Government of the People's Republic of Bangladesh
Agro-Meteorological Information Systems Development Project
Component-C of BWCSRP
Department of Agricultural Extension
Khamarbari, Farmgate, Dhaka-1215

Request For Expressions of Interest
(Consulting Services – Firm Selection)
Strengthening of BAMIS Portal by incorporation of Agromet data base and information and Development Crop Weather calendar and pest & Disease Weather Calendar for different major cereals, cash and horticultural crops on "Agro-Meteorological Information Systems Development Project" (Component C of Bangladesh Weather and Climate Services Regional Project) (Contract Package No.: AMISDP-SD-009)

Memo: 12.01.0000.018.01.001.21.6371 **Date: 19.12.2021**

The People's Republic of Bangladesh has received a credit in the amount of USD 113million as from the International Development Association (IDA) towards the cost of Agro-Meteorological Information Systems Development Project [Component –C of Bangladesh Weather and Climate Services Regional Project (BWCSRP)] to be implemented by Department of Agricultural Extension (DAE) and it intends to apply part of the proceeds to payments for the provision of consultancy services for the project by hiring of an International Agro-Meteorological Services Consultant.

2. **Scope of Task /Service:**

The services, among others, include the following:

It is required to issue crop and location specific agromet advisories with special reference to major extreme weather events. A number of products related to drought and flood are required to prepare agromet advisories for different crops. At present, all the products are not readily available in DAE. It is possible to develop a number of drought and flood products for operational use. It is proposed to develop number of indicators like Aridity anomaly, SPI seasonal update and last four weeks, SPI forecast, QPF, Basin level forecast, rainfall distribution using Markov Chain Model, Assured rainfall using incomplete gamma distribution, soil moisture estimation etc. It is also proposed to arrange hands on training to develop above mentioned products with the meteorological data available at BMD.

There is great need of remote sensing applications to cover up the gap areas of observation particularly in land surface observation required for agromet advisories. Active promotion of the use of remote sensing in DAE would enhance improved agrometeorological applications. DAE has started incorporation of satellite based agrometeorological component, particularly NDVI composite image, developed by NOAA for generating information on crop vigour and agricultural progress. This information along with the rainfall data are being used in stress monitoring and track the crop growth from sowing to harvesting of the major crops in the country. At present strategies need to be worked out, how one can use the other parameters including their anomalies like LST, surface insolation, surface soil wetness index, clear sky evaporation, PET, VITT etc. in monitoring of different weather parameters and events and ultimately preparation of advisories. It is proposed to interpret different satellite information in Agromet advisory for Farmers.

The Crop-Weather Calendars are used in agromet-advisory services. With the week as the basic time unit, the compiled information can assist forecasters in farming weather warnings and forecasts directed at farmers. Crop-weather calendars provide information on crop growth stages, normal weather for crop growth, warnings to be issued based on prevailing weather condition, water requirement of crops during their various phenophases and weather conditions favourable for development of crop pests and diseases. These calendars are useful for crop planning, irrigation scheduling and plant protection measures. Information contained in the calendars gives broad indications of the direction of development which may prove useful to the planners, agricultural administrators, plant breeders and the farmers in formulating policy matters regarding plant breeding, crop adoption, drought, supplemental irrigation, maximizing the yield. Crop weather calendars can act as guiding tool while issuing crop weather advisories for the farming community.

It has been well established that climate plays a dominant role in regulating the incidence and spread of pests and diseases. Pest & disease weather calendars are useful in advising the farmers for need-based application of the insecticides by considering the susceptible stage of crop as well as range of meteorological parameters required for the establishment of the pests. Considering such early warning models/guidelines, users can take crop protection measures in time and save them from pest and disease attacks. Moreover, if weather information for the out-break of a pest & disease in a particular crop is issued sufficiently in advance, farmers can even switch to cultivation of another crop. Thus, by close monitoring of temperature, rainfall and humidity in months when the probability of attacks of pests and diseases are highest, it is possible to issue warnings. AMISDP project may engage in developing weather based early warning models, pest weather calendars, as well as guidelines for combating different plant pests and diseases.

3. Department of Agricultural Extension (DAE) now invites eligible consulting firms ("Consultants") to indicate their interest in providing the Services. Interested Consultants should provide information demonstrating that they have the required qualifications and relevant experience to perform the Services. The short-listing criteria are:

(a) General experience of the Firm(s);
(b) Experience in similar assignments of compatible size, complexity and technical specialty in the required area;
(c) Financial soundness of the firm; and staffing and logistics of the firm.

Consultants are requested to submit the following supporting documents in support of the above-mentioned criteria:

(a) Registration paper of the firm (s); (b) JV agreement/letter of intent (if applicable); (c) Firm's brochure; (d) Audited financial reports for last two years; (e) service experience record (including nature, total cost, total input in terms of man month, employer, location of service etc.).

4. Consultants may associate to enhance their qualification, but should mention whether the association is in the form of a "joint-venture" or of "sub-consultancy". In the case of an association, all members of such "association" should have real and well-defined inputs to the assignment and in such "association" it is preferable to limit the total number of firms including the associates to a maximum of three (03).

5. The consultant will be selected in accordance with the Consultants Qualification Selection Method (CQS) method set out in the World Bank's Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, January 2011 (Revised July 2014).

6. Terms of Reference (ToR) will be available in the office of the undersigned and also in the DAE's website (www.dae.gov.bd/site/view/tenders/tender-EOI-job-circular and https://www.bamis.gov.bd/en/page/tender/). Interested consultant may obtain further information from the office of the undersigned from 09:00 to 17:00 hours (Except holidays).

7. Expression of Interest (both hard and soft copy) must be delivered to the address below (in person or by mail or by email) by **16:00 hours (GMT+ 6 hours) on or before January 06, 2021.** The authority reserves the right to accept or reject any or all EOIs without assigning any reason, whatsoever.

19/12/21

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Terms of Reference (ToR)
For Hiring a Consulting Firm

for

Strengthening of BAMIS Portal by incorporation of Agromet data base and information and Development Crop Weather calendar and pest & Disease Weather Calendar for different major cereals, cash and horticultural crops "Packager No.: AMISDP-SD-009

Assignment Duration	:	12 Months
Assignment location	:	Country-wide
Funding source (s)	:	IDA, World Bank
Contracting entity	:	Project Director, Agro-Meteorological Information Systems Development Project' (Component-C of "Bangladesh Weather and Climate Services Regional Project"), Department of Agricultural Extension, Khamarbari, Dhaka.
Method	:	CQS,NCB

1. Background

Bangladesh Agro-Meteorological Information System (BAMIS) portal is a dynamic web portal developed under Agro-Meteorological Information Systems Development Project (Component C: BWCSRP), DAE with a view to disseminate agrometeorological services and other related information to the different users especially to the farmers in Bangladesh. Meteorological data from Bangladesh Meteorological Department and hydrological data from Bangladesh Water Development Board are accumulated in BAMIS portal. After being translated and validated by the DAE Agromet Technical Committee the information is disseminated to the farmers and stakeholders. At present BAMIS includes:

- Weather and Climate information across Bangladesh.
- Updated 64 districts agromet advisories twice in a week and one national agromet advisory once in a week.
- Agromet information in respect of crop, weather sensitivities on crops, pests and diseases information and its linkages with weather along with control measures, Crop Weather Calendars for certain crops.
- Development of Agro-Meteorological products including satellite products to help different users to make tactical & strategic decisions

During the first phase of the project, though substantial work has been done and being used for the welfare of the farmers of Bangladesh, still there is enough scope to strengthen the BAMIS portal by incorporating smart information and data to make further improvement of operational Agromet

Advisory Services in Bangladesh and make it scalable so that individual farmers in the country can get the benefit of the new approach.

As part of the Agro-Meteorological Information Systems Development Project (AMISDP), Component C: Bangladesh Weather Climate and Services Regional Project, funded by the World Bank, the consulting firm will support the development of improved agrometeorological services to farmers of Bangladesh in order to sustain and increase agricultural productivity and assist them in coping with weather aberrations and climate extremes through further improvement of the BAMIS Portal. Among other activities, the goal is to ensure the development of agromet advisories that are informed by the best available science including generation of service tools in respect of different agromet products, remote sensing products, crop weather calendars & forewarning of pests and disease by using pest and disease weather calendars to provide the agricultural sector with a decision support information system and tools through BAMIS Portal.

2. **Objectives**

- To find out the interrelation between weather parameters and crop growth at different phenological phases including the critical limits for growth of crop at different phenophases and integration of all the above information and others for preparation of Crop Weather Calendars of major cereals, cash crops & horticultural crops.
- To Identify the areas of incidences of major pests and diseases along with the interrelation between weather parameters and pests & diseases incidences and integration of all the above information and others in preparation of Pest Weather Calendars of pests and diseases of economic importance for major cereals, cash crops, horticultural crops in Bangladesh.

For preparing crop-weather calendars and crop-weather-P&D calendars the foundation is sound R&D based understanding of the crop weather relationship and crop-weather-Pest/Disease relationships. Of course, the consulting firm will develop the required calendars based on literature, but it will be good to develop country capacity in Agricultural Research Institutions and/or Ag. Universities.

- Development of products like Aridity anomaly, SPI seasonal update, SPI forecast, drought monitoring, soil moisture estimation etc.
- Development of temperature based agrometeorological indices like Heat units (HU), photo-thermal unit (PTU), helio-thermal unit (HTU), photo-temperature, nycto-temperature and heat use efficiency (HUE), Plant heat stress (PHS) etc. for assessing crop phenology, growth and yield in field crops.
- Development of different remote sensing products like land surface radiation products, estimation and downscaling of Soil Moisture etc.

- Transfer the developed technology to DAE staff and strengthen their capacity to issue seamless agromet advisories. Provide training up to 10 (ten) DAE officials.

3. **Scope of Work**

It is required to issue crop and location specific agromet advisories with special reference to major extreme weather events. A number of products related to drought and flood are required to prepare agromet advisories for different crops. At present, all the products are not readily available in DAE. It is possible to develop a number of drought and flood products for operational use. It is proposed to develop number of indicators like Aridity anomaly, SPI seasonal update and last four weeks, SPI forecast, QPF, Basin level forecast, rainfall distribution using Markov Chain Model, Assured rainfall using incomplete gamma distribution, soil moisture estimation etc. It is also proposed to arrange hands on training to develop above mentioned products with the meteorological data available at BMD.

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based application of the insecticides by considering the susceptible stage of crop as well as range of meteorological parameters required for the establishment of the pests. Considering such early warning models/guidelines, users can take crop protection measures in time and save them from pest and disease attacks. Moreover, if weather information for the out-break of a pest & disease in a particular crop is issued sufficiently in advance, farmers can even switch to cultivation of another crop. Thus, by close monitoring of temperature, rainfall and humidity in months when the probability of attacks of pests and diseases are highest, it is possible to issue warnings. AMISDP project may engage in developing weather based early warning models, pest weather calendars, as well as guidelines for combating different plant pests and diseases.

4. Technical Approach and Methodology

The consulting firm should collect all the related information on crop, pest and disease incidences and weather parameters. These crop weather calendars provide information on crop growth stages, normal weather requirement for crop growth, warnings to be issued based on prevailing weather conditions and meteorological conditions favorable for development of pests and diseases. A Crop Weather Calendar (CWC) consists of typical life history of the crop, from sowing through vegetative growth, flowering, grain growth to period of maturity. These CWC provide information on crop growth stages, normal weather for crop growth, warnings to be issued based on prevailing weather conditions, water requirement of crops during their various phytophases, meteorological conditions favourable for development of crop pests and diseases. Crop weather calendar should be prepared based on the threshold of weather parameters critical at particular phenophase of the crops Based on the data, sensitivity analysis should be made to understand the relations between the pest & disease incidences with the corresponding meteorological parameters. All types of statistical and other techniques should be done to find out the coherence between these two variables and also the explain/describe its understanding of the objectives of the assignment, approach to the services, methodology for carrying out the activities and obtaining the expected output, outcomes and the degree of detail of such outcome.

As far as the agromet products and remote sensing products are concerned, the recent and advanced techniques including the GIS and other state of technology should be used. Efforts may be done to check the validity and usability of the products as far as the Bangladesh context. Besides, full phased training should be given to the DAE officials to appropriately develop the products based on the required data based and methodology and efficiently interpret all the data for preparation of crop and location specific agromet advisories.

In addition to this, the proposed work should be based on the firm's own state-of-the-art products and methods, and the firm should be able to demonstrate its unique expertise in the field. The firm should highlight the problems being addressed and its importance and explain the technical approach

that would adopt to tackle them. The firm should also explain the methodologies that it proposes or adopts and highlight the compatibility of those methodologies with the proposed approach. It will be important to use these crop calendars in auto-preparation of agrometeorological advisory bulletins. Hence, suitable data files of these calendars be also prepared in required formats (in ready to use data forms) to facilitate automation of agromet bulletin preparation.

5. Deliverables and timeline

The main outcome of the project will be the generation of agro-advisories based on the interrelationship of weather and crop and pests & diseases as well as, to improve the resilience of agriculture systems.

The outputs will include:

- Development of crop weather calendars
- Development of pest & disease calendars
- Identification of vulnerable zones & time of occurrences of pests and diseases in respect of particular crop.
- Integration of above-mentioned tools/information with spatial and temporal weather forecast in operational management of pest & diseases on crops.

Agromet Products includes

- Development of products like Aridity anomaly, SPI seasonal update and last four weeks, SPI forecast, drought monitoring etc.
- Development of temperature based agrometoeolrogical indices
- Application of Markov Chain model and other methods for rainfall distribution at district level.
- Based on the historical & forecast data on the spread & intensity of flash flood and riverine at upazila level, different products will be generated and linked to automatic generation agromet advisories for management of flood for saving the standing crops.
- Generation products of temperature for Agromet purpose
- Estimation of soil moisture

Remote Sensing products include

a) Development and operationalization of some land surface radiation products;
b) Estimation and downscaling of Soil Moisture;
c) Development, validation and utilization of the operational satellite-based agromet indicators or data for characterization and management of abiotic and biotic stresses;
d) Optimum sowing suitability for kharif (June, July), rabi (Nov., Dec.) seasons and general agricultural health based on edaphic factors;
e) Forecasting of pest & disease incidences on crops;
f) Development of methodology for tracking of major pests and diseases;
g) Development of methodology for forecasting spatial crop age / phenology;
h) Development of SPI from satellite rainfall;
i) Development of operational demand-based irrigation scheduling;
j) Development of Digital agro-climatic atlas for improved crop planning

Deliverable	Date
1. Collection of crops, weather & pests & incidences data of cereal crops, horticultural crops 2. Collection of data required for development of different agromet, hydromet & remote sensing products	February 2022
1. Identification of vulnerable zones & time of occurrences of pests and diseases in respect of particular crop. 2. Identification of stressed and not stressed area due to rainfall and other weather variables	April 2022
1.Development of sensitivities between weather parameters and pests and diseases incidences on crops. 2. Development of some of the agromet, hydromet & remote sensing products	June 2022
1. Development of weather based forewarning model for pest and diseases incidences on crops. 2. Development of some of the agromet, hydromet & remote sensing products	August 2022
Preparation of crop and pest weather calendars as important tools for issuing crop and location specific timely agromet advisories to save the loss of crops.	October 2022
1. Integration of above-mentioned tools/information with spatial and temporal weather forecast in operational management of pest & diseases on crops 2. Validation of the agromet, hydromet & remote sensing products with the ground and actual weather variables	December 2022
Transfer the developed technology to DAE staff and strengthen their capacity to issue seamless agromet advisories.	January 2023

6. Duration of Services and Reporting

Total Study period will be considered 12 months. The tentative reporting schedule for the consultant's assignment is given below:

Reports	Planned Time
Inception Report: 05 copies	At the end of 1st month of contract signing
First quarterly progress report: 05 copies	During 3rd month
Second quarterly progress report: 05 copies	During 6th month
Third quarterly progress report: 05 copies	During 9th month
Draft final report: 05 copies	At the end of 11th month of contract signing
Final report: 10 copies	At the end of this study.

7. Selection Method

The consultant shall be selected following Consultants Qualification Selection Method (CQS) based selection method set forth in Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, January 2011 (Revised July 2014) on the basis of consultant's qualification, experiences and capability to carry out the assignment.

8. Selection Criteria

Department of Agricultural Extension (DAE) now invites eligible consulting firms ("Consultants") to indicate their interest in providing the Services. Interested Consultants should provide information demonstrating that they have the required qualifications and relevant experience to perform the Services. The short-listing criteria are:

(a) General experience of the Firm(s);
(b) Experience in similar assignments of compatible size, complexity and technical specialty in the required area;
(c) Financial soundness of the firm; and staffing and logistics of the firm.

Consultants are requested to submit the following supporting documents in support of the above-mentioned criteria:

(a) Registration paper of the firm (s); (b) JV agreement/letter of intent (if applicable); (c) Firm's brochure; (d) Audited financial reports for last two years; (e) service experience record (including nature, total cost, total input in terms of man month, employer, location of service etc.).

9. Key Personnel and Qualifications

a) Key Personnel

The firm may propose the structure and composition of its team members, listing the main disciplines of the assignment, the key experts responsible, and proposed technical and support staff. The expected team profile is presented in Table 1.

Table 1: Proposed Team Composition (Key and non-key Experts)

Sl. No.	Designation	Number	Total Person-Months	Type
	Key Experts -			
1.	Team Leader	1	12	Continuous
2.	Senior Hydromet Specialist	1	8	Intermittent
3.	Senior Remote Sensing Specialist	1	8	Intermittent
4.	Senior Agriculture Specialist	1	10	Continuous
5.	Statistical Climatologist	1	5	Continuous
6.	Climate Data Specialist	1	10	Continuous
7.	Pathologist	1	10	Continuous
8.	Entomologist	1	10	Continuous

9.	Agronomist	1	10	Continuous
10.	Research Assistant	1	10	Intermittent

b). The Qualifications of the Proposed Team

Table 2: Qualification and Experiences of Key and non-key Experts

Sl. No.	Position	Qualifications	Experience
1.	Team Leader	M.Sc./Ph.D. in a field relevant to climate services or agro climate services	15 years of working experience on agrometeorology, including 8 years of working experiences on projects and programs focused on developing countries
2.	Senior Hydromet Specialist	B.Sc/M.Sc. in Civil Engineer or Ph.D. in a field relevant to Hydrometeorology/Meteorology	10 years of working experience on hydrometeorology, including 5 years of working experiences on leading projects and programs.
3.	Senior Remote Sensing Specialist	B. Sc./M.Sc. in CSE/ Geography/ Geo Science/ any other relevant field to agrometeorology/Remote Sensing	10 years of working experience on remote sensing, including 5 years of working experiences on projects and programs.
4.	Senior Agriculture Specialist	M. Sc. Or Ph.D. in a relevant field of Agriculture	10 years of working experience on climate services for agriculture, including 8 years of working experiences on leading projects and programs
5.	Statistical Climatologist	M.Sc. in statistics or Ph.D. in Statistics or related field	10 years' experience developing and evaluating statistical methods for developing and evaluating crop weather relationship & pest & disease and weather relationship in agriculture.
6.	Climate Data Specialist	Master's degree in Atmospheric Sciences or related field	5 years' experience in meteorological data management, quality control, merging; NMHS capacity development

7.	Pathologist	M.Sc. in Pathology or Ph.D. in a relevant field of Agriculture	08 years of working experience on agriculture, agricultural planning, agricultural project implementation and management including 5 years of working experience on agricultural pathology and extension services in the field level of Bangladesh.
8.	Entomologist	M. Sc. In Entomology or Ph.D. in a relevant field of Agriculture	08 years of working experience on agriculture, agricultural planning, agricultural project implementation and management including 5 years of working experience on agricultural entomology and extension services in the field level of Bangladesh.
9.	Agronomist	M.Sc. in Agronomy or Ph.D. in a relevant field of Agriculture	10 years of working experience on agriculture, agricultural planning, agricultural project implementation and management including 8 years of working experience on agronomy and extension services in the field level of Bangladesh.
10.	Research Assistant	B.Sc or Masters of agriculture & meteorology or in a field relevant to climate services	05 years of experience in participatory action research on climate change, climate services and associated fields, including several years of experience in Bangladesh.

19/12/21

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