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EARLY WARNING AND FOOD INFORMATION SYSTEMS IN BANGLADESH: ISSUES, EVIDENCES AND NEED FOR ACTION

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Executive Summary

Conceptual aspects of early warning for food management were identified and analysed. The important elements of early warning practices were identified. The important factors influencing crop output were highlighted. The general economic indicators influencing food production and availability were identified and their nature influences were analysed.

The methods applied to arrive at forecasts of food crop production were identified as: (a) monitoring crop conditions on the basis of agro climatic data; (b) reporting planting intentions, progress of sowing, crop development and conditions, area damaged and other factors related to crop production; (c) making regular survey to assess area, yield and production of crop; and (d) estimating regression models describing the relationship between selected weather parameters and final yield.

The history of early warning exercises in Bangladesh was traced and the works accomplished under different initiatives were highlighted. The background of the current early warning project was discussed and the works undertaken and accomplished through the project were highlighted. Some constraints to the realization of the objectives were identified and some guidelines for improving early warning for better food management were suggested.

1. Conceptual Aspects of Early Warning for Food Management

Early warning system is an essential management tool for safeguarding and improving food security. Its main objective is to give timely signals of impending food shortages or surpluses by providing advance information on possible shortfalls in production or abnormally large harvest of the basic foodstuffs. This enables the government to initiate timely measures to mitigate the harmful impacts on producers and consumers and on the national economy. An effective early warning system provides sufficient lead time between prognosis and actual occurrence of food shortages or surpluses and enables the government to plan for efficient management of food supplies. By making available reasonably accurate and timely information on the production prospects of basic foodstuff, stock and consumption requirement, it also enables the government to plan import/export and maintain optimum stock and thereby minimize storage, transportation and handling costs. Thus an effective early warning system provides a precise degree of food security at lowest possible cost to the nation.

In the event of a potential production shortfall, an effective early warning system enables government to:

i) initiate measures for saving of foodstuffs in the public food management system;

ii)provide motivations to farmers for higher production by providing support in the supply of inputs and credit;

iii) identify food shortage area and assess their requirements for additional food supplies;

iv) improve the efficiency of food management planning including :

a) timely movement and positioning of stocks at strategic points to avoid any breakdown in the supply line to needy areas;

b) estimation of likely domestic procurement and import requirement;

c) checking speculative hoarding, profiteering, wasteful consumption and smuggling of grain outside the country;

d) strengthening of food-for-works programme and arrangement for free distribution of food to vulnerable groups of people in the disaster prone areas.

In the event of potential bumper crops, the early estimation of the size of the surplus enables government to:

i) make appropriate arrangements for purchases to provide support to the market and maintain producer incentives;

ii)streamline transport and storage facilities, and

iii) take decisions on whether to stock or export the quantities in excess of current domestic requirements.

2. Issues to be addressed in Early Warning practices

The primary function of an Early Warning System (EWS) is to monitor continuously the crop outlook and food situation through the year and to present an integrated analysis of its findings to the decision makers. The EWS would also be expected to report on the weakness in the timeliness, quality and content of the available data/reports and to suggest improvement measures. It would also make suggestions for improvements in the collection of data for filling in the data gaps for initiation of new reports, and for arranging refresher training for field staff, with a view to improving the quality of their crop assessments.

The important inputs/elements of the EWS are:

- time series data on area and production, prices and the qualitative reports on crop condition from field agencies;
- agro meteorological and input data such as rainfall, temperature, sunshine, evapotranspiration, irrigation, fertilizer and other input use;
- remote sensing data on planted areas and condition of crops, through satellite imagery techniques; and
- information on general economic indicators including demand condition and global prospects of production and trade of basic foodstuffs.

The important factors which have direct influence on crop output of a country are the following:

- Weather including precipitation and temperature: continuous study of crop-weather relationship is essential for forecasting of output of main crops in advance of the harvest. FAO has developed a fairly simple technique of crop-water balance calculations for pre-harvest estimation of crop output in rainfed area, which could be usefully be employed by National Early Warning Systems in most developing countries.
- Other natural factors such as crop diseases, pests and the use of insecticides/ pesticides: Regular reports on surveillance of crop diseases and pest infestation, the extent of crop areas affected and the use of insecticides/pesticides could provide a basis for the estimation of likely damage to food crops.

Progress of implementation of relevant agricultural development programmes

- Irrigation: Information on annual targets and the observed progress in the implementation of these targets could provide a basis for estimation of the expected production under irrigated conditions. In addition, data on rainfall, river flow, water level reservoirs, canals, tanks, and the availability of electricity and diesel for exploitation of groundwater resources could be analysed to form a realistic judgement of the impact of irrigation on production of basic foodstuffs.
- Other Inputs: Information on the availability/sales of fertilizers, high yielding varieties of seeds and other inputs, and their use for basic food crops provides an additional indication of likely crop output.

There are also a few general economic indicators which influence food production and availability. These include:

- Price behaviour of basic food staff:

The prices of basic food stuffs are important determinants of output and availability of food. For example, an unusually sharp increase in prices during the off season is both a result of poor harvest in the preceding season and an inducement to produce more in the succeeding season. Conversely an unusually large fall of prices following a bumper harvest provides disincentive for production in the next season. In using the price indicator, its limitations also need to be kept in mind. Price movements may often be triggered by seasonal changes in supply and demand; or they may be prompted by speculation or hoarding on the basis of market rumour and gossip.

- Quantities marketed - pace and pattern of arrivals.

Information on the quantum and the flow of market arrivals provides some indications of the production prospects and the overall food supply situations. The pace and pattern of market arrivals reflects not only the size of the previous year's crop, but also the expectation of farmers about output in the coming season. Unusually large arrivals of old grain on the eve of the harvest would be an indication of good crop and vice versa. Also, heavy arrivals in the early months of the marketing season would confirm a bumper harvest, whereas early decline in arrivals from predominantly surplus areas would mean a below-average crop harvest. A significant drop in market deliveries would reflect either a production shortfall or a distribution problem. In either case the drop would be a signal of potential shortage.

- Stocks held by government, traders and farmers

Stocks held by government agencies are intended primarily to meet the requirements for public distribution, and also to serve an important tool for stabilizing the markets. Inadequate government stocks sometimes trigger violent fluctuation in prices. Changes in the levels of stock held by traders are a more useful indicator of emerging supply situation. An unusual build up of stocks by traders would suggest a possible future supply shortfall. On the other hand, if traders run down their stocks, this could be in the expectation of a good harvest.

- Procurement, import and public distribution of food

Information on the volume of procurement together with import and stock formation provides an early indication of whether or not people will have access to supply of food at reasonable prices in the lean period. The larger the procurement, the greater the capacity of the government, to deal with any food crisis in the lean season. However, large scale domestic procurement and public sector import implies tying up of scarce capital resources on the one hand and exertion of extra pressure on the storage and distribution capacity on the other. Again, if large scale procurement leads to depletion of supplies in the open market, the demand forces are likely to create extra pressure on the government distribution system.

3. Crop Forecasting as a Means of Early Warning: Concept and Procedures

Crop forecasting is an essential means of Early Warning about the emerging food situation in the country. The term ‘forecast’ is generally used to indicate the qualitative and quantitative information on the size of the harvest, with a stipulated lead time. It differs from the term ‘estimate’ which generally refers to a quantitative magnitude and is made at the time of harvest

or afterwards. The term ‘prediction’ is also different in that it generally relates to very specific events based on measurement and implies a level of likelihood.

From the time of sowing to harvesting, a crop evolves through different growth stages and can reach ‘its genetically determined yield potential only when all environmental and other input factors remain optimal during each phase of the growing cycle’. If a certain growth stage is not completed satisfactorily, the potential yield is reduced and such reduction is either not recovered or recovered very partially. The final yield obtained is thus governed by the interaction of a host of agroclimatic, environmental and input factors which affect plant physiology in varying manners during the crop cycle. These circumstances offer the scope of evaluating the yield performances at different stages of growth of the crops.
There are several methods which can be applied to arrive at forecasts of food crop production. These are:

(a) Monitoring crop conditions on the basis of agro-climatic data;

(b) Reporting planting intentions, progress of sowing, actual area planted, crop development and conditions, area damaged and other factors related to crop production.

(c) Making regular survey to assess area, yield and production of crop;

(d) Estimating regression models describing the relationship between selected weather parameters and final yield.

The method to be selected in a particular case depends on the objectives chosen, the state of socioeconomic development in the country, resources available and, most importantly, the technical capability of the agency/organization entrusted with the job. During the early stages of crop growth, the subjective method are more likely to be used, while during the later stages more sophisticated objective methods can be conveniently used in forecasting crop yield.

3.1 Forecasts of Crop Area:

Area forecasting is an important component of crop forecasting. Obviously, area intended for planting differs from actual area planted because of various physical, climatic and economic factors. Again, actual harvested area may fall for short of planted or prospective harvest area because of adverse climatic and other conditions such as drought, flood, hailstorm, insect and pest attacks.

There are several methods for forecasting area under a crop. These include carefully designed farm survey, eye estimation by crop reporters/extension workers and aerial survey. One of the latest innovations in crop forecasting is the use of satellite imagery data which are fed into crop yield models to arrive at area, yield and production.

3.1.1 Area of Prospective Planting/Sowing:

Forecast of the area to be planted can be made on the basis of the following criteria :

- Intentions of planting: Area intended for planting can be obtained in two ways. One is the regular crop survey through which sample respondents can be asked questions on the area to

be planted under a particular crop in the next season. If the information is obtained from a carefully designed sample survey, procedures are available to obtain estimates for the whole population from which the sample is drawn. Since the total area and cropping patterns of the sample farmers are known from the interview, this information gives a good objective estimate of the intentions of the total area to be sown under different crops. The other way of obtaining information on planned area under a crop is through eye estimation of the crop reporters extension workers who make regular field visits and make observations and reporting on the area planted under a particular crop in a given cropping area.

- Economic factors: The areas to be sown under different crops are influenced by various factors such as relative prices, availability of credit, availability and prices of fertilizers and other inputs. The lagged price of the crop also influences farmers' decision on the acreage to be devoted to a particular crop in the ensuing season.

- Trend analysis: In this method, trend function is estimated by using data on the area harvested under a crop for a sufficiently large number past years to arrive at area to be planted to the crop in the current and future seasons.

3.1.2 Area of Actual Planting:

The actual planted area may exceed or fall short of the planned area because of physical, climatic and socioeconomic factors. The estimates of actual planting can be obtained from a carefully designed farm survey in which farmers are asked to state how much area they planted to a particular crop. The other methods of taking account of the planted area are eye estimation by the extension agents, aerial survey, satellite imagery etc. Sometimes use of seed and other inputs are also used as proxy for estimating area planted to a particular crop.

3.1.3 Area to be Harvested:

Forecast of area to be harvested need to be adjusted by the area partly and completely damaged by adverse weather conditions such as drought, flood, heavy rains or insect and pest attacks and also by the area replanted. These and other factors can also lead to make difference between prospective harvest area and actually harvested area of a crop.

3.2 Forecast of Crop Yield:

Forecast of crop yield is an important element in the estimation of total production. Yield of a crop is more sensitive to natural environment and tend to show more variability than area. Thus production forecast is more influenced by the quality of yield forecast than that of area. Yield forecast can be done by following a number of methods which are described below :

- **Eye appraisal of the crop :**

Eye appraisal of the general crop condition provides subjective forecast of the growing crops. This is generally done by person(s) in close contact with farming activities in a locality, normally an extension agent. In the early stages of the growing season, the general look of the crop i.e.

number of plants per unit area, the extent of tillering and the vegetative growth of plants are taken into consideration. At later stages attention is shifted to those factors which have direct bearing on the yield i.e. size of the panicle, condition of grain filling etc. The visible incidence of insect and pest attack, drought or water logging become more evident and gradually quantifiable criteria for measuring crop yield.

- **Crop-weather regression model :**

In this method, forecast of crop yield is obtained through statistical analysis of time series data on crop yield and selected weather variables. The regression equation consists of historical data on yield as the dependent variable and selected weather indicators as the independent variables. Statistical relationships are established between yield and selected weather variables at different stages of the crop growing cycle. The forecast of yield is obtained by using the coefficients of the estimated equations and relevant values of the selected variables. A good set of agrometeorological data are required for arriving at meaningful forecast of yield.

- **Biometric methods :**

This method provides objective forecasts of the yield on the basis of measurements of particular plant characteristics of the crop such as height of plants, diameter of stalks, size of panicle etc. The measurements are related with the size or weight of the crop at harvest time by means of regression. The measurements on crop characteristics are generally made on a sub-sample of those plots which are included in subsequent random crop cutting experiments to determine the final yield.

3.3 Forecast of Crop Production:

Forecast of total crop production is obtained by multiplying the area sown/to be sown by the prospective yield per unit area of the crop. As the crop passes through successive stages of the life cycle, the quality of the forecast continually improves up to the time of harvest when estimates of actual production can be made.

In Bangladesh, exercises on forecasting of crops are based, primarily on subjective methods. Information on area forecast is obtained from the DAE which generates information on areas to be planted to a crop on the basis of physical/economic environment and opinions of cross section of farmers, through the network of extension agents working at grass-root levels. The target area is monitored and revised on the basis of changed circumstances. Area forecasting is also done by the BBS on the basis of relatively objective criteria through the sample survey of seasonal land use pattern across the country. In recent times, information on gross and net area planted to different crops are being generated through satellite imageries, obtained and analysed by the SPARRSO.

Information on prospective crop yield are also generated by the DAE, BBS and SPARRSO on the basis of a combination of subjective and objective methods in which climatic variables, input use, price changes and remote sensing techniques are used by the relevant organizations.

4. History of Early Warning System in Bangladesh:

The history of early warning exercises in Bangladesh can be traced back to early eighties. Following a couple of food crisis resulting from natural disasters, the international circles strongly advised the government to set up some institutional structure with the capability of dealing with early assessment of production, monitoring production, stocking and distribution of the basic foodstuffs. A series of FAO, World Bank and USAID missions visited Bangladesh and dealt, directly or indirectly, with the improvement of agricultural statistics and the establishment of an early warning system. A World Bank report in 1979 provided an outline of a proposed early warning system. In 1982, a USAID mission commissioned a study for the development of an early warning crop forecasting model. The USAID assistance was provided in the context of its support to the Food and Fertilizer Planning and Monitoring Unit, established in 1979, within the Ministry of Planning. In 1983 this unit was renamed as the Food Planning and Monitoring Unit (FPMU) and was transferred to the Ministry of Food.

Following a request by the government of Bangladesh for assistance under Food Security Assistance Scheme, a mission from the FAO Food Security Assistance Unit visited Bangladesh in 1982 to review the country's food security programme and to identify further actions required for its improvement. On the basis of the recommendation of the mission, a project entitled 'Development of Early Warning System in Bangladesh' (GSPS/BgD/021/JPN) was formulated in 1983 and the plan of operation of the project was signed by the government of Bangladesh and FAO in April 1984. The project was executed by the FAO with financial assistance from the government of Japan.

The project was intended to assist the government with its long-term development objectives of providing an adequate basis for decisions on policies, programmes and operational activities in the food security sector. To this end, the immediate objective of the project was to assist in establishing an Early Warning Unit (EWU) in the Ministry of Food. Accordingly, an EWU was established in the FPMU with specified responsibility and identified staff.

4.1 Works Accomplished under the EWU:

At the initial stage, the unit worked on updating the statistical compendium prepared earlier by the FPMU. The compendium served as a useful database with respect to variables like production of foodgrain, internal procurement, import, stock, distribution and prices; supply of farm inputs, and various aspects of agrometeorology. As regards analysis of data with respect to crop forecasting and early warning, the following exercises were done by the EWU:

- **Trend Analysis:**

Trend equations were estimated using national time series data on area, yield and production of selected varieties of rice and wheat, and projections were made for the following year. This exercise provided an early forecast prior to planting or sowing, with the assumption that the existing trends would continue. However, the projection based on trend analysis excludes the effect of weather which does not exhibit any particular trend, and deviations of actual yield from trend may be attributed largely to the effect of weather. In particular years, impact of such phenomena as flood, drought wind, hailstorm and pest attack may account for a substantial part

of variation in area harvested, yield and production. Differences in the projections of production based on aggregate and disaggregated series were examined.

- **Price Analysis:**

As is well known, market prices of foodgrains rise and fall regularly before and after harvest in the three crop growing seasons. Attempts were made to examine the relationship between the extent of these price variations and the size of the harvest, with the aim of predicting production level corresponding to alternative price regimes. It was observed that inclusion of stock variable acted as a moderator in the analysis of the impact of changes in the level of production on price of the respective food crop and vice versa.

- **Water Balance Index**:

Based on the relationship between crop water requirements and the moisture available to the root system from rainfall and soil reserves, Water Balance Index (WBI) was calculated for wheat and *aman* rice in selected districts. The consultant in 'agrometeorology' also introduced the conceptual refinements to the WBI made by the agrometeorological group at the FAO headquarters. The new concepts introduced were Water Requirement Satisfaction Index (WRSI) and Crop-Specific Soil-Water Balance (CSSWB). Calculation of the indices were, however, constrained by the lack of appropriate data.

- **Crop Yield - Weather Regression Equations:**

Quantitative relationship between crop yield and selected weather variables were estimated for selected crop varieties in two districts namely Sylhet and Rangpur. Weekly equations were estimated to examine the impact of selected weather variables at different stages of crop growth on the crop yield. Twenty four such equations were estimated for each of the districts of Sylhet and Rangpur (six rice crop/varieties x four weekly equations each). The predicted values of yield were calculated using the data series for 1968-84. The results were reported to be encouraging and it was concluded that further work on additional districts would be undertaken.

- **Training:**

The training requirements of the counterpart staff were assessed and accordingly on the job trainings were imparted through the project. Close working relationship between international experts and counterpart staff proved to be very effective through regular discussions on technical matters. A total of 14 training sessions were conducted for FPMU personnel, either by the Chief Technical Advisor or by invited speakers.

- **Seminar:**

A seminar on Food Security and Food Situation Monitoring was organization by the project and held on 3 and 4 January, 1987. A total of 18 papers were presented in 4 technical sessions chaired by distinguished public servants and researchers. The proceedings of the seminar were subsequently edited and published for wider circulation.

With all the above accomplishments, the project was terminated at the end of June, 1988. After expiry of the project, exercises on early warning, in its technical sense, seemed to be discontinued, although crop yield and production forecasting in some form or other remained to be practised with acreage and prospective yield data obtained from the Department of

Agricultural Extension (DAE) and the Bangladesh Bureau of Statistics (BBS). Thus the need for strengthening early warning system continued to persist.

4.2 The New Project: Early Warning and Food Information System (EWFIS)

In view of the vacuum prevailing in respect of early warning practices, a new project entitled 'Strengthening Early Warning and Food Information System' was designed and undertaken by the government. The project started functioning from April 1998 with an intended tenure of three years. The project is in its initial stages of operation. It is being administered by a Project Director who is assisted by an Assistant Chief and a Research Officer. The technical job of the project is to be accomplished by a team of consultants headed by a Team Leader. The Team Leader and the Agrometeorologist have recently joined their duties while a Statistical Specialist and a Database Management Specialist are yet to be recruited. With recruitment of the technical personnel and with the support services to be available, the project aims to accomplish the following objectives in respect of Early Warning and Food Information System:

- Define an organizational structure for early warning and food information activities, including the definition of the contributory roles and functions of various participating agencies and the institutional arrangement required for setting up an Early Warning Technical Committee (EWTC);
- Provide assistance and on-the-job training to the staff of the related organizations in undertaking their responsibilities,
- Provide assistance for developing and coordinating the flow of information from and among the various participating agencies contributing to the Early Warning and Food Information System;
- Propose a regular meeting schedule for the EWTC and convene meetings accordingly;
- Organize orientation and technical workshops on the Early Warning and Food Information System for officers of the participating agencies.

4.2.1 Progress of work under EWFIS:

After joining of the Team Leader and Agrometeorologist in November/99, the technical aspects of the project were taken up for implementation. The following jobs have been accomplished or are in the process of being accomplished:

- Substantial progress has been made in making review of early warning literature, identifying variables for forecasting model and specifying appropriate model for forecasting production of major food crops.
- Working relationships with relevant agencies/organizations such as BBS, BMD, BARC, DAE and SPARSO have been established through repeated visits to the organization and holding discussion with the relevant personnel.
- Initial arrangements have been made for acquisition of data from BBS, DAE, BMD and SPARRSO by using appropriate formats for obtaining data.

- Programme has been developed for holding a planning workshop on Early Warning and Food Information System and arrangements have been made for holding the workshop.
- Programmes have been developed for holding training on Early Warning, Agrometeorology and Remote Sensing, and arrangements have been made for holding the training programmes.
- Preliminary estimates have been made on prospective boro rice and wheat production in 1999-2000 season by using subjective method of estimation.
- Preparations are under way to make forecast of *aus* and *aman* production by using objective method such as estimation of crop yield-weather regression models.
- Preparations are under way for developing an appropriate database for comprehensive food policy analysis.

5. Constraints to Realization of the Potentials of the Early Warning Exercises

The review of early warning exercise in the country reveals that the practice of early warning has suffered from lack of continuum. The TA project on 'Development of Early Warning System' initiated some works including statistical modelling of yield forecasting. It has been evident from the review that the project did some exercises on trial basis, covering limited geographical areas. Thus the full scale estimation of the model using the proposed methodologies and nationwide data was yet to be done. With all these jobs ahead, the project was terminated by the end of June 1988, which may be considered as a premature termination from technical output-point of view.

The subsequent evidence is rather disappointing in that with the termination of the project, early warning exercises using statistical model seemed to be abandoned. This might be due to the fact that during the tenure of the project, FPMU could not build up necessary technical manpower set-up to carry on the necessary technical jobs.

Estimation of yield forecasting model requires voluminous time series and cross section data base on various agroclimatic, input and price variables, many of which are not readily available or even if available, the quality of data are not often up to the reliable standard. These things act as constraints to statistical estimation of yield and production of major food crops.

The prevailing practice of forecasting area and yield of major food crops are based mainly on subjective methods in which the value judgements of the crop reporters (the extension workers in the case of DAE) play vital role. Although BBS has developed a scheme of nationwide sample survey of plots for estimation of area and yield of crops, it does not apparently possess adequate manpower to handle the job and consequently, the information generated are taken with sufficient degree of scepticism. Moreover, information on yield, obtained from crop cuts of the sample plots, are made available long after the harvest and as such are not useful for early warning purposes.

The newly constituted 'Early Warning and Food Information System' project started functioning from April, 1998. However, the project office is physically located away from the rest of the MOF in the Secretariat compound and from the Directorate General of Food and FPMU. This

creates a physical barrier in the exchange of messages, ideas and documents between the Project Office and the rest of the organs of the Ministry. Again, recruitment of technical consultants has not yet been completed and as such full scale operation of the project is being delayed.

As for the organizational aspects, the nature of coordination of the Early Warning project with relevant organs of other Ministries such as Agriculture and Planning has not clearly been established and this has been creating impediments to acquisition of necessary data for early warning exercises, and arriving at consensus on early warning results and disseminating those for efficient planning of food supply and management.

6. Suggestions for Improving Early Warning for better Food Management

Early warning system has been recognized as an important tool for food supply management and hence improved national food security. The review of past early warning exercises in Bangladesh has revealed that because of lack of built-in technical manpower set-up in the Ministry of Food, technical assistance support did not work well in developing effective early warning system in the country. It is, therefore, suggested that the Ministry of Food should incorporate an Early Warning Cell with technically trained manpower with provision of long term tenure of the manpower in the Ministry.

The newly constituted Early Warning project should be physically located in the FPMU office premises so that day-to-day works of the project can have constant link with other establishments of the FPMU. Besides, recruitment of technical consultants should be expedited for full-scale operation of the project as early as possible.

Measures should be taken for establishing effective working linkage with other organs of the government such as DAE, BBS, BMD and SPARRSO so that data and information necessary for early warning exercises can be made quickly available to the Early Warning project. Besides, there should be an Interministerial Technical Committee with representatives from the Ministries of Food, Agriculture, Planning, Water Resources, Disaster Management and Relief, which will hold regular meeting to arrive at consensus on crop yield and production forecast, and suggest policy guidelines for food management and overall food security issues.

As regards forecasting of area and yield of major food crops, it has been evident that the DAE has reasonably adequate manpower at gross-root levels, but the information generated by the organization are not based on sound methodology. On the other hand, the BBS has developed a relatively sound methodology, but is lacking in adequate manpower to handle the job. It would be worthwhile to explore ways and means of combining the efforts of the two organizations so that useful information can be generated on these two important variables in a cost-effective manner.

It is widely recognized that there can be a great deal of complementarity between the national early warning system and the global early warning system. Accurate and effective forecasting of weather and rainfall for relatively longer periods requires meteorological studies at global level and the results of such studies need to be exchanged for the purpose of meeting the needs of the developing countries. Although substantial improvements have been made in the areas of

recording and forecasting weather data by the BMD and SPARRSO, the precision and interpretation of the data for crop forecasting is often not taken with great confidence. Besides, new analytical techniques are being developed to provide more accurate estimates about future outlook, both on national and global perspectives. Thus in order to enhance the analytical capabilities in the areas of early warning, it may be worthwhile to seek technical assistance from international agencies for certain parts of the on-going Early Warning and Food Information System Project.

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