

PN-ARR-342
87' 10

Kingdom of Morocco
Ministry of Agriculture
And Agrarian Reform

USAID/Morocco
Agriculture and Natural
Resources Office

**CEREALS MARKETING REFORM PROJECT
(CMRP--PHASE II)**

PRELIMINARY STUDY

OF

**AGRICULTURAL DATA NEEDS OF THE MOROCCAN
MINISTRY OF AGRICULTURE**

by

D. Benatya et. al.

July 1992

PRCC--12

Table of Contents

I. INTRODUCTION	1
II. DATA NEEDS	2
A. The changing economic environment and its impacts on data needs	2
B. Market information	3
1. Price information	3
2. Market system information	5
C. Cost and supply information	6
1. Cost of production	6
2. Analysis of farmer behavior	7
3. Aggregate supply information	8
D. Farm income analysis	8
E. Cost-benefit analysis	8
F. Monitoring and evaluation of agricultural development	9
G. Data needs from sources outside MARA	10
H. Sub-sector data needs	11
1. Cereals	11
2. Livestock	11
3. Fruit and vegetable crops	11
I. Data need priorities	13
III. CURRENT DATA COLLECTION SYSTEM	13
A. Adopted sampling methods	13
B. DPAE/CSD current data collection system	14
1. Area frame construction	14
2. Sampling methodology	15
3. Data collection methods	16
4. Survey management	16
5. Non-sampling error	16
6. Current surveys	17
7. Human and computer resources	18
C. DPV current data collection system	19
D. DE current data collection system	20
E. ONICL current data collection system	20
F. Assessment of the current statistical system	21
1. Area sampling frame	21
2. Non-Probability methods used in MARA	21
3. Unified system of official MARA statistics	21

IV. THE IDEAL DATA COLLECTION SYSTEM	22
A. General approach	22
B. Organizational structure	23
C. Quality	23
D. Timing	24
E. Sampling	24
F. Technology	25
G. Resource needs	25
V. RECOMMENDATIONS	26
A. Market information system	26
B. More economic data collection and analysis	27
C. Allocate more resources to exterior units	28
D. Data collection is a service function	28
E. Administrative recommendations	29
F. Recommendations for the statistics unit	30
G. Computer related recommendations	32
BIBLIOGRAPHY	33
ANNEX	35

Table of Acronyms

ASPAM	Citrus Crop Producer Association
ASPEM	Early Season Horticultural Crop Producer Association
CMR	Cereals Marketing Reform Project
CMV	Development Center (<i>Centre de Mise en Valeur</i>)
CT	Work Center (<i>Centre de Travaux</i>)
DCLF	Cereals, Legumes and Forage Division
DE	Livestock Department
DPA	Regional Agricultural Department
DPAE	Department of Planning and Economic Affairs
DPV	Crop Production Direction
EEC	European Economic Community
ENA	National Agricultural School
FRUMAT	Moroccan Company of Fruit Processing (<i>Fruitière Marocaine de Transformation</i>)
GATT	General Agreement on Tariffs and Trade
IAV	Agronomic and Veterinary Institute Hassan II
MARA	Ministry of Agriculture and Agrarian Reform
NASS	USDA National Agricultural Statistics Service
ONICL	Grain Marketing Board (<i>Office National Interprofessionnel des Céréales et des Légumineuses</i>)
ORMVA	Regional Office of Agricultural Development
PASA	Agricultural Program of Adjustment
SEEMP	Service of Economic Studies, Markets and Prices
SSD	Statistics, and Documentation Service
UMA	Maghreb Arab Union
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

/

PRELIMINARY STUDY OF
**AGRICULTURAL DATA NEEDS OF
THE MOROCCAN MINISTRY OF AGRICULTURE**

I. INTRODUCTION

This report provides a general assessment of the data needs and capabilities of the Ministry of Agriculture (MARA). It considers data needed for economic policy analysis and formation as well as for furnishing information necessary for the efficient functioning of a market oriented agricultural economy. Data capacity is considered in the context of both current and potential capacity to produce the information identified in the needs assessment. Data production capacity is examined in detail for the statistics service (SSD) of the planning and economic affairs direction (DPAE). The technical directions of crop production (DPV) and livestock production (DE), ONICL, the DPAs and ORMVAs, and regional and local offices of these units are covered in less detail.

This study of agricultural data needs was requested at this time for two main reasons. First, significant progress has been made in data collection and analysis in recent years in DPAE and the Ministry of Agriculture in general. DPAE has received technical assistance from USAID project O182, Planning, Economics, and Statistics for Agriculture in Morocco since 1984. More recently DPAE and ONICL have been receiving technical assistance from USAID through the Cereals Marketing Reform project. Second, Morocco has launched many policy changes intended to liberalize agricultural markets. In that connection, USAID has launched an agricultural business project in Morocco.¹ Hence, it is the changes in data collection and analysis capacity coupled with the changes in the economic environment of agriculture that have brought about the need for this assessment.

The study has the following four major objectives:

- 1) To evaluate the current data collection systems in MARA
- 2) To analyze the current organization of data collection efforts
- 3) To make recommendations concerning a) changes in data being collected, b) responsibilities for data collection and diffusion, and c) the methods of collection, diffusion, and analysis
- 4) To identify specific priority areas for the reform and optimization of MARA data collection efforts that will need further study and development.

The precise terms of reference for the study team are included in this report as Annex.

¹ The three above mentioned USAID projects have provided funding for this study.

The remainder of the report is divided into four sections. The section following this introduction covers the team's assessment of data needs both for agricultural policy analysis and decision making and for improved functioning of free markets in agricultural inputs and outputs. Section three provides the team's assessment of current data collection capacity in SSD and other parts of MARA and ONICL. In section four, we begin the process of combining data needs (demand) and capacity (supply). It describes an ideal data collection system to meet the needs indicated in part two. In a sense, it is a target for which to aim -- a system desired in the future for Moroccan agriculture. Part five contains our recommendations for the near term. The recommendations concern (a) a market information system; (b) increased data needs for economic analysis; (c) allocation of more resources to exterior units; (d) data collection as a service function; (e) administrative changes; (f) specific recommendations for SSD; and (g) computer related recommendations.

II. DATA NEEDS

A. The changing economic environment and its impacts on data needs

The environment of the agricultural sector has been changing significantly since 1983 with the adoption of structural adjustment policies. The reforms have been affecting the agricultural sector through exchange rate devaluation, trade liberalization and reduction of public expenditures. The agricultural program of adjustments (PASA) has generated new needs for economic analyses. It is now time to determine the extent and amplitude of adjustments to be made in the Moroccan agricultural statistical system in order to enhance its capacity to respond to new agricultural questions.

At present, agricultural data comes from a number of different administrative units within and outside the Ministry of Agriculture. The information has been used mainly for supply management, extension, agricultural policy actions, monitoring, and also for planning. The sets of variables cover production, input use and market prices. Each agricultural organization has been collecting the subset of information relevant to its domain of action.

Liberalization of the agricultural sector and the macroeconomic environment induces demand for new information that can be used to monitor and evaluate the effects of policy changes. The need for such knowledge will increase with trade liberalization and the regional and international negotiations now under way (EEC, UMA, GATT).

While some of these information needs can be met with data obtained from other ministries, demand for information on the agricultural sector will increase significantly in the months and years ahead. With the increased importance of

communes rurales, agricultural chambers, etc., more attention will need to be devoted to local and regional agricultural problems. This focus implies a reorientation of the current data system, which has been oriented towards national level data collection.

In addition, data will be needed on environmental conditions in the agricultural sector and on changes in the stock of renewable natural resources. Medium and long term questions relating to soil and water quality and forest and grazing areas will become increasingly important.

The following sections focus on specific types of data needs anticipated for the near future. The data needs include market information, cost and supply information, farm income information, cost-benefit data, data for monitoring and evaluating agricultural development, data needs from sources outside MARA, and specific data needs by sub-sector. The final part of this section provides priorities on the various data collection needs.

B. Market information

Market information is needed for several purposes.² In this assessment we will focus on two major uses of market information:

- 1) Market price information intended to improve the functioning and efficiency of a market economy -- information intended for use by buyers and sellers, and
- 2) Market information intended for studies aimed at improving understanding of the functioning of the market, estimating consumer or producer response to changes in prices, or other types of economic analysis.

1. Price information

Reliable price information is needed both for efficient functioning of markets and for analysis of economic policy issues in a market economy. In this section we will discuss a price information system that would provide timely price information for both purposes.

a. A market information system

Markets function well in the presence of good information and less efficiently when information is poor or one sided. Given this reality, most governments consider provision of market information a public

² See "An Overview of Agricultural Market Information Systems" by R. B. Schulte (CMR Report 14) and "Système d'Information sur le Marché des Céréales: PLAN D'ACTION PROPOSÉ" (CMR Report 15).

good and provide public funds to gather, distribute, and analyze market information.

A market information system must consist of at least the following characteristics:³

- 1) The information must be credible and of high accuracy
- 2) The information must be timely, normally within 24 hours of actual market transactions being reported
- 3) The information must be equally accessible to both buyers and sellers

The reason for the first characteristic is obvious -- users of the information must believe the information before they will use it in making decisions. Timeliness, the second characteristic, is important because market conditions can change very quickly. While older information may be quite satisfactory for the economist doing price analysis, information must be current to be useful to participants in the market. Finally, the information must be equally available to both buyer and seller to avoid giving advantage to one or the other in transactions.

In Morocco, market information is needed for a wide range of commodities. At present information is collected (but not diffused) on the major cereals (durum wheat, bread wheat, barley, and maize), important legumes (fava beans, lentils, and chick peas), and major fruits and vegetables (clementines, oranges, apricots, peaches, pears, apples, bananas, potatoes, tomatoes, and onions). Eventually the number of fruits and vegetables will need to be expanded significantly.⁴ Also, prices for meat and fish products, animal feed ingredients, and important agricultural inputs will need to be added.

Ultimately, markets representing the entire country will need to be covered. Initially, however, it would be adequate to cover principal markets in those areas representing the majority of the transactions in the country. It is important to note, that the important markets are not always in major production zones; some are closer to consumption centers. With the accumulation of data and understanding of correlation among markets, the market coverage can

³ See CMR reports 14 and 15 for more information on the details of desired and necessary characteristics of a market information system.

⁴ See the 25 June 1992 issue of *L'Economiste*, page 37 (or any weekly issue), for a more comprehensive list of products. Also note that these data were collected 23 June, and the publication date is 25 June.

be adjusted to provide the best information at lowest cost.

Price information for most products will be needed on a daily basis to be useful. Eventually, if futures markets or even more sophisticated cash markets develop in Morocco, it may be desirable to collect and diffuse information from the largest markets more than once per day. For example, one could envision a morning market news report from the Casablanca market diffused by radio at 9:30 a.m. each market day.

Market information needs to be diffused to be useful. The most important means at the present time in Morocco are radio, newspaper, and information bulletins posted at convenient places in or near souks and/or wholesale markets. All three of these distribution mechanisms should be used. It is very important that the information be distributed every market day with no more than a one day delay. Morning newspapers should carry prices from the previous day. There should be an early morning agricultural news program on the radio and, eventually, television.⁵ Prices from the previous day should be posted no later than opening time for markets on the following day.

In addition to daily price reports, it would be desirable to distribute weekly and monthly price summaries containing longer-term price trends. This information could be useful for the public as well as policy makers.

b. Price analysis

In general, the price information collected for the market information system can be used for quantitative price analysis. For this purpose, the daily data must be stored in a data base permitting retrieval in the form of weekly, monthly, or annual averages on a regional or national basis. The data base should reflect the importance of the particular market for each commodity so that quantity weighted averages instead of simple arithmetic averages can be used. There are some statistical problems with this weighing that will need to be resolved.

2. Market system information

a. Improved understanding of the system

Data on the supply and demand sides of markets help identify market imperfections and enhance knowledge about marketing systems. With the liberalization of cereal marketing, it is important to assure

⁵ Agricultural news programs (radio and television) in the United States normally run at 6:00 or 6:30 AM. They cover agricultural markets as well as other items of interest to farmers.

free entry and exit in these markets. Market structure, conduct and performance studies can identify ways to reduce market imperfections. This will require detailed information about producers, sellers, buyers, and the spatial and temporal aspects of the various marketing systems.

b. Commodity flows, transport, and storage

Understanding commodity flows requires information on production, market supply, demand, and foreign trade. Such data can provide the basis for a social accounting matrix for the agricultural sector. These data should be desegregated by region and locality. Optimization and econometric analyses of such data can answer numerous technical and economic questions.

Storage and transport affect production, supply and demand of inputs and outputs, inter-regional trade, input and output quality, and availability of goods through the year. Analysis of transportation and storage costs for specific commodities can reduce the spread between producer and consumer prices by suggesting high priority improvements in the marketing system.

c. Sub-sector studies

Sectoral and sub-sectoral economic models are useful for evaluating agricultural policies in free markets. Such models require knowledge of technical coefficients, prices, and an understanding of how the sub-sector operates in order to identify appropriate goals and constraints. Knowledge on the interaction of a given sub-sector with others (e.g., crops and livestock) is also required.

C. Cost and supply information

Cost and supply information is useful for evaluating technologies and for predicting both individual and aggregate farmer behavior.

1. Cost of production

Cost of production information can be helpful in establishing or revising national or regional price support levels. It is useful in identifying new technologies and for estimating comparative advantage among regions in crop or livestock production. Production cost data are used to estimate cost and profit functions which have several applications in economic analysis, such as estimating input demand functions. Production cost information, supplemented with other information, also is useful in determining levels or changes in farm or enterprise income. The current mode of operation between SSD and SEEMP (Service des

Etudes Economiques, des Marchés, et des Prix) is good. In the future, it will be desirable to have participation from technical directions (e.g., DPV and DE) as well. SEEMP needs to publish reports each year with the cost of production survey information.

Regional coverage of cost of production surveys will depend primarily on the objectives of the particular study. Cereals and livestock are spread over most agricultural regions, while industrial crops (except sunflower) are located in large irrigated perimeters. Citrus and early season vegetable crops are mainly located along the Atlantic coast while vegetables grown for local consumption are scattered throughout the country.

The timing of data collection is also important for cost of production studies. At present in Morocco, the cost of production survey is done once per year in late summer/early fall. The information collected covers all the agricultural operations that occurred over the past agricultural season (about 10 months). It would be preferable to have at least two passes so that soil preparation, planting, weeding, and other early operations could be collected in one pass (January-March), and the remaining operations after the harvest. The current system envisions going to each province twice (two years in a row). Then the province would be rotated out and a new province added. With current resources, no more than two or three provinces can be done per year. It would be desirable to increase the resources so that about four provinces could be done per year, and some could be done three consecutive years to get better cost information linked to yield variability. Appropriate estimation of production functions can improve the efficiency of data collection.

The number of passes needed and the frequency of collection will vary significantly by target crop. Up to present, the cost of production surveys have concentrated on cereals and legumes. When horticultural crops are added, the methodology will need to be revised in order to produce viable economic information.

2. Analysis of farmer behavior

Cost of production survey data can and should be used to create representative farm models to improve understanding of farmer behavior and to perform economic analyses of policy and technology alternatives. Some additional data may be necessary in order for standard cost of production data to be used to develop representative farm models. These models may require input use by activity by crop and by time of year. In other words, data are needed not only for total labor or fertilizer used on a crop, but by activity (planting, plowing, weeding, harvesting, etc.) and by time of year when that activity is done. Prior information on the crop calendar used in the region often helps to allocate the resources used to the proper time period. However, it is important that all the data needed for representative farm modeling be included in the farm cost survey at the level of disaggregation required for the particular modeling technique being considered.

Representative farm models are commonly used to evaluate new or improved technologies at the farm level. For example, representative farm models have been used in Morocco to estimate the impact on farm income, crop mix, and input use of the introduction of a new pest resistant variety of wheat. Representative farm models also can be used to obtain information at the micro level on the impact of policy changes. In Morocco, these models have been used to estimate the impact of changes in the support price for wheat, to estimate the impact of greater freedom of choice on crop mix for farmers in irrigated areas, and to estimate the impact of increased fertilizer use.

DPAE needs to have representative farm models for all the major producing regions and major agricultural production systems. Given the importance of livestock production, models that include both livestock and crop production will be helpful. DPAE should attempt to produce/update at least two models per year. It is likely to take 10-20 models to cover major production systems. Representative farm modeling should be considered a standard part of the work plan for the economic studies unit of DPAE.

3. Aggregate supply information

Information on aggregate supply is used for sectoral analysis, for projecting production and prices under various demand scenarios, and for agricultural policy analysis. Estimating aggregate supply requires knowledge of various production technologies, yield, area, input use, livestock numbers, and prices, all on a regional basis. Usually, the data come from cost of production surveys, sectoral marketing studies, consumption surveys, and other associated information.

D. Farm income analysis

Farmer disposable income is an important determinant of living standards and the demands for credit in rural areas. In Morocco a large number of farmers get income from outside farming. Moreover, many farming units consume and sell goods and services including family labor. Data for farm income analysis come from both household and cost of production surveys. Farm household models provide the microeconomic foundations for sectoral models. Household surveys provide information on household characteristics, labor allocation between farming and non-farming activities, education, household consumption and production. In the future, it may be wise to continue the practice begun this year of combining the cost of production and farm household surveys into one survey.

E. Cost-benefit analysis

The service of projects in DPAE has responsibility for monitoring and evaluation of projects. The projects are usually funded by external donors. At present a baseline survey is often, but not always, done; sometimes the baseline

information is based on norms. When the project is evaluated, another survey is conducted to attempt to obtain impact measurements.

Project analysis and technology assessment should be done in a with-without framework, not a before and after framework. All of the economic calculations are done with the project in place and without the project in place. Baseline information may be needed to establish information on actual conditions before the project is implemented. The baseline survey information must be supplemented with other information to project what would have happened in the project zone without the project. This analysis can be done by comparing results in the project area with a similar area outside the influence of project activities. The evaluation survey is then used to provide information on what happened with the project. It is very important to avoid the before-after framework and cast the entire analysis in a with-without context. In order to do project analysis correctly, DPAE will need to have baseline household and cost of production surveys or some evidence that the project areas and control areas were the same before the project began. The same information needs to be gathered in the evaluation survey that follows the project. A number of the techniques described above such as farm budgets, representative farm models, and enterprise budgets are used in project analysis.

Technology assessment follows a somewhat similar procedure except that often the assessment is done *ex ante* so that technical parameters must be used to perform the assessment. The with-without framework is still used for technology assessment.

F. Monitoring and evaluation of agricultural development

It's clear that MARA departments will have an ongoing need for information and data that will permit the ministry to describe and evaluate its activities. At the present time there is considerable duplication in what the various departments are requesting from the provincial services and the ORMVAs. If one central service such as SSD were to collect all common data, and either have it ready one or two months before the other departments have to report on their activities, or were itself responsible for reporting on all common data, much of this duplication could be avoided.

Yet, even if all duplication is removed, each department will still need to report on those activities that are particular to its domain of responsibility. As long as SSD is not providing reliable statistics for these activities each department will have to do whatever it can to get the data it needs, especially data intended to monitor the activities for which it is responsible. The need for at least some such data will never cease.

Data needed for monitoring agricultural activities are already being collected by the various departments. Each can use help in improving methodology. A high priority responsibility of SSD should be to provide that service. Some of what is

now being collected is of questionable value and can be eliminated with little consequence. MARA should set up a committee to review each department's annual report and make recommendations on what data can be eliminated and what needs to be added with particular emphasis on harmonizing the information. The same committee should meet each year to review in detail current and future MARA data needs.

Data needed for evaluating agricultural development activities is another matter. These measures should be gathered by someone other than the department responsible for the activity. SSD is an obvious choice. The nature of the data to collect will depend on the development activity being evaluated. But there will usually be a core of data relating to changes in area, production, yields and quality that will be essential to all evaluations. Since few agricultural development initiatives impact on the entire country, SSD will have to provide lower level data having a reasonable precision in order to allow evaluation of many activities.

G. Data needs from sources outside MARA

In order to prepare sectoral and sub-sector models, DPAE will need to obtain data on the micro and macroeconomic environment in which agriculture operates. For this purpose, exchange rate, interest rates, price deflators, human consumption, animal consumption, and demand of the processing industries will be required. Such data exist and can be obtained from regular publications of ministries of planning, economic affairs, and finance, and from producer associations.

Demand analysis is a major component of sectoral and sub-sector models. Up to the present, demand has been estimated through a pluriannual household consumption survey conducted about every ten years by the ministry of plan. The results from those surveys are presented mainly in the form of descriptive statistics about consumption patterns of different food and non-food items, and consumers' expenditures. Most of the results presented are highly aggregated. Household surveys (see above) might help enhance the estimation of demand for agricultural food commodities.

Most of the information needed for analyzing Morocco's agricultural trade is available from the Ministry of Foreign Trade. That ministry produces printouts on imports and exports by country of origin or destination for all major agricultural commodities. The major problem is that the data are not available on electronic media and must be re-entered by DPAE. Arrangements should be made to obtain the data in electronic form so it will be accessible sooner and will not have to be re-entered by DPAE. In the future, data may be needed by port of export for certain commodities.

H. Sub-sector data needs

1. Cereals

ONICL collects data on cereals production, trade, prices, and transport and storage margins. It uses this information mainly for purposes of managing domestic markets through price and import controls. Area, production, and yield data are produced annually by SSD. The SEEMP conducts economic studies on cereals cost of production, cereals supply, and other topics.

Since the mid 1980s Morocco has progressively removed certain internal and border controls on cereals prices and marketing. It appears that the public resources which formerly were devoted to control now need be reoriented toward provision of information which would enhance efficiency in cereals markets. As the sub-sector moves to a market orientation, information about prices, marketing, transportation and storage and foreign markets becomes critical. This information should be collected, diffused to the private sector, and used for economic studies.

2. Livestock

At present, the livestock direction is undertaking a price collection program for meat and animal feed products. The prices are collected from several points around the country. Because of the drought, the prices are being collected more frequently (weekly) this year than normally. In the future, it will be very important to provide meat and animal feed prices on a daily basis so that the prices can become a part of the price diffusion system described above.

The livestock direction also has launched a study of animal production systems. This study should permit it to obtain better information on what systems are being used and the relative economic efficiency of each. Ideally, the livestock direction should work with SSD and SEEMP of DPAE on two aspects of this study. First, SSD should be involved in making sure that the sampling system will yield representative results. Second, SEEMP should collaborate in the economic analyses of the different systems. Gaining a better understanding of the economic consequences of crop-livestock systems is very important in Morocco.

3. Fruit and vegetable crops

Reliable but incomplete data on horticultural crops is available from two sources, both producer associations geared towards exports. The part of national production coming from non-associated producers is not well understood. For most fruits and vegetables, national consumption exceeds exports by a substantial amount. The availability of production from seasonal and open-field producers can have a major impact on the amounts that are delivered for export or for processing, and on the returns to investments in these areas. Getting good production, crop forecasting and price data on this sub-sector is high on the list of priorities of several public agencies and agro-industries, especially those food processors which

pre-sell their pack.

ASPAM, the citrus crop producer association, has good area data but needs reliable harvest forecasts from MARA. Reliable forecasts are absolutely necessary to avoid poor coordination between contracts to sell overseas and the supply of citrus in local markets. Insufficient or excessive delivery in relation to external contracts can be expensive.

Periodically, ASPAM does a citrus tree census in order to monitor area planted by region, by age, and by variety of trees. ASPAM needs a new census every five years in order to adjust the base used for annual estimates.

The last citrus census done in 1991 with technical assistance from SSD, included all producers having more than 50 trees, 300 being the number typical for a hectare. According to these results, orchards less than one hectare represent 42% of the total, but account for only 3% of total area. These figures suggest that small producers don't have an important impact on total production, which was affirmed by the director of ASPAM.

Concerning prices, ASPAM expressed interest in wholesale market prices assuming the delay does not exceed seven days. This data could come from the SSD survey without difficulty and with a reduced cost. ASPAM obtains prices from FRUMAT and from external markets. For external market prices, a delay of seven days is much too long for the information to be useful.

The early season horticultural crop producers association (ASPEM) expressed a need for better statistics on local production (for export) and on production by its competitors in world markets. This information will make it easier to maximize the amount of foreign exchange earnings generated by fresh vegetable exports. The association is now talking with MARA on how to get better information on external markets.

Production data appears to be a major problem for open-field, non-industrial fruits and vegetables. It would seem to be worthwhile to do some experimentation with SSD area and production data to see if it would be possible to get better information from current data collection resources. This might include re-stratification in order to create a separate stratum for vegetable production. Aggregating fruit and vegetable crops into four or five sub-groups with similar consumption characteristics may also provide better quality data on area and production. Adding a second or third pass during slack data collection periods for horticultural crops might be possible. SSD should begin to try to get a better handle on the domestic as well as the export component of this important agricultural activity.

I. Data need priorities

The above sections have described a wide range of data needs for market information and economic analysis. This section attempts to establish some priorities among the many economic data needs.

The highest priority at present is to establish an operational price cellule that collects and diffuses price information (wherever collected) on a daily basis. The cellule should establish a time table by October 1 for making this system fully operational. It should be possible to have a fully functioning system by the end of 1993.

The second priority is to standardize the cost of production and household surveys and make them a part of the permanent set of surveys done each year. The cost of production and household information is essential for much of the economic analysis that needs to be done.

The third priority is to establish a data base within DPAE/MARA containing the data collected by MARA and data from external sources (exchange rates, interest rates, trade data, etc.) and to establish means of obtaining most of this data electronically.

III. CURRENT DATA COLLECTION SYSTEM

Most of the information published by MARA is based on data collected through a system of probability and non-probability sample surveys undertaken by DPAE, DPV, and DE. The objective of this section is to present, discuss and assess the performance of the current data collection system.

A. Adopted sampling methods

Sample surveys are well known and widely accepted as the means of providing statistical data on an extensive range of subjects. The subject of sample design deals with the process of selecting a part of the population to represent the whole. The basic distinction to be made is how the sample is selected. With a probability sample, each population element has a known, non-zero chance of being selected. Consequently, selection bias is avoided.

The major strength of the probability selection mechanism is that it permits the development of statistical theory to examine the properties of estimators. Thus, unbiased estimators can be developed and the relative precision of estimates can be determined. The weakness of non-probability methods is that the level of precision cannot be determined. Non-probability sample quality can only be assessed by subjective evaluation, not by standard statistical methods. Despite their theoretical weakness, various forms of non-probability sampling such as

haphazard, judgement, and quota sampling are used in practice, mainly for reasons of cost and convenience.

Probability sampling requires the existence of a sampling frame from which the sampled elements can be selected. In a simple case, when a list of all the population elements is available, the frame may be the list. When there is no list, the frame is some equivalent procedure for identifying the population elements. Area sampling provides a good illustration of such a frame. With this technique, each element of the population is associated with one and only one geographic area. A sample of areas is drawn, from which, either all or a sub-sample of elements are included.

B. DPAE/SSD current data collection system

Since 1974 when MARA assumed responsibility for agricultural surveys, various approaches to data collection have been employed. A variety of sampling frames, some dating back to 1961 have been used. Some of the frames were based on a census of agriculture taken by the Ministry of Plan in 1974, and others on the "general farm data file" established by MARA in 1976. This farm data file soon replaced all previous frames and became the standard for agricultural surveys. It has been used for the construction of statistical reference information systems at both the national and regional levels.

A douar-based survey methodology involves inaccuracies linked to the confused and complex notion of a douar, to the construction and updating of the sampling frame and to the difficulty of verifying responses of selected farmers. For such reasons MARA eventually determined that the douar-based frame was inadequate.

To overcome the difficulties and improve the quality of the results, MARA, with the assistance of the USAID and the US Department of Agriculture introduced area frame sampling. The intention was to gradually replace the old sampling system on a province by province basis. Following is a general description of the area sampling frame as it was adopted by MARA.

1. Area frame construction

Area frame sampling is the term commonly used where the sampling units are areas of land (clusters). The procedure is basically multi-stage sampling in which maps rather than lists serve as the sampling frame. It has important advantages of versatility, completeness (coverage error), and durability. Its disadvantage is related to clustering, which can result in a larger design effect than would be the case from a sample drawn from a list of reporting units.

Area frame sampling has been progressively introduced into Morocco since 1980. Currently, about 80 percent of all agricultural areas were included in the

area frame. The remaining area will be added before the end of 1993.

The technical development of an area frame occurs in four stages: stratification, formation of zones, digitization, and segmentation.

- . Stratification: Stratification provides a method of using existing information to obtain greater precision from a sample of a given size. In principle it consists of dividing the domain under study into relatively homogeneous land areas called strata. The degree of the gain in precision depends on the degree of homogeneity within each stratum. Morocco uses eight land-use strata: non-irrigated cropland, irrigated cropland, fruit trees, forest, roads and uncultivated land, small towns, large towns and large douars.
- . Formation of Zones: To reduce the cumbersome task of defining sampling units (segments), it was necessary to regroup areas within given provinces into over 20,000 *zones naturelles*, from which the sample segments are drawn.
- . Digitization: In order to determine accurately the area of each natural zone, zones are digitized from boundaries drawn on maps. Microcomputer software that has been programmed to the scale of the maps then calculates the area of each zone as it is digitized. The 20,157 natural zones comprise 20,700,419 Ha.
- . Segmentation: Selected natural zones are partitioned into segment units, the number of which is determined by dividing area in the zone by the desired segment size for the stratum. Segment boundaries are identified on aerial photographs in a way to yield segments of approximately the same size by stratum. Field travel is often required to resolve issues of segment boundaries.

2. Sampling methodology

The general strategy is to use a two-stage stratified sample, utilizing the principle of defining heterogeneous primary sampling units (natural zones) which are grouped into strata and sampled with probability proportional to size. The secondary sampling units (segments) are then sampled with equal probability within each selected natural zone. The reporting units are tracts for the closed segment approach and farms for the open segment approach. Within a domain of interest, the calculation of sample size and its allocation to strata was determined by using the computer program "Allocate", developed by the USDA.

Several target values for the coefficient of variation (relative sampling error) have been used, depending on the importance of the agricultural commodities being produced in the domain under study. The range has varied from 5 to 15 percent. The final decision on size of sample took into account the desired precision and the human and material resources available in the region of interest.

The sample was selected stratum by stratum within a given domain of interest using replicated sampling, a process which selects a number of independent small samples called replicates rather than a single large sample. Sample sizes under this methodology can easily be changed by simply adding or deleting replicates. A total of 6660 segments have been selected in the national sample.

3. Data collection methods

Data are collected using the open-segment and closed-segment approaches. Either method will produce unbiased estimates. With the closed-segment approach data are collected only on the area within the segment boundaries. For crops and land use data, this method has the advantage of being verifiable on the aerial photograph used by the enumerator for segment identification. With the open-segment approach, the enumerator collects data on the entire farm, but only for those operators whose primary residence falls within the segment boundaries. Because of their mobility, livestock can best be estimated using the open-segment approach.

4. Survey management

All large-scale surveys are developed and managed from SSD headquarters in Rabat. Data collection, and to an increasing degree data entry, are managed by provincial field offices (services exterieurs). With the exception of the objective yield survey, data are collected by personal interview. In the case of objective yield measurements, cuttings are taken from random locations in selected fields.

5. Non-sampling error

The SSD has undertaken several measures to improve data quality and reduce non-sampling error in its recurrent statistics program. These include standardizing questionnaires, improved training, preparing and distributing instruction manuals, and greatly improving the data editing process.

The reorganization of SSD into functional divisions rather than project divisions has resulted in supervision and control activities having to compete with other survey design and execution activities within the survey bureau. To counter this, SSD should establish a recurrent program of central level supervision of field data collection activities.

One problem SSD does not seem to have is a lack of physical resources and operating budget for executing field supervision and monitoring activities by central staff. Resources are not so abundant in the provincial offices where vehicles are old and in short supply. This problem needs to be addressed. In addition, the long-term use of contractual staff for field data collection causes low morale as such personnel lose hope that their good work will lead to their being absorbed into the civil service.

An effort to analyze the variance in responses of enumerators as a check on non-sampling error lasted only one year even though key staff members were pleased with the results. This important activity should be continued on an annual basis. Another activity consisted of gathering 3-4 enumerators from each of the provinces in one of four regions for further training provided by Survey bureau staff. The strategy was to train the *Chef d'équipe* who would, in turn, train the enumerators in his team. This activity was providing good results and was done for three years, but not last year for lack of central staff time. The survey bureau intends to resume both of these activities as soon as the work load permits. Additional resources should be made available to ensure that such efforts continue.

An ongoing supervision activity that appears to be working well while building a certain esprit de corps consists of using the Chef de Service Extérieur from 6-7 provinces to supervise the data collection activities in another province. Each year different chefs de service and different target provinces are chosen. This process will continue until all provinces are covered. This activity provides each chef with the opportunity effectively to evaluate his own performance. According to the survey bureau chief, everyone seems to want to participate and the results are beneficial.

· 6. Current surveys

SSD conducts both recurring and special surveys. Recurring surveys are scheduled according to the agricultural production cycle and have as their goal the measurement of crop and livestock production and prices. Special surveys are conducted at the request of various agencies and organizations, normally under the MARA sphere of influence.

Recurring Surveys: Results of the recurring surveys are always published at the national, province, DPA, and ORMVA levels. The principle recurrent surveys are:

- LAND USE SURVEY (Enquête Occupation du Sol): This survey provides an estimate of land occupied by various crop and land uses for all the provinces of the kingdom. In combination with yield data from a later survey, estimates from this survey are used in determining crop production.
- SUBJECTIVE YIELD SURVEY (Enquête Prévisionnelle): This survey is conducted in April of each year. The object of the survey is to get an early estimate of yield potential for the four cereals (hard wheat, soft wheat, barley and corn).
- OBJECTIVE YIELD SURVEY (Enquête Rendement Objectif): The objective yield begins in June and continues through September depending on the crop and the climatic zone of the country. The survey provides a measurement of final yield by crop. Cuttings are taken from a sub-sample of fields identified in the land use survey. Field data are collected just prior to harvest.

- **LIVESTOCK SURVEY (Enquête Elevage):** This survey is conducted twice per year, in May and October. The objectives are to estimate inventory numbers of cattle, sheep, goats and work animals and to estimate production of animal products, principally milk and wool. Collecting data twice in the same year does a better job of covering production and marketing activities which, for livestock, are continuous.
- **PRODUCER PRICE SURVEY (Enquête Prix à la Production):** This is a broad-based survey conducted just following harvest and designed to establish farm level prices for field and horticultural crops. Crops included in the survey are cereals (hard wheat, soft wheat, barley, oats, alpist, and sorghum), legumes (fava beans, peas, lentils, chick peas, and orobe), and other crops such as olives, sunflowers, and peanuts.
- **MARKET SURVEY (Enquête Souk):** This survey collects daily price data for cereals and legumes from souks in 13 important provinces. Prices are for hard wheat, soft wheat, barley, corn, broad beans, lentils, and chick peas.
- **WHOLESALE MARKET SURVEY (Enquête Marché de Gros):** Data are collected daily for selected markets in the six most important provinces of Morocco. Data are collected on prices of clementines, oranges, peaches, pears, apples, bananas, potatoes, tomatoes and onions.
- **Special Surveys (Enquêtes Ponctuelles):** In parallel with the recurring surveys, there are a certain number of special surveys conducted, usually for organizations or agencies associated with MARA. On average, there might be 3 or 4 per year of such surveys. Examples of recent special surveys include:

(Enquêtes Projets Intégrés de Développement Agricole),

Citrus census (Recensement Agrumicole),

Olive survey (Enquête Oléicole),

Ag industry survey (Enquête Unités Agro-Industrielles),

7. Human and computer resources

At the present time, the service is composed of three bureaus: sampling, surveys and data processing. The central office has 103 employees of which 13 are *ingénieurs d'état*, 3 *ingénieurs d'application*, 5 data processing specialists, 33 *adjoints techniques*, 11 *agents techniques et publiques*, 16 keypunch operators, and 22 agents.

Funding from a joint USAID/MARA project provided for advanced computer equipment, an aerial photography laboratory and printing equipment. Central to the computer hardware is an IBM 4361 minicomputer equipped with 19 data entry

stations. In addition, there are some 21 microcomputers installed in the central office. Over the past few years, six regional field offices have been equipped with microcomputers, thus relieving the central office of some of the burden of data entry.

C. DPV current data collection system

With the exception of sugar cane, sugar beets and cotton, for which administrative data are available, crop data are collected in a subjective manner. For cereals, legumes and forage crops, a series of data are collected from different DPAs and ORMVAs. Questions are of a general nature and concern crop condition throughout the growing season. Data are summarized at the CT or CMV level and sent by the DPA or ORMVA to the DPV/DCLF. As harvest time approaches, technicians travel through their administrative areas to examine the condition of the crops and make a subjective evaluation of expected yield.

Horticulture crops are more difficult to estimate. Figures provided by the DPAs and ORMVAs can be biased. In an effort to improve these estimates, DPV contacts certain trade associations and considers their input data when setting the final estimates.

Among the horticultural crops, the statistics on citrus appear to be the best. Each year the association of Moroccan citrus producers (ASPAM) estimates the production of its members, and the amount and price of exports. However, with liberalization, this task becomes more and more difficult.

ASPEM (Association des Producteurs Exportateurs de Maraîchage et Primeurs du Maroc) provides MARA with the best statistics on production of winter vegetables for export. Taxes on exported produce, the previous year's production, and data on area and production given to it by its member groups supplement field agent reports.

In spite of the effort made, estimates of horticultural crops remains inaccurate. The data collection system focus on central tendency rather than examining the principle problems in this developing sector. For this reason, horticultural data have limited value.

There are two cases to note for industrial crops. First, crops produced under contract (sugar cane, sugar beets and cotton) for which acceptable data are available, and second, other crops for which data are either lacking or are of poor quality. It should be noted that in addition to the data collected by the field offices, the DPV receives information from DPAE, other MARA directions and other public establishments working in the agricultural sector.

D. DE current data collection system

In general, data concerning animal production (inventories, sales, losses, etc.) are supplied by SSD while subjective information is supplied by the DPAs and ORMVAs. Occasionally, DE conducts studies in collaboration with IAV, ENA, and private companies. In addition, DE collects data on red meat production and prices and on certain livestock products. Except for slaughter data, which is of reliable quality, other data are collected using either subjective methods (DPA data, souk surveys) or purposive samples (prices).

E. ONICL current data collection system

ONICL now has 33 offices that cover the entire country. Through these offices it monitors internal prices for cereals as part of its market regulation and stabilization functions. ONICL has been collecting market prices on cereals since 1938.

At the present time ONICL collects weekly or more frequent market prices for the four principal cereals (hard and soft wheat, barley and maize) and legumes (fava beans, peas, chick peas and lentils) in 35 souks and 15 grain halls spread across 17 regions. The markets are selected according to their importance by volume of sales, and include both surplus and deficit producing areas. These data are transmitted to the central service in Rabat by telex every week and are entered into spreadsheets.

ONICL price data are communicated regularly to MARA, the Ministry of Plan and the Ministry, delegated to the Prime Minister's office, charged with Economic Affairs and Privatization. There is no current program of timely public distribution of these data, though ONICL has just begun producing a monthly newsletter that summarizes the price data for the previous month. ONICL now has computers in each of its offices and has the capacity to transmit prices on the day following collection if necessary. It appears to be willing to transmit this data to SSD for timely publication to all market participants.

Neither ONICL nor SSD follow rigorous procedures for sampling methodology, the time of collect, the quality of grain or the volume and type of transaction associated with the price data that is necessary to ensure consistency across time and space in its data. This creates noise that compromises the usefulness of such data for economic and market analysis. The short time period for our study did not allow us to evaluate how effectively modifications in the price collection methodology for either service would be implemented. ONICL has indicated receptivity to assistance from SSD in order to enhance the statistical quality of its price data.

F. Assessment of the current statistical system

1. Area sampling frame

The Moroccan experience in area frame sampling in agriculture has been positive, although the degree of performance is related to the type of survey, the type of reporting units, and to the method adopted for collecting the data.

The closed segment method has been found to be satisfactory for estimating crop area, especially for survey items that appear in a high proportion of the segments. Closed segment data has not proved satisfactory for livestock estimates and for data relating to farm operations (social and economic data, farm size etc.). The closed segment approach has been easier for enumerators to understand and apply.

The open segment method has been used to collect entire farm data and to make livestock estimates. Good results are obtained from regions where the "resident operators" are nearly uniformly distributed among the segments and the average segment size is small. However, results are not encouraging in areas where resident operators are clustered (douars, villages). Considerable research remains to be done for improving the accuracy of data related to farming operations and to livestock numbers. In fact much more experience is needed as a basis for practical judgement on the choice of data collection methods.

2. Non-Probability methods used in MARA

Since non-probability methods are subjective, there is no objective method for assessing their accuracy. However, one should emphasize that there are many ways when personnel judgement, "when it is good", can be utilized effectively in improving sample design, provided judgement is not used in the final selection of the elements to be included in the sample.

Our advice is to use probability sampling whenever possible. If non-probability sampling is used, one should be cautious about expanding the results.

3. Unified system of official MARA statistics

The DPAs and ORMVAs are frequently asked for communal and other statistics that are not covered by the SSD data. They are forced to give an answer, and they respond as best as they can, generally relying on the statistical data gathered by the CTs. In order to reduce this problem it seems appropriate to combine the various existing sets of statistics produced by MARA to provide the best statistics possible at all levels that available resources allow.

The statistical service would still be responsible for maintaining provincial level relative error at the 5%-10% level for as many crops as resources allow. But in each province the DPA/ORMVA staff would have responsibility for developing

official estimates for communes. To generate a single set of consistent statistics the DPA/ORMVA would be required to produce communal level statistics that, when aggregated, are in complete agreement with the provincial estimate of the statistics service. The development of commune estimates would be done in an annual meeting consisting of MARA department heads in the province and whichever of their lower level staff could provide good judgement for making estimates. These preliminary estimates should then be reviewed by the statistics service and the directors of the technical departments in MARA before being accepted as official commune estimates.

IV. THE IDEAL DATA COLLECTION SYSTEM

The description of an ideal data system allows the team to set aside any preconceptions about current conditions and look objectively into a well coordinated, well organized future. While there will never be complete agreement on the composition of the ideal system, key components are widely known and widely used around the world. These will be developed systematically in the discussion to follow. The team recognizes that data needs, like other economic goods and services, are insatiable. Data users will always want to address more variables, in greater detail and with less time delay. While no system could ever satisfy all demands, the description of this hypothetical model should supply a basis for incremental change and improvement leading to a program that answers national needs and provides a sound basis for comparison with operational systems in economically developed countries. The term system will be used throughout the description rather than a more limiting term such as agency. It is doubtful that one agency could ever supply all the data needs of this important sub-sector. It is possible, however, and perhaps desirable that one agency could play the lead role in collecting basic agricultural statistics and additionally serve as a collecting point for data from other sources. The same agency should be responsible for developing and maintaining a computer data base of agricultural information readily accessible by users from all sectors of the economy.

A. General approach

The ideal data system should operate with a service bureau attitude, realizing that providing quality and timely data to users is the only reason for its existence. The various units of the system should closely collaborate and cooperate with the user community. Users should not only dictate data priorities, but they should also have a role in survey planning and questionnaire design.

The issue of data ownership is another philosophical issue. In the ideal system, whoever pays for the data has a right to the published results. In the case of government funded surveys, the owner of the survey results is the general public.

The ideal system should be an open one, within the bounds of confidentiality generally respected by statistical agencies. Survey procedures and results should be open to audit and, on occasion, experts from outside the system should be invited to participate in the process of setting estimates.

B. Organizational structure

In the ideal case, data will likely be collected by several units of MARA depending on the scope and objective of the data collection effort. At the center, however will be a statistical agency responsible for the major data collection activities. The statistical agency should be organized along functional lines to permit specialization in the areas of sample frame development and maintenance, survey design and management, and in data processing. The unit should report to a manager at a high level in MARA to assure good cross-agency collaboration. The work of the statistical agency should be programmed and budgeted well in advance with input from principle user groups. Principle publication dates should also be scheduled in advance, and the release dates respected.

The central statistical agency would have at least three levels of involvement in surveys:

- 1) For national and provincial level surveys, the agency will, in collaboration with principle users, design and conduct the surveys.
- 2) Where the data being collected is at the request of a specific client, a multi-disciplinary team of users and SSD staff should be formed to design the survey. Once data are collected and edited, they should be turned over to the client along with an explanation of the sampling procedures and the sampling error of key variables.
- 3) In the case where small area studies are needed by technical agencies, a mechanism should be in place to encourage early collaboration between the statistical agency and the subject matter specialist to maximize the benefit of the data collection effort. Advice should be given on a sampling plan, if needed, and on survey techniques most likely to be effective. The statistics office may or may not be involved in data collection, depending on the preference of the two agencies involved.

C. Quality

Statistical standards relating to sampling and data expansion must be respected and must be open to review by independent experts. Sample sizes and the related sampling errors should be determined by the needs of the survey and resources available and should be published with the survey results.

Quality control procedures should be initiated for all major surveys. A follow-up interview of 1 or 3 percent of the samples should be regularly conducted by interviewers other than the original ones. The quality control data should be carefully followed to detect signs of reporter bias and procedural weaknesses. Independent statistical audits should be conducted periodically to verify that sampling errors are within acceptable tolerances. A research effort should be established to:

- 1) Review literature from other statistical units around the world,
- 2) Make selected tests of possible new procedures under Moroccan conditions, and
- 3) Recommend improvements in survey methodology.

Careful attention should be paid to non-sampling errors all along the survey process. Subject matter experts from user groups should be consulted in all aspects of questionnaire and survey design. Attention should be given to international statistical standards and to research findings. Quality control should include careful pretests, adequate enumerator training, follow-up interviews and development of independent data sets which could serve as a verification of survey results. Shipments, stocks, import/export data, and animal health records are some examples of these kinds of data. Provisions should be made for continual training of professional staff, at both the central and regional levels, in the disciplines of statistics, sampling, data collection, and data processing.

D. Timing

Data usefulness is often directly tied to the time delay between collection and publication. The data system should include in its planning the resources needed to release data in a timely fashion. For national and provincial surveys, basic summaries should be available for publication within 10 days of the last day of data collection.

E. Sampling

Fundamental to accepted survey methodology is a sampling plan which will properly represent population. Sampling frames can be area or list based or both, depending on the variables being estimated. Multiple and varied sampling procedures that can represent all major production enterprises need to be developed. Because of the cost and complexity of developing and maintaining these frames, one agency should be charged with the responsibility of managing this task. Surveys that are provincial or national in level should be conducted by the statistical agency which has the expertise to do the sampling and properly expand the data. Smaller sample surveys could be conducted in one of two ways.

In collaboration with the data user, the statistical agency could 1) assume full responsibility for the data collection, or 2) the statistical agency could provide guidance that would allow users to collect the data themselves. For all medium to large scale sample surveys, sampling errors should be no more than 5 percent for major commodities and no more than 10 percent for minor ones.

F. Technology

The technology for a modern data system begins with adequate computer equipment. Both the quantity of data that can be processed and the quality of survey results are closely tied to the computer. To the extent possible, data entry and editing should be decentralized to the level where collection occurred, and where most information is available about the details of local agriculture. In the interest of timing, careful planning should allow for concurrent data collection, data entry, and editing. Summary procedures should be well tested and fully operational before the survey begins.

Particularly for large surveys, an effective means needs to be developed to transfer the data from the local offices to the central location where expansions, aggregation and summaries will be performed. The most effective approach is electronic transfer of edited data, but other methods can also be used with good results. The level of available technology and costs are the determining factors in making this decision. The minimum requirements for an electronic data transfer system would be:

- 1) an effective and dependable telephone system,
- 2) microcomputers at the sending and receiving sites, and
- 3) modems and communications software to accomplish the transfer of data.

When not in use as a communications device, the microcomputers could be used for data entry or other office applications.

In addition to the standard set of office automation software, the system will need a quality data entry program, a system for both interactive and batch edits and a statistical package capable of processing large raw data files efficiently. Desktop publishing and graphics software would also be useful.

G. Resource needs

It needs to be recognized that large-scale data collection programs are expensive. Users who need quality data in a timely fashion must be prepared to provide the resources necessary. By careful planning, money can be saved by combining data collection activities, by making better use of existing data and by keeping demands as simple as possible.

In addition to adequate funding, the data system will need experts in sampling, data processing, and survey design and management. Work should be arranged along functional lines in order to take advantage of the special skills of key employees. The management philosophy should be one of professionalism and pride and one where good work is rewarded.

V. RECOMMENDATIONS

In this section we provide recommendations that can be implemented in the near term to help move from the current situation towards a much improved system of data collection, analysis, and diffusion.

One overall theme behind many of the specific recommendations is that there needs to be a reallocation of resources within the Ministry of Agriculture towards the collection, analysis, and diffusion of information. Morocco has made substantial progress in liberalizing its economy. Controls have been removed. Many state functions have been or are being privatized. Considerable progress has been made in changing from a centrally directed economy to a market oriented economy. There has not been, however, a corresponding reallocation of resources within the Ministry of Agriculture from control functions to functions needed by a market economy. In the past, the MARA directions were responsible for provision and distribution of some inputs, for controlling some prices, for monitoring certain planned activities, etc. In principle, the resources used for these activities should be available for reallocation to activities designed to support the efficient functioning of a market economy. We strongly recommend that MARA and affiliated agencies examine the current resource allocation within the administration and reallocate resources to the provision of better data collection, diffusion, and economic analysis.

A. Market information system

Markets function well when there is adequate information widely available to the participants in the market. Both buyers and sellers need price information from nearby markets to make good marketing decisions. If that information is not available or if it is more accessible to either buyers or sellers, then the markets will function less efficiently. In most countries, provision of market information is considered a public responsibility and is performed by the government.

Agricultural market information is not being provided to market participants at present. Because of that, markets cannot be expected to function at the highest efficiency. We recommend that an agricultural price information system be established to provide price information to the public on major agricultural commodities and on major markets in different regions of Morocco on a daily basis. This information should be diffused to the public in less than 24 hours. Diffusion

should be in at least three forms:

- 1) Posting the information on previous day prices in or near the market sites
- 2) Announcing prices on the radio each morning for the previous day
- 3) Publishing in newspapers each morning prices from the previous day from major markets for important commodities

To implement this recommendation, adequate resources will need to be allocated to the unit responsible for price information.

We recommend that one unit (the price cellule) be responsible for collection and dissemination of price information on all agricultural commodities in Morocco. That is, cereal and legume prices, fruit and vegetable prices, animal and animal feed prices should all be the responsibility of one unit. There are considerable efficiencies in data collection and distribution if one unit does all agricultural prices. If professional associations collect price data, that data should be transmitted to the MARA price data cellule for dissemination and data storage.

Obtaining accurate price information is very important for the credibility of a price reporting system. Eventually, it will be important for Morocco to have quality standards (as has been done for meat) and to report prices according to quality. For the present, it is important to define precisely the prices to be collected so that all data collection agents are collecting the same information. For some products, this will mean specifying a variety; for others it may involve training data collectors to obtain prices on the same quality of product everywhere. The level in the price chain from farm gate to wholesale to retail is another important consideration. Adequate training for the data collectors is very important in assuring accuracy of the price information being collected.

For animal and animal feed prices, at least in the near term, it may be desirable to have the prices collected by the Livestock Direction but immediately transferred to the price cellule for dissemination. The Livestock Direction has the technical knowledge of the animal, animal product, and animal feed markets that will help insure high quality information. Data in other areas that requires a strong technical background for proper collection could be handled in the same way. However, eventually, it will be desirable to have all price data collected and disseminated by the same unit.

B. More economic data collection and analysis

Agricultural statistics in the past has concentrated on planted area, yield, production, and livestock numbers. These statistics will continue to be important. However, we recommend that a greater fraction of the resources for data collection be allocated to economic data needed for policy analysis and for

monitoring economic conditions in agriculture. More information is needed on cost of production, farm income, etc. by size of farm and by production technology used. More economic information also is needed on mixed crop-livestock farming systems. Cost of production and farm household surveys should become part of the permanent set of surveys done by the statistics unit. There should continue to be close coordination between the economic analysis unit (currently Service des Etudes Economiques) and the statistics unit (currently the Service des Statistiques et de la Documentation) on designing the surveys. Staff from technical directions should be included in the study teams as well. Analysis of the survey data should be the responsibility of the economic studies unit. Outputs from the analyses should include use of production inputs as well as cost of production, representative farm analysis, and other economic studies.

C. Allocate more resources to exterior units

There are three major forces driving the recommendation to allocate more resources to exterior units. First, with market oriented reforms, there is a significantly increased demand for more information by province, by ORMVA, or even by commune. Morocco needs additional data collection and analysis capacity at these levels. Secondly, the central statistics unit will have vastly increased responsibilities if these recommendations are accepted. More of the work in entering and editing data will need to be done at province, DPA, or ORMVA levels in order to avoid overloading the central statistics unit. Thirdly, such a reallocation would facilitate the development of a unified system of official MARA statistics covering all levels down to the commune. The total of commune level estimates in each province should equal SSD's provincial estimate.

By strengthening the exterior units, it would be possible for certain ORMVAs, DPAs, or even communes to add local resources to the data collection process in order to increase sample size or improve accuracy for statistics of particular interest to them. The central statistics unit should continue to have responsibility for creating or reviewing the sampling methodology, designing or reviewing questionnaires, and providing national and provincial statistics. However, we recommend that the process become a bit more flexible to permit local units to add resources in order to obtain information of particular use to them. We would envision in this case, that the local unit could execute data collection for the survey (with training from the central statistics unit), and enter and edit the data. The data would then be sent electronically (or by diskette) to the central statistics unit for compilation and entry into the MARA data base. The data would also be available for use at the local level.

D. Data collection is a service function

The central statistics unit needs closer linkages with users of its information. There should be an annual meeting between the statistics unit and each of the

technical directions to make sure the needs of the technical directions are well understood by the statistics unit. Also, SSD should present a seminar for each technical direction explaining the statistical methods and procedures used in their data collection, editing, tabulation, and publication. The technical directions need a better understanding of the complexity of the statistics operation.

The central statistics unit provides data collection services for the entire Ministry of Agriculture. That is as it should be. MARA needs to move rapidly in the direction of probability surveys for most kinds of data collection. Otherwise, the survey information cannot be extrapolated to a larger scale with a known precision. For that reason, the central statistics unit should be involved, at least on a consultative basis, in the design of all surveys in MARA. However, the central statistics unit cannot possibly collect and distribute every shred of data desired by every unit within MARA. This fact together with our recommendations for additional responsibilities for the statistics unit led us to suggest guiding principles determining the division of labor between the statistics unit and users of the data produced. Following considerable discussion, we established the following principles:

- 1) Certain surveys, such as national and provincial area, yield, and production, should be designed and conducted by the central statistics unit and the DPAE service exterieur, possibly with assistance from other levels (such as ORMVAs) in data collection, entering, and editing.
- 2) Surveys with high economic content such as cost of production and farm household surveys should be jointly designed and conducted by the economic studies unit and the statistics unit with the assistance of other technical directions. The economic studies unit should perform the economic analyses and publish the results in a timely manner.
- 3) Highly technical studies such as the livestock production systems analysis could be conducted by the technical direction but with assistance from the statistics unit in sampling design and methods (including questionnaire design, data editing, etc.).

E. Administrative recommendations

While some of the recommendations provided above will require administrative changes, the following additional recommendations are designed to minimize duplication and improve resource use:

- 1) No survey should be permitted unless the statistics unit has been offered the opportunity to provide technical assistance in designing the survey. If the statistics unit does not have the resources available to help, it would simply indicate that. If the proposers of the survey choose not to accept the recommendations of the statistics unit (for financial or other reasons), the

survey could go forward so long as the technical assistance from the central statistics unit had been sought.

- 2) Any unit planning to do a survey should inform other units in MARA and give them two weeks to offer suggestions or to request that the work be undertaken jointly. We encountered situations where significant cost savings and improved outputs could have been achieved had different units been aware of other work underway or planned.
- 3) Each service in DPAE (and eventually MARA) should prepare and distribute to all other services in DPAE an annual work plan in order that each service have better information on the work activities being planned by other services.
- 4) DPAE staff should be encouraged to publish and disseminate widely reports on the economic studies and project evaluations that are conducted. A considerable amount of good work is being done, but in most cases studies have had a very limited distribution, which diminishes considerably the effectiveness of the tremendous resources spent on data collection and analysis.

F. Recommendations for the statistics unit

- 1) The MARA central statistics unit should manage the central data base for data on Moroccan and international agriculture. The data base should be managed by the statistics unit but should be easily and quickly accessible to MARA users.
- 2) The statistics unit should begin to publish as soon as possible production, yield, and area statistics classified by irrigated and non-irrigated categories and yield classes. Use of factors of production from two or three recent years also should be published as soon as possible. As soon as resources permit (and perhaps after the agricultural census is completed), these statistics also should be published by farm size.
- 3) The statistics unit and the economic studies unit should work together to make maximum use of prior economic information on correlation of prices and costs among regions in order to streamline the data collection needed for economic analysis and market information.
- 4) DPV, DE, and the statistics unit should work together to produce a weekly report on crop and livestock conditions similar to the Crop/Weather report issued by USDA/NASS in the United States. The information collected is subjective in nature, but provides a timely account of conditions as the season develops. This report would answer many needs of the Minister, DPV, DE and others interested in the agricultural situation.

- 5) Given the increasing importance of agro-business and of horticultural crops to the Moroccan economy, efforts need to be made to improve the production and yield information on these crops. The statistics units should begin now to identify areas of concentration of horticultural production. Through research, it could determine whether estimates could be most efficiently improved by 1) increasing the number of segments in the area frame, 2) sampling from lists of producers, or 3) using a multiple frame (joint use of area and list frame). With the results of this research, the statistics unit could then take the appropriate action to bring the estimates within acceptable limits. To get good information on production of horticultural crops, it will probably be necessary to visit sample farms at least twice.
- 6) Acquire microcomputer based software to do data entry/data edit. The program BLAISE developed by the central statistics agency of Holland is a good example of such a software and is one that is available to developing countries at no cost. The software will allow local units to do editing of data before it is sent to headquarters for expansion and summary. This should improve data quality since local staff are usually more knowledgeable about the corrections that need to be made.
- 7) Data processing should include comparison with previous year's data (at least for a sample) on a farm by farm basis in order to help detect misreported or improperly keyed data.
- 8) Our team concurs with views expressed by several departments and services on the need for an agricultural census on a periodic basis. Census data would provide an accurate base for making annual production estimates, especially at the commune level, and would provide information not contained in the annual surveys. The census would also provide a list frame for other units to use to collect supplemental data.
- 9) Evaluation of the quality of data collected by SSD should become a recurrent activity. SSD should establish a regular program of re-interviews and spot checks by central staff and analysis of the variance in the data recorded by different enumerators to assure that the excellent reputation of DPAE data collection operations is maintained.
- 10) Crop production estimates suffer from a procedural fault that needs to be corrected. Production is derived by multiplying planted acres by biological yields taken from the objective yield survey. Two elements are missing in the formula. A sub-sample survey needs to be conducted to determine the percent of planted area that was actually harvested as opposed to that used for forage or abandoned. Secondly, research needs to be done to determine the correlation between biological yield and effective yield obtained by producers.
- 11) Research needs to be undertaken to determine the level of bias in farm survey data, especially declared livestock reports. It could be done with a

· sub-sample of the livestock survey and could consist of in-depth interviews with respondents and local authorities. Once known, the livestock data quality could be improved.

- 12) Work should begin immediately to evaluate using independent survey data and administrative data to serve as a base for adjusting/refining statistical estimates. Data related to inspections, vaccinations, and exports might be highly correlated with production and would be helpful when setting estimates.
- 13) SSD should improve its statistical method of estimation by using ratio or regression estimation. SSD should also study the possibility of using an other method of collecting data called weighted segment method.
- 14) SSD should allocate more resources to publishing outputs from the data that is collected. At present, there is considerable data being collected for which there are no published results. Unless the data can be summarized, results published, and data be made available for analysis, SSD should stop collecting the data.

G. Computer related recommendations

- 1) DPAE should proceed with the installation of the LAN (local area network) in the new building. The network will offer some information sharing, printer sharing, and communication possibilities not now available. DPAE will also be the home of the MARA data base. However, it is very important to understand that operation of the LAN will require a technical competence that does not currently exist in DPAE. At least two or three people should be thoroughly trained in network management.
- 2) MARA/DPAE should proceed as quickly as possible to obtain a connection to INTERNET, an international data network, to permit access to agricultural data and other information from around the world. INTERNET access will also provide electronic mail access to USDA, universities, and other organizations around the world.
- 3) A WAN (wide area network) is not needed at present. Communication needs between the external offices and the central network occur normally once per day for a very brief period. That type of communication need is better handled through modem connections than through a WAN, which offers instant communications 24 hours a day. When the real need is five minutes per day, 24 hour capability hardly seems justified. We believe that improving the computing capacity in the province offices would constitute a better use of resources.

BIBLIOGRAPHY

- Belghazi, S, M. El Mir, R. El Mezroui, "La Minoterie Artisanale: Enquête nationale de Juillet-Août 1989". INSEA/ONICL, Rabat, January 1990.
- "Bilan de la Campagne Agricole 1990-91: Productions Végétales". DPV/MARA, February 1992.
- "Commerce, Stockage et Transformations des Céréales: Rapport Principal". MARA/PRCC, CMR-9, Rabat, January 1992.
- Driouchi, A., R. El Mezroui, "Economie du Secteur des Légumineuses Alimentaires au Maroc". Le Secteur des Légumineuses au Maroc, Etude DPV-GTZ, pp. 71-105, Actes Editions 1992.
- "Etude sur le Suivi et l'Evaluation des Filières Lait et Viandes Rouges: Approche Méthodologique". DE/MARA
- Greenwood, "Système de Suivi du Développement Agricole: La Collecte et le Traitement des Données". Doct Principal No.5, FAO Project UTFN/MOR/002/MOR, Rabat, March 1988.
- "Les Données Principales du Marché Intérieur des Céréales et des Légumineuses". Marché des Céréales et des Légumineuses, Bulletin Mensuel Interprofessionnel d'Information de l'ONICL, ONICL, No. 1 et 2, April et May 1992.
- Parham, G.L., "Proposal for Electronic Communications and Networking in Morocco". ES/USDA Report for DPAE/MARA through USAID Project 608-182, January 1992.
- "Recensement Général du Verger Agrumicole National 1991". SSD/DPAE/MARA and Citrus Professional Association, Rabat, March 1992
- Shulte, B.R. "An Overview of Agricultural Market Information Systems". CMR-14, Rabat, May 1992.
- Shulte, B.R. et al. "Proposed Action Plan for the Cereal Market Information System". CMR-15, Rabat, May 1992.
- Steedman, C., H. Benaderrazik, "Sécurité Alimentaire et Réforme des Marchés Céréalières". CMR-18, Rabat, June 1992 .
- "Système de Suivi et d'Evaluation du Développement Agricole: Rapports Relatifs aux Journées d'Etudes". FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, July 1988.

"Système de Suivi et d'Évaluation des Activités de Développement Agricole concernant la DPV du Ministère de l'Agriculture et de la Réforme Agraire". Volume I, FAO Project UTFN/MOR/002/MOR, Rabat, March 1988.

"Système de Suivi du Développement Agricole au niveau de la Direction de la Planification et des Affaires Economiques, Rapport". Principal Document No.1A, FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, July, 1987.

"Système de Suivi du Développement Agricole au niveau de la Direction de la Planification et des Affaires Economiques, Annexes". Principal Document No.1A, FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, July, 1987.

"Système de Suivi du Développement Agricole au niveau des Offices Régionaux de Mise en Valeur Agricole". Principal Document No.2, FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, October, 1987.

"Système de Suivi du Développement Agricole: Directions Provinciales de l'Agriculture". Principal Document No.3, FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, October, 1987.

"Système de Suivi et d'Évaluation: Contenu du Système National Proposé pour le Suivi et Evaluation du Développement Agricole". Principal Document No.4, FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, December, 1987.

"Système de Suivi du Développement Agricole: Modalités de Mise en Place". Principal Document No.6, FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, April, 1987.

"Système de Suivi et d'Évaluation du Développement Agricole au niveau des Direction Techniques du Ministère de l'Agriculture et de la Réforme Agraire". Principal Document No.18, FAO Project UTFN/MOR/002/MOR for DPAE, Rabat, October, 1987.

ANNEX

**BACKGROUND AND TERMS OF REFERENCE FOR
A PRELIMINARY STUDY ON AGRICULTURAL DATA NEEDS FOR THE GOM
MINISTRY OF AGRICULTURE**

This paper provides terms of reference for a general review of statistical data needs within the Moroccan Ministry of Agriculture. The focus is on key data on the production and marketing of important crop and livestock subsectors, both for the domestic and export markets. The overall objective is to review Morocco's agricultural data needs for the next decade and to begin a process of reflection on how these data can best be collected to improve their usefulness, scientific quality and the overall efficiency of their collection. Given the dimensions of this topic, this study should be seen as preliminary in nature, resulting in both near and longer-term recommendations for the optimization and rational evolution of MARA agricultural data capacity.

1. Background: Reasons for the Study

Statistical data systems need to be reviewed periodically to make sure that the right data are being collected with the right methods and subject to the most useful analyses. In the Moroccan context, there are four major reasons for undertaking this type of review:

1.1.) Changes in economic policy orientation: a greater emphasis on market mechanisms (in cereals for example) increases the relevance of market information systems and market analysis. Second, increased emphasis on production of high value crops for both the domestic and export markets by new types of integrated agri-business firms requires an even more sophisticated data system on production and marketing (as contemplated in the new USAID/GOM agribusiness project);

1.2.) New data communication and computer technologies are rapidly being introduced in Morocco and are changing the opportunities to produce, transmit, analyze data. For example, in its new building, DPAE has decided to set up a LAN and is planning to set up a WAN to enable modern data communications with provincial offices. It is important that MARA avoid wasting its resources in setting up duplicate telecommunications/data transmission systems and duplicate field staff. Resources should be concentrated so the Ministry can have one adequately staffed and equipped "data office" in all provinces of the Kingdom;

1.3.) Over the past decade MARA has given more statistical data collecting responsibilities to DPAE/SSD which has also received substantial technical assistance, particularly from USAID project 182. Now it is relevant to review SSD's data-collection mandate to ask whether further responsibilities and greater resources would help rationalize MARA's field data collection capability.

There seem to be areas where the division of labor is still a bit unclear. In some cases statistical data are still being collected by other directions (DE, DPV, ONICL, etc.) that might be more efficiently collected by SSD. In a few cases two parts of MARA are collecting approximately the same kinds of data (eg: cereals price data being collected by both SSD and ONICL). The major question to be answered is this: does it make sense to consolidate most agricultural data collection functions in SSD and, at the same time, improve the data analysis capabilities of different "user groups" such as DPV, DE, DPAE, ONICL? Or are there valid reasons to maintain a duplication of statistical personnel in provincial field offices?

1.4.) In the past few years there has also been a great increase in economic analysis capability in MARA, much of it concentrated in DPAE. Having a "critical mass" of economists (as well as ingenieurs agricole) has led to changes in the types of analyses undertaken and changes in types of data needed to undertake these analyses. Experience in the first phase of PRCC have indicated that

some types of data (having to do with the economic functioning of farms, livestock producers, marketing firms, exporters and importers of agricultural products, etc.) are not available to do the kinds of analyses that are needed by national decision-makers considering changes in agricultural policy. Therefore, the adequacy of current data for economic analysis must be assessed. Even in areas of strength in the current system -- such as annual area and production estimates for field crops -- there are weaknesses that have been revealed (eg., inability of current data system to deliver production data by size of farm -- *taille d'exploitation*). Also, more complex interactions among subsectors (such as crop/livestock relationships) can not be adequately addressed.

2. Objectives of Study

The objectives of the "Agricultural Data Needs Study" (*Etude en Besoins des Données Agricoles*) are:

2.1. Evaluate the current MARA systems for agricultural data collection with respect to: types of data collected, methods used, adequacy of data collected for major MARA uses: program administration, reporting and evaluation, information diffusion and outlook, economic and policy analysis, etc. Areas of emphasis and specific problem areas are listed in the methods section below.

2.2. Analyze the organization of current data collection efforts in terms of allocation of responsibility, availability of resources, technical efficiency, implications of new computer and communications technology (WAN, etc.) for the organization of collection and transmission procedures in the local offices and in Rabat.

2.3 By the end of the study period, make any warranted recommendations on: (a) changes in types of data to be collected, (b) in collection and diffusion responsibilities by MARA agencies (in Rabat and in field offices), and (c) on collection, diffusion, and analysis methods.

2.4 Recognizing the complexity of this subject, the current consultancy should be seen as laying out the major orientations for the reform and optimization of MARA agricultural statistical gathering capability. In this vein, the team will identify specific priority areas of for additional study and development.

3. Study Methods

3.1 Areas of focus: the study should place major emphasis on addressing the following priority areas in Moroccan agricultural statistics:

(a) **Crop data collection:** review the state of current SSD collection of data through the five major annual surveys. In some uses of statistical data in recent years, a number of problems related to the area frame method have been identified. These should be addressed: inability of current system to produce data by farm size and whether crops are grown under irrigation or not. This capability is critical to the development of relevant models for farm production and for addressing key policy issues. In addition, the development of an improved system for cost of production estimation and its relationship to these sampling issues and the development of meaningful representative farm types should be addressed.

(b) **Livestock and livestock/crop interactions:** Review current data collected and its adequacy for conducting more complex analyses required in optimizing livestock systems through improved feeding and marketing and implications for other policy reforms that may change the relative prices of crops and crop byproducts used as feed.

(c) **Horticultural crops:** With some expectations, data collection on horticultural crop production and marketing is woefully inadequate for purposes of policy analysis and improving the performance of these important subsectors that seem to have so much potential for growth in exports and employment. This topic will be explored and receive assistance under the new USAID agribusiness project. Therefore, this study should make preliminary recommendations on types of data, collection responsibilities, and so forth to be developed in more detail by the agribusiness project.

(d) **Price Data and Market Information:** As Morocco continues the agricultural sector liberalization process begun in the mid-1980s, there are important changes occurring in the need for improved price data and market analysis, particularly for dissemination to the private sector. The PRCC, in collaboration with ONICL and DPAE, has begun to explore the needs for an improved Market Information System (MIS) for cereals (SIM -- Système d'Information sur le Marché). This effort is concentrating on the development of a market news service on domestic cereals and less on the development of "more analyzed data products" such as market situation and outlook reports that are also important and deserve attention. MARA currently has the situation where two services are collecting very similar cereals price data, with none of this data accessible to the public in any form at all. The collection of market data for analysis and diffusion to the public has major implications for the organization and work of MARA's different directions.

(e) **Irrigated/industrial crops:** The final area that should receive attention is data on industrial crops such as sugar and oil seeds. This also raises the issue of standardization of data collection methods and procedures between the DPAs (with largely dryland agricultural responsibilities) and the 9 ORMVAs (with responsibilities for agriculture in the major irrigation schemes of the country).

3.2 Administrative Steps to be Taken by MARA: Given the scope of this preliminary study, it is vital for success that a certain amount of preliminary information contacts be conducted by MARA personnel before the start of the consultancy period (June 22-July 17). Each concerned Department (DPV, DE, ONICL, DPAE) will be asked to describe his current data collection method and results, develop current and future data needs, provide a staff member knowledgeable in this matter to directly correspond as needed with the team.

3.3 Organization and Logistics:

(a) **Personnel:** The personnel for this study would be paid for primarily by USAID (under projects 182 and 191). The following are suggested (all US and two Moroccan for three weeks each, one Moroccan consultant would work for six weeks: one extra week to help MARA in study organization and logistical arrangements, then two additional weeks for finalizing report in French.)

Outside Consultants:

- Data Systems and Statistics Consultant: Will Sherman/ USDA (182 covers all costs)
- Economic Analysis Needs: Dr. Wally Tyner (182 covers salary; 191 travel and per diem)
- Field Data Collection Specialist: Dr. Tom Zalla or someone with similar profile (191 covers all costs)

Moroccan Counterparts (all costs to be born as a pre-implementation expense by USAID agribusiness project):

- Data Systems and Statistics: consultant from INSEA
- Economic Analysis Needs: consultant from IAV or ENA
- Field Data Collection: consultant from IAV DDR or Science Humaine

(b) Other costs: per diem for US consultants for entire per diem, for Moroccan consultants during field visits (2/3 days for Data Systems and Economic Analysis sub-teams and 1 week for field data sub-team).

(c) USAID and MARA would designate one team member as team leader for the three week period when all consultants are working together. The team should present an outline of the draft report to the steering committee at the end of week one.

(d) At the beginning of the third week of work, preliminary conclusions would be presented to the MARA steering committee, so that reactions can be taken into account in finalizing report. A draft report in French would be provided to the steering committee for review at the end of three weeks. One Moroccan consultant would then meet with the steering committee and have the balance of two additional weeks to make changes to the draft report and have the final report completed in French. 50 copies of the final report will be produced (10 to USAID and 40 to MARA).