0	0
7			0	0	0	0
8			0	0	0	0
9	**Capital**		0	0	0	0
10			0	0	0	0
11			0	0	0	0
12			0	0	0	0
13	**Tradable**		0	0	0	0
14			0	0	0	0
15			0	0	0	0
16			0	0	0	0
17			0	0	0	0
18	**TOTAL COST**				0	0
19		**Unit**	**Price**	**Quantity**		
20	**REVENUE**	ton	0	0	0	
21	**TAXES on REVENUE**				0	
22	**PROFIT**				0	
23						
24	**BUDGET 2 : Post-Harvest per ton of rice**					
25	**Conversion rate**	0	**tons of rice per ton of paddy**			
26						
27	**Cost item**	**Description**	**Taxes (%)**	**Subvention (%)**	**Private price**	**Social price**
28	**Commodity in process**				#DIV/0!	#DIV/0!
29	**Labor**		0	0	0	0
30			0	0	0	0
31			0	0	0	0
32			0	0	0	0
33			0	0	0	0
34	**Capital**		0	0	0	0
35			0	0	0	0
36			0	0	0	0
37			0	0	0	0
38			0	0	0	0
39			0	0	0	0
40	**Tradable**		0	0	0	0
41			0	0	0	0
42			0	0	0	0
43			0	0	0	0

QUICKPAM | Tab1 Simulation results | Feuil2 | Feuil3

Record the value of the indicators in the first column of table in the sheet named Simulations results

The Policy Analaysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	0	#DIV/0!	#DIV/0!	#DIV/0!
Social Price	E	F	G	H
	0	#DIV/0!	#DIV/0!	#DIV/0!
Divergence	I	J	K	L
	0	#DIV/0!	#DIV/0!	#DIV/0!

INDICATORS		
1. FINANCIAL PROFITABILITY	[D = A - B - C]	#DIV/0!
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	#DIV/0!
3. SOCIAL PROFITABILITY	[H = E - F - G]	#DIV/0!
4. DOMESTIC RESOURCE COST	[G / (E - F)]	#DIV/0!
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	#DIV/0!
6. TRANSFERS	[L = I + J + K]	#DIV/0!
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	#DIV/0!
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - F	#DIV/0!
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F	#DIV/0!
10. PRODUCERS SUBSIDY RATIO	[L / E]	#DIV/0!
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	#DIV/0!

✓ Save

2.2 Make a copy of the sheet Rainfed Pam Sim 0 and name it Irrigated Pam Sim 0. Enter the data for the Commodity Chain Irrigated Rice. Enter the data for irrigated systems based on the 1.2 section after proper correction to fit the spreadsheet requirement (producer data per ha basis and post-harvest on ton basis. Record the value of the indicators in Simulation results sheet.

✓ Save

3. Simulation/Analysis

3.1. Compare the situation between the two commodity chains using the indicators

3.2 Simulation 1: Make a copy of the Irrigated Pam Sim 0 and name it Irrigated Pam Sim 1. Eliminate the subvention. The producers decide to maintain the same level of input utilization in the new situation. What are the private prices of the input in the new situation? Records the values of the indicators in the Simulation results sheet. Compare the values, what are the effects on the performance of the commodity chain?

3.3 Simulation 2: Reduction of input subsidy with reduction in input use. Make a copy of the Irrigated Pam Sim 1 and name it Irrigated Pam Sim 2. The rice producers react to the input private price increase by reducing their purchase to previous level (value of input purchase in Irrigated Pam Sim 0). Rice yield declines from 2.5 ton down to 1.6 ton. Record the values in

Simulations results sheet. What are the remarkable effects on the commodity chain performances and transfers?

3.4 Simulation 3: reduction in rice price. Make a copy of the Irrigated Pam Sim 0 and name it Irrigated Pam Sim 3. The social price of rice decrease by 25%. Record the value in the Simulation results sheet. What are the effect on the performances of the commodity chain and the transfers?

3.5 Simulation 4: Devaluation of the local currency by 33%. Make a copy of the Irrigated Pam Sim 0 and name it Irrigated Pam Sim 3. This devaluation of 33% translate into an increase of the private price of tradable by 50% (except for other expenditure), including the investment in capital and an increase in the social price of the rice. We suppose that at short term the private value price of the rice remain the same. Copy the Rainfed rice Pam Sim 0 into a new sheet named Rainfed Pam Sim 4. Apply the same modifications as for Irrigated Pam Sim 3 and record the value of the indicator in the Simulation results sheet? What are the effects of the devaluation on the respective performance of both systems?

4. Sensibility Analysis

Use the function table from Excel to assess the sensibility of the DRC to rice yield.

Table 1.a Production cost for 1 ha of rainfed rice

Item	Amount	Unit
Fencing	7000	AU/ha
Tools	7000	AU/ha
Labor	182000	AU/ha
Seed	20000	AU/ha
Yield	1.2	tonne

Table 1.b Production costs for 1 ha of irrigated rice

Item	Amount	Unit
Infrastructure	18 000	AU/ha
Tools	20 000	AU/ha
Labor	250 000	AU/ha
Seeds	20 000	AU/ha
Fertilizer NPK	37 000	AU/ha
Herbicides	30 000	AU/ha
Income taxes	10 000	AU/ha
Yield	2.5	ton

Table 1.c Parboiling cost

	For 80 kg of paddy		For 1 ton of paddy		For 1 ton of rice	
Conversion rate			?			?
Item	Amount	Unit	Amount	Unit	Amount	Unit
Parboiling tank	156	AU/80 kg		AU/t		AU/t
Fuel wood	780	AU/80 kg		AU/t		AU/t
Labor	988	AU/80 kg		AU/t		AU/t

Table 1.d Dehulling cost

	For 11 t of paddy		For 1 ton of paddy		For 1 ton of rice	
Conversion rate			?		?	
Item	Amount	Unit	Amount	Unit	Amount	Unit
Machine	128 739	AU/11t		AU/t		AU/t
Building	1 430	AU/11t		AU/t		AU/t
Labor	50 065	AU/11t		AU/t		AU/t
Fuel	92 978	AU/11t		AU/t		AU/t
Maintenance	14 304	AU/11t		AU/t		AU/t
Various expenses	10 728	AU/11t		AU/t		AU/t

Table 1.e Transport cost

	10 t on 2000 km		1 Ton on 200 km	
Conversion rate			?	
Item	Amount	Unit	Amount	Unit
Truck cost	150 000	AU/10t/2000km		AU/t/200km
Labor	100 000	AU/10t/2000km		AU/t/200km
Fuel	500 000	AU/10t/2000km		AU/t/200km
Maintenance	100 000	AU/10t/2000km		AU/t/200km

TABLE 2

BUDGET 1: Rice farmer per Ha of Paddy

Costs Item	Description	taxes (%)	Subsidy (%)	Private price value	Social price value
LABOR					
CAPITAL					
TRADABLES					
TOTAL COST					
	Unit	Price	Quantity		
REVENUE					
TAXES ON REVENUE					
PROFIT					

TABLE 2 (continued)

BUDGET 2 : POST-HARVEST per Ton/rice

Conversion rate:		Ton of rice/Ton of			
Cost item	Description	Impot (%)	Subvention(%)	Private price value	Social price value
RAW MATERIAL					
LABOR					
CAPITAL					
TRADABLE					
TOTAL COST					
	Unit	Price	Quantity		
REVENUE	Ton		1.00		
TAXES ON REVENUE					
PROFIT					

TABLE 3

REVENUE						
	UC/HA	Conversion Yield Paddy	UC/PADDY	Conversion Paddy Rice	UC/ TON OF RICE	PAM Indicator
Private price						
	[redacted]		[redacted]		[redacted]	A
Social price						
	[redacted]		[redacted]		[redacted]	E

TRADABLE INPUT						
Private price	AU/HA	Conversio Yield Paddy	AU/PADDY	Conversio Paddy Rice	AU/ TON OF RICE	PAM Indicator
Budget rice farmer	A		Y			
Post-harvest budget	[redacted]		[redacted]			
				TOTAL =	0	B
SOCIAL PRICE	AU/H	Conversio Yield Paddy	AU/PADD	Conversio Paddy Rice	AU/ TON OF RICE	MAP Indicator
Budget rice farmer	A		Y			
Post-harvest budget	[redacted]		[redacted]			
				TOTAL =	0	F

TABLE 3 (Continued)

DOMESTIC FACTOR						
Private price	AU/HA	Conversio Yield Paddy	AU/PADDY	Conversio Paddy Rice	AU/ TON OF RICE	MAP Indicator
Budget rice farmer						
Post-harvest budget	[redacted]		[redacted]			
				TOTAL =	0	C
Social price	AU/HA	Conversio Yield of t Paddy	AU/PADDY	Conversio Paddy rice	AU/ TON OF RICE	Indicateur MAP
Budget rice farmer						
Post-harvest budget	[redacted]		[redacted]			
				TOTAL =	0	G

TABLE 4

PAM
AU/Ton of Rice

	REVENUE	COST		PROFIT
		TRADABLE INPUT	DOMESTIC FACTORS	
PRIVATE PRICE	A	B	C	D
				0
SOCIAL PRICE	E	F	G	H
				0
DIVERGENCES	I	J	K	L
	0	0	0	0

1. FINANCIAL PROFITABILITY	[D = A - B - C]
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]

3. SOCIAL PROFITABILITY	[H = E - F - G]
4. DOMESTIC RESOURCE COST	[G / (E - F)]
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]

6. TRANSFERS	[L = I + J + K]
7. NOMINAL PROTECTION COEFFICIEN	[A / E]
8. EFFECTIVE PROTECTION COEFFICIE	[(A - B) / (E - F)]
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-G)]
10. PRODUCERS SUBSIDY RATIO	[L / E]
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]

TABLEAU 5

INDICATEURS		Plateau Sim 0	Bas - Fond Sim 0	Bas - Fond Sim 1	Bas - Fond Sim 2	Bas - Fond Sim 3	Plateau Sim 4	Bas - Fond Sim 4
1. RENTABILITÉ FINANCIERE	[D = A - B - C]							
2. RATIO COUTS-BENEFICES	[C / (A - B)]							
3. RENTABILITÉ ECONOMIQUE	[H = E - F - G]							
4. COUT EN RESSOURCES INTERIEURES	[G / (E - F)]							
5. RATIO COUTS-BENEFICES SOCIAL	[(F + G) / E]							
6. TRANSFERTS DE POLITIQUE	[L = I + J + K]							
7. COEFFICIENT PROTECTION NOMINAL	[A / E]							
8. COEFFICIENT PROTECTION EFFECTIVE	[(A - B) / (E - F)]							
9. COEFFICIENT PROTECTION GLOBALE	[(A-B-C)/(E-F-G)]							
COEFFICIENT DE RENTABILITÉ	[D / H]							
10. TAUX SUBVENTION PRODUCTEUR	[L / E]							
11. EQUIV. SUBVENTION PRODUCTEUR	[100 * L / A]							

Quick MAP exercice solutions.

1. Building the budget for the rainfed rice commodity chain from the producer to the urban market.

1.1. Modified the initial budget to get an homogenous unit of reference across all budget in Table 1a, 1b,1c,1d:

Table 1.c Parboiling cost

	For 80 kg of paddy		For 1 ton of paddy		For 1 ton of rice	
Conversion rate			0.08		0.65	
Item	Amount	Unit	Amount	Unit	Amount	Unit
Parboiling tank	156	AU/80 kg	1950	AU/t	3000	AU/t
Fuel wood	780	AU/80 kg	9750	AU/t	15000	AU/t
Labor	988	AU/80 kg	12350	AU/t	19000	AU/t

Table 1.d Dehulling cost

	Pour 11 t de paddy		Pour 1 tonne de paddy		Pour 1 tonne de riz	
Conversion rate			11		0.65	
Item	Amount	Unit	Amount	Unit	Amount	Unit
Machine	128 738	AU/11t	11703	AU/t	18005	AU/t
Building	1 430	AU/11t	130	AU/t	200	AU/t
Labor	50 065	AU/11t	4551	AU/t	7002	AU/t
Fuel	92 977	AU/11t	8452	AU/t	13004	AU/t
Maintenance	14 304	AU/11t	1300	AU/t	2001	AU/t
Various expenses	10 728	AU/11t	975	AU/t	1500	AU/t

Table 1.e Transport cost

	10 tonne sur 2000 km		1 tonne sur 200 km	
Conversion rate			100	
Item	Montant	Unité	Montant	Unité
Truck cost	150 000	AU/10t/2000km	1500	t/200km
Labor	100 000	AU/10t/2000km	1000	t/200km
Fuel	500 000	AU/10t/2000km	5000	t/200km
Maintenance	100 000	AU/10t/2000km	1000	t/200km

1.2. Classify the cost item between tradable and non-tradable item. And complete the table 2 at market price.

Table 2

BUDGET 1: Rice farmer per Ha of Paddy

Costs Item	Description	taxes (%)	Subsidy (%)	Private price value	Social price value
LABOR	Labor			182000	182000
CAPITAL	Fences			7000	7000
	Tools	15%		7000	6087
TRADABLES	Seeds			20000	20000
TOTAL COST				216000	215087
	Unit	Price	Quantity		
REVENUE		250 000	1.2	300 000	
TAXES ON REVENUE					
PROFIT				84 000	

BUDGET 2 : POST-HARVEST per Ton/rice

Conversion rate:	0.65 Ton of rice/Ton of				
Cost item	**Description**	**Impot (%)**	**Subvention(%)**	**Private price**	**Social price value**
RAW MATERIAL				384615	275753
LABOR	Labor (parb.)			19000	19000
	Labor (dehul)			7000	7000
	Labor (trp)			1000	1000
CAPITAL	tank (parb)	15		3000	2609
	Machine (dehul)	15		18000	15652
	Building (dehul)			200	200
	Truck (trp)	15		1500	1304
TRADABLE	Fuel wood (parb)			15000	15000
	Fuel (dehul)	30		13000	10000
	Maintenance (dehul)	15		2000	1739
	Other expenses (dehul)			1500	1500
	Fueld (trp)	30		5000	3846
	Maintenance (trp)	15		1000	870
TOTAL COST				471815	355473
	Unit	**Price**	**Quantity**		
REVENUE	**Ton**	600000	1	600000	500000
TAXES ON REVENUE					
PROFIT				128185	144527

1.4. We the assistance of Table 3, put together revenue, expenditure in tradable good and domestic factor while applying the appropriate conversion from numeraire in ha to a numeraire in ton of paddy and then in ton of rice.

Table 3

REVENUE						
	AU/HA	Conversion Yield Paddy	AU / PADDY	Conversion Paddy to Rice	AU/ TON RICE	Indicators PAM
Private price						
Paddy						A
Rice					600000	
Social price						
Paddy						E
Rice					500000	

TRADABLE INPUT						
Market price						
	AU/HA	Conversion Yield Paddy	AU/PADDY	Conversion Paddy to Rice	AU/ TON RICE	Indicators PAM
Rice farmer						B
Seeds	20000	1.2	16667	0.65	25641	
Porst-harvest						
Fuel wood (parb)					15000	
Fuel (dehul)					13000	
Maintenance (dehul)					2000	
Other expenses (dehul)					1500	
Fueld (trp)					5000	
Maintenance (trp)					1000	
				TOTAL=	63141	
Social price						
	AU/HA	Conversion Yield Paddy	AU/PADDY	Conversion Paddy to Rice	AU/ TON RICE	Indicators PAM
Rice farmer						F
Seeds	20000	1.2	16667	0.65	25641	
Porst-harvest						
Fuel wood (parb)					15000	
Fuel (dehul)					10000	
Maintenance (dehul)					1739	
Other expenses (dehul)					1500	
Fueld (trp)					3846	
Maintenance (trp)					870	
				TOTAL=	58596	

Table 3 (continued)

DOMESTIC FACTORS						
Prix du marche						
	AU/HA	Conversion Yield Paddy	AU/PADDY	Conversion Paddy to Rice	AU/ TON RICE	Indicators PAM
Rice farmer						
Labor	182000	1.2	151667	0.65	233333	
Fence	7000	1.2	5833	0.65	8974	
Tools	7000	1.2	5833	0.65	8974	
Post-harvest						
Labor (parb.)	[redacted]		[redacted]		19000	
Labor (dehul)					7000	C
Labor (trp)					1000	
tank (parb)					3000	
Machine (dehul)					18000	
Building (dehul)					200	
Truck (trp)					1500	
				TOTAL=	300982	
Social prices						
	AU/HA	Conversion Yield Paddy	AU/PADDY	Conversion Paddy to Rice	AU/ TON RICE	Indicators PAM
Rice farmer						
Labor	182000	1.2	151667	0.65	233333	
Fence	7000	1.2	5833	0.65	8974	
Tools	6086.956522	1.2	5072	0.65	7804	
Post-harvest						
Labor (parb.)	[redacted]		[redacted]		19000	
Labor (dehul)					7000	G
Labor (trp)					1000	
tank (parb)					2609	
Machine (dehul)					15652	
Building (dehul)					200	
Truck (trp)					1304	
				TOTAL=	296877	

1.5. Complete the MAP with the aggregate corresponding value in Table 4 and compute the various indicators.

Table 4

PAM
AU per ton of rice

	Revenue	COST		PROFIT
		Tradable Input	Domestic Factors	
Private Price	A 600 000	B 63 141	C 300 982	D 235 877
Social Price	E 500 000	F 58 596	G 296 877	H 144 527
Divergence	I 100 000	J 4 545	K 4 105	L 91 350

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C]	235 877
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.56
3. SOCIAL PROFITABILITY	[H = E - F - G]	144 527
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.67
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.71
6. TRANSFERS	[L = I + J + K]	91 350
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	1.20
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - F)]	1.22
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-G)]	1.63
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.18
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	15.23

Results interpretations:

- From the Map table :

  - Both price systems show positive results for private price (D=235 877 AU) and social price (H= 144 527 AU).

  - The third line of the matrix indicates the following :
    - On the output market (revenue) we observe a divergence of 100 000 AU in favor of the rice Commodity Chain, which corresponds to a transfer from the economy to the rice CC.
    - On the input market (tradable input) and domestic factors we observe a positive divergence of 4545 AU and 4105 AU which corresponds to the taxes paid on tradable good and equipment, so a transfer from the rice CC to the rest of the economy.
    - The cell L indicates a total transfer of 91 349 AU from the economy to the rice CC.

- The indicators.
  Remark. The interpretation of the ratios is easier and more meaningful when it is done by comparing various Commodity chains.

  - We can however underline the following.

    - DRC : the ratio is below unity indicating that the economy has a comparative advantage in producing rice

    - NPC: The rice is taxed at a level of 20% of the social price.

    - EPC: It lightly higher than the NPC at 1.22 indicating that most of the distortion on tradable come from the output market.

    - The producer subsidy ratio of 0.18 indicate that the rice CC is supported by the economy at a level of 18% of the social price value.

2. Simulation results interpretations

- Baseline situation – Sim 0

QuickMap Simple spreadsheet for MA P Rainfed Sim 0

BUDGET 1: Rice producer per ha

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Labor	Labour	0	0	182 000	182 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
Capital	Fence	0	0	7 000	7 000
	Tools	15	0	7 000	6 087
		0	0	0	0
		0	0	0	0
Tradable	Seeds	0	0	20 000	20 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				216 000	215 087
		Unit	Price	Quantity	
REVENUE		ton	250 000	1.2	300 000	
TAXES on REVENUE					0	
PROFIT					84 000	

BUDGET 2 : Post-Harvest per ton of rice

Conversion rate 0.65 **tons of rice per ton of paddy**

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Commodity in process				384 615	275 753
Labor	Labor (parboiling)	0	0	19 000	19 000
	Labor (dehuller)	0	0	7 000	7 000
	Labor (trasnport)	0	0	1 000	1 000
		0	0	0	0
		0	0	0	0
Capital	Tank (parboiling)	15	0	3 000	2 609
	Machine (dehuller)	15	0	18 000	15 652
	Building (dehuller)	0	0	200	200
	Truck	15	0	1 500	1 304
		0	0	0	0
		0	0	0	0
Tradable	Fuled wood (parboil)	0	0	15 000	15 000
	Fuel (dehuller)	30	0	13 000	10 000
	Maintenance (dehuller)	15	0	2 000	1 739
	Other expenditure (dehuller)	0	0	1 500	1 500
	Fuel for the truck (transport)	30	0	5 000	3 846
	Maintenance (truck)	15	0	1 000	870
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				471 815	355 473
		Unit	Price	Quantity	
REVENUE		ton	600 000	1	600 000	500 000
TAXES on REVENUE					0	
PROFIT					128 185	144 527

Rainfed Sim 0

The Policy Analysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	600 000	63 141	300 982	235 877
Social Price	E	F	G	H
	500 000	58 596	296 877	144 527
Divergence	I	J	K	L
	100 000	4 545	4 105	91 349

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C	235 877
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.56
3. SOCIAL PROFITABILITY	[H = E - F - G	144 527
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.67
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.71
6. TRANSFERS	[L = I + J + K]	91 349
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	1.20
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - I	1.22
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-	1.63
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.18
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	15.22

QuickMap Simple spreadsheet for MA P Irriagted Sim 0

BUDGET 1: Rice producer per ha

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Labor	Labour	0	0	250 000	250 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
Capital	Irrigation infrastructure	0	30	18 000	25 714
	Tools	15	0	20 000	17 391
		0	0	0	0
		0	0	0	0
Tradable	Seeds	0	0	20 000	20 000
	NPK	0	50	37 000	74 000
	Herbicide	0	50	30 000	60 000
		0	0	0	0
		0	0	0	0
TOTAL COST				375 000	447 106
	Unit	Price	Quantity		
REVENUE	ton	250 000	2.5	625 000	
TAXES on REVENUE				10 000	
PROFIT				240 000	

BUDGET 2 : Post-Harvest per ton of rice

Conversion rate 0.65 **tons of rice per ton of paddy**

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Commodity in process				384 615	275 142
Labor	Labor (parboiling)	0	0	19 000	19 000
	Labor (dehuller)	0	0	7 000	7 000
	Labor (trasnport)	0	0	1 000	1 000
		0	0	0	0
		0	0	0	0
Capital	Tank (parboiling)	15	0	3 000	2 609
	Machine (dehuller)	15	0	18 000	15 652
	Building (dehuller)	0	0	200	200
	Truck	15	0	1 500	1 304
		0	0	0	0
		0	0	0	0
Tradable	Fuled wood (parboil)	0	0	15 000	15 000
	Fuel (dehuller)	30	0	13 000	10 000
	Maintenance (dehuller)	15	0	2 000	1 739
	Other expenditure (dehuller)	0	0	1 500	1 500
	Fuel for the truck (transport)	30	0	5 000	3 846
	Maintenance (truck)	15	0	1 000	870
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				471 815	354 862
	Unit	Price	Quantity		
REVENUE	ton	600 000	1	600 000	500 000
TAXES on REVENUE				0	
PROFIT				128 185	145 138

Irrigated Sim 0

The Policy Analysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	600 000	91 038	226 931	282 031
Social Price	E	F	G	H
	500 000	127 724	227 138	145 138
Divergence	I	J	K	L
	100 000	-36 686	-207	136 893

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C	282 031
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.45
3. SOCIAL PROFITABILITY	[H = E - F - G	145 138
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.61
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.71
6. TRANSFERS	[L = I + J + K]	136 893
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	1.20
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - I	1.37
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-	1.94
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.27
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	22.82

- Comparison between systems:

  The Irrigated system has a higher profitability than the Rainfed system as shown by the Financial Cost Benefit Ratio.

  In social price value, Irrigated rice system is also more efficient with a higher profit, however the differences is less than in private price value. When we use the SCB ratio the two systems are on a par basis. It shows that the yield gain achieved with the irrigated system just compensates the increase in cost.

  NPC are the same for both system, but EPC is higher for the Irrigated, indicating the higher protection/distortion induced by the irrigated system which use subsidized inputs.

➢ Simulation 1

QuickMap Simple spreadsheet for MA P Irrigated Sim 1

BUDGET 1: Rice producer per ha

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Labor	Labour	0	0	250 000	250 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
Capital	Irrigation infrastructure	0	30	18 000	25 714
	Tools	15	0	20 000	17 391
		0	0	0	0
		0	0	0	0
Tradable	Seeds	0	0	20 000	20 000
	NPK	0	0	74 000	74 000
	Herbicide	0	0	60 000	60 000
		0	0	0	0
		0	0	0	0
TOTAL COST				442 000	447 106
	Unit	Price	Quantity		
REVENUE	ton	250 000	2.5	625 000	
TAXES on REVENUE				10 000	
PROFIT				173 000	

BUDGET 2 : Post-Harvest per ton of rice

Conversion rate 0.65 **tons of rice per ton of paddy**

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Commodity in process				384 615	275 142
Labor	Labor (parboiling)	0	0	19 000	19 000
	Labor (dehuller)	0	0	7 000	7 000
	Labor (trasnport)	0	0	1 000	1 000
		0	0	0	0
		0	0	0	0
Capital	Tank (parboiling)	15	0	3 000	2 609
	Machine (dehuller)	15	0	18 000	15 652
	Building (dehuller)	0	0	200	200
	Truck	15	0	1 500	1 304
		0	0	0	0
		0	0	0	0
Tradable	Fuled wood (parboil)	0	0	15 000	15 000
	Fuel (dehuller)	30	0	13 000	10 000
	Maintenance (dehuller)	15	0	2 000	1 739
	Other expenditure (dehuller)	0	0	1 500	1 500
	Fuel for the truck (transport)	30	0	5 000	3 846
	Maintenance (truck)	15	0	1 000	870
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				471 815	354 862
	Unit	Price	Quantity		
REVENUE	ton	600 000	1	600 000	500 000
TAXES on REVENUE				0	
PROFIT				128 185	145 138

Irrigated Sim 1

The Policy Analysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	600 000	132 269	226 931	240 800
Social Price	E	F	G	H
	500 000	127 724	227 138	145 138
Divergence	I	J	K	L
	100 000	4 545	-207	95 662

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C	240 800
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.49
3. SOCIAL PROFITABILITY	[H = E - F - G	145 138
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.61
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.71
6. TRANSFERS	[L = I + J + K]	95 662
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	1.20
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - I	1.26
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-	1.66
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.191
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	15.94

The profitability at private price decrease compared to the initial situation with a Financial Cost Benefit ratio reaching 0.49 against 0.45. The level of EPS decreases accordingly with the elimination of the subsidy. The Nominal Protection Coefficient remains the same as there are no changes on the output trade policy.

- Simulation 2

QuickMap Simple spreadsheet for MA P Irrigated Sim 2

BUDGET 1: Rice producer per ha

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Labor	Labour	0	0	250 000	250 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
Capital	Irrigation infrastructure	0	30	18 000	25 714
	Tools	15	0	20 000	17 391
		0	0	0	0
		0	0	0	0
Tradable	Seeds	0	0	20 000	20 000
	NPK	0	0	37 000	37 000
	Herbicide	0	0	30 000	30 000
		0	0	0	0
		0	0	0	0
TOTAL COST				375 000	380 106
	Unit	Price	Quantity		
REVENUE	ton	250 000	1.6	400 000	
TAXES on REVENUE				10 000	
PROFIT				15 000	

BUDGET 2 : Post-Harvest per ton of rice

Conversion rate 0.65 **tons of rice per ton of paddy**

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Commodity in process				384 615	365 486
Labor	Labor (parboiling)	0	0	19 000	19 000
	Labor (dehuller)	0	0	7 000	7 000
	Labor (trasnport)	0	0	1 000	1 000
		0	0	0	0
		0	0	0	0
Capital	Tank (parboiling)	15	0	3 000	2 609
	Machine (dehuller)	15	0	18 000	15 652
	Building (dehuller)	0	0	200	200
	Truck	15	0	1 500	1 304
		0	0	0	0
		0	0	0	0
Tradable	Fuled wood (parboil)	0	0	15 000	15 000
	Fuel (dehuller)	30	0	13 000	10 000
	Maintenance (dehuller)	15	0	2 000	1 739
	Other expenditure (dehuller)	0	0	1 500	1 500
	Fuel for the truck (transport)	30	0	5 000	3 846
	Maintenance (truck)	15	0	1 000	870
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				471 815	445 206
	Unit	Price	Quantity		
REVENUE	ton	600 000	1	600 000	500 000
TAXES on REVENUE				0	
PROFIT				128 185	54 794

Irrigated Sim 2

The Policy Analaysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	600 000	121 154	326 623	152 223
Social Price	E	F	G	H
	500 000	116 609	328 598	54 794
Divergence	I	J	K	L
	100 000	4 545	-1 974	97 429

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C	152 223
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.68
3. SOCIAL PROFITABILITY	[H = E - F - G	54 794
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.86
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.89
6. TRANSFERS	[L = I + J + K]	97 429
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	1.20
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - I	1.25
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-	2.78
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.195
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	16.24

We suppose that due to budgetary constraint, farmers are not able to increase the cash allocated to input purchase to compensate for price increase, and therefore reduce the amount of fertilizer applied. The corresponding decrease in yield affects both the financial (private value) and the economic (social value) performances of the system. The domestic factor per ton of rice produced increase from 226 931 AU in Sim 1 up to 326 623 AU in Sim 2. The level of profit declines and the FCB increase from 0.45 up to 0.68, the DRC increase from 0.61 up to 0.86.

The comparison of simulation 1 and simulation 2 indicate that it important to take into account changes in factors allocation corresponding to changes in factors prices induced by policy changes.

➢ Simulation 3

QuickMap Simple spreadsheet for MA P Irrigated sim 3

BUDGET 1: Rice producer per ha

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Labor	Labour	0	0	250 000	250 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
Capital	Irrigation infrastructure	0	30	18 000	25 714
	Tools	15	0	20 000	17 391
		0	0	0	0
		0	0	0	0
Tradable	Seeds	0	0	20 000	20 000
	NPK	0	50	37 000	74 000
	Herbicide	0	50	30 000	60 000
		0	0	0	0
		0	0	0	0
TOTAL COST				375 000	447 106
	Unit	Price	Quantity		
REVENUE	ton	250 000	2.5	625 000	
TAXES on REVENUE				10 000	
PROFIT				240 000	

BUDGET 2 : Post-Harvest per ton of rice

Conversion rate 0.65 **tons of rice per ton of paddy**

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Commodity in process				384 615	275 142
Labor	Labor (parboiling)	0	0	19 000	19 000
	Labor (dehuller)	0	0	7 000	7 000
	Labor (trasnport)	0	0	1 000	1 000
		0	0	0	0
		0	0	0	0
Capital	Tank (parboiling)	15	0	3 000	2 609
	Machine (dehuller)	15	0	18 000	15 652
	Building (dehuller)	0	0	200	200
	Truck	15	0	1 500	1 304
		0	0	0	0
		0	0	0	0
Tradable	Fuled wood (parboil)	0	0	15 000	15 000
	Fuel (dehuller)	30	0	13 000	10 000
	Maintenance (dehuller)	15	0	2 000	1 739
	Other expenditure (dehuller)	0	0	1 500	1 500
	Fuel for the truck (transport)	30	0	5 000	3 846
	Maintenance (truck)	15	0	1 000	870
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				471 815	354 862
	Unit	Price	Quantity		
REVENUE	ton	600 000	1	600 000	375 000
TAXES on REVENUE				0	
PROFIT				128 185	20 138

Irrigated Sim 3

The Policy Analysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	600 000	91 038	226 931	282 031
Social Price	E	F	G	H
	375 000	127 724	227 138	20 138
Divergence	I	J	K	L
	225 000	-36 686	-207	261 893

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C	282 031
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.45
3. SOCIAL PROFITABILITY	[H = E - F - G	20 138
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.92
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.95
6. TRANSFERS	[L = I + J + K]	261 893
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	1.60
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - I	2.06
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-	14.00
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.70
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	43.65

The decrease of rice price on the world market translates mechanically into a decrease of the comparative advantage of the system. The DRC is closed to one which indicates that the threshold beyond which the system will have no comparative advantage is almost reached. The Effective Protection Rate reached 2.07 against 1.37 in the initial situation.

- Simulation 4.

QuickMap Simple spreadsheet for MA P Irrigated Sim 4

BUDGET 1: Rice producer per ha

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Labor	Labour	0	0	250 000	250 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
Capital	Irrigation infrastructure	0	30	18 000	25 714
	Tools	15	0	30 000	26 087
		0	0	0	0
		0	0	0	0
Tradable	Seeds	0	0	20 000	20 000
	NPK	0	50	55 500	111 000
	Herbicide	0	50	45 000	90 000
		0	0	0	0
		0	0	0	0
TOTAL COST				418 500	522 801
		Unit	Price	Quantity	
REVENUE		ton	250 000	2.5	625 000
TAXES on REVENUE					10 000
PROFIT					196 500

BUDGET 2 : Post-Harvest per ton of rice

Conversion rate 0.65 **tons of rice per ton of paddy**

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Commodity in process				384 615	321 724
Labor	Labor (parboiling)	0	0	19 000	19 000
	Labor (dehuller)	0	0	7 000	7 000
	Labor (trasnport)	0	0	1 000	1 000
		0	0	0	0
		0	0	0	0
Capital	Tank (parboiling)	15	0	4 500	3 913
	Machine (dehuller)	15	0	27 000	23 478
	Building (dehuller)	0	0	200	200
	Truck	15	0	2 250	1 957
		0	0	0	0
		0	0	0	0
Tradable	Fuled wood (parboil)	0	0	15 000	15 000
	Fuel (dehuller)	30	0	19 500	15 000
	Maintenance (dehuller)	15	0	3 000	2 609
	Other expenditure (dehuller)	0	0	1 500	1 500
	Fuel for the truck (transport)	30	0	7 500	5 769
	Maintenance (truck)	15	0	1 500	1 304
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				493 565	419 454
		Unit	Price	Quantity	
REVENUE		ton	600 000	1	600 000
TAXES on REVENUE					0
PROFIT					106 435

Irrigated Sim 4

The Policy Analysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	600 000	122 154	244 335	233 512
Social Price	E	F	G	H
	750 000	177 182	242 272	330 546
Divergence	I	J	K	L
	-150 000	-55 028	2 063	-97 035

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C	233 512
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.51
3. SOCIAL PROFITABILITY	[H = E - F - G	330 546
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.42
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.56
6. TRANSFERS	[L = I + J + K]	-97 035
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	0.80
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - I	0.83
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-	0.71
10. PRODUCERS SUBSIDY RATIO	[L / E]	-0.13
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	-16.17

QuickMap Simple spreadsheet for MA P Rainfed Sim 4

BUDGET 1: Rice producer per ha

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Labor	Labour	0	0	182 000	182 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
Capital	Fence	0	0	7 000	7 000
	Tools	15	0	10 500	9 130
		0	0	0	0
		0	0	0	0
Tradable	Seeds	0	0	20 000	20 000
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				219 500	218 130

	Unit	Price	Quantity		
REVENUE	ton	250 000	1.2	300 000	
TAXES on REVENUE				0	
PROFIT				80 500	

BUDGET 2 : Post-Harvest per ton of rice

Conversion rate 0.65 **tons of rice per ton of paddy**

Cost item	Description	Taxes (%)	Subvention (%)	Private price value	Social price value
Commodity in process				384 615	279 654
Labor	Labor (parboiling)	0	0	19 000	19 000
	Labor (dehuller)	0	0	7 000	7 000
	Labor (trasnport)	0	0	1 000	1 000
		0	0	0	0
		0	0	0	0
Capital	Tank (parboiling)	15	0	4 500	3 913
	Machine (dehuller)	15	0	27 000	23 478
	Building (dehuller)	0	0	200	200
	Truck	15	0	2 250	1 957
		0	0	0	0
		0	0	0	0
Tradable	Fuled wood (parboil)	0	0	15 000	15 000
	Fuel (dehuller)	30	0	19 500	15 000
	Maintenance (dehuller)	15	0	3 000	2 609
	Other expenditure (dehuller)	0	0	1 500	1 500
	Fuel for the truck (transport)	30	0	7 500	5 769
	Maintenance (truck)	15	0	1 500	1 304
		0	0	0	0
		0	0	0	0
		0	0	0	0
		0	0	0	0
TOTAL COST				493 565	377 385

	Unit	Price	Quantity		
REVENUE	ton	600 000	1	600 000	750 000
TAXES on REVENUE				0	
PROFIT				106 435	372 615

Rainfed Sim 4

The Policy Analaysis Matrix
UC per ton of rice

	REVENUE	COSTS		Profit
		Tradable Input	Domestic Factors	
Private Price	A	B	C	D
	600 000	73 641	316 719	209 640
Social Price	E	F	G	H
	750 000	66 823	310 561	372 615
Divergence	I	J	K	L
	-150 000	6 818	6 158	-162 976

INDICATORS

1. FINANCIAL PROFITABILITY	[D = A - B - C	209 640
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.60
3. SOCIAL PROFITABILITY	[H = E - F - G	372 615
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.45
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.50
6. TRANSFERS	[L = I + J + K]	-162 976
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	0.80
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - I	0.77
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-	0.56
10. PRODUCERS SUBSIDY RATIO	[L / E]	-0.22
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	-27.16

Following the devaluation, the increase in the tradable price value has a negative impact on the financial performance of the Rainfed system with a FCB increasing from 0.45 up to 0.51. On the contrary we observe an improvement of the DRC which decrease from 0.61 down to 0.42 due to the lag in price private price output adjustment to the social price. If the government decides to maintain a lower price for the private price of rice, the negative transfer noted in the PAM will correspond to the level of taxation of the system to the benefit of the rest of the economy.

Comparing the respective impact of the devaluation changes of both systems we observe that the Rainfed system RCB increase is lower compare to the Irrigated system RCB. This is due to the lower share of tradable input in the cost structure of the Rainfed system. In term of transfer, the Rainfed system having less subvention compared to the Irrigated, its more heavily taxed than the Rainfed system.

Summary sheet

INDICATORS		Rainfed Sim 0	Irrigated Sim 0	Irrigated Sim 1	Irrigated Sim 2	Irrigated Sim 3	Irrigated Sim 4	Rainfed Sim 4
1. FINANCIAL PROFITABILITY	[D = A - B - C]	235 877	282 031	240 800	152 223	282 031	233 512	209 640
2. FINANCIAL COST-BENEFIT RATIO	[C / (A - B)]	0.56	0.45	0.49	0.68	0.45	0.51	0.60
3. SOCIAL PROFITABILITY	[H = E - F - G]	144 527	145 138	145 138	54 794	20 138	330 546	372 615
4. DOMESTIC RESOURCE COST	[G / (E - F)]	0.67	0.61	0.61	0.86	0.92	0.42	0.45
5. SOCIAL COST-BENEFIT RATIO	[(F + G) / E]	0.71	0.71	0.71	0.89	0.95	0.56	0.50
6. TRANSFERS	[L = I - J - K]	91 349	136 893	95 662	97 429	261 893	-97 035	-162 976
7. NOMINAL PROTECTION COEFFICIENT	[A / E]	1.20	1.20	1.20	1.20	1.60	0.80	0.80
8. EFFECTIVE PROTECTION COEFFICIENT	[(A - B) / (E - F)]	1.22	1.37	1.26	1.25	2.06	0.83	0.77
9. PROFITABILITY COEFFICIENT	[(A-B-C)/(E-F-G)]	1.63	1.94	1.66	2.78	14.00	0.71	0.56
10. PRODUCERS SUBSIDY RATIO	[L / E]	0.18	0.27	0.19	0.19	0.70	-0.13	-0.22
11. EQUIV. PRODUCER SUBSIDY	[100 * L / A]	15.2	22.8	15.9	16.2	43.6	-16.2	-27.2