

## Terms of Reference for consultants

The consultants for the proposed TA will largely comprise actuaries, underwriters and data analysts with relevant experience in crop insurance and their expertise will need to be supplemented by:

- ❑ Local expertise sourced through AICI in areas such as agro-meteorology, agronomy and agricultural economics
- ❑ Technical inputs from World Bank staff with specialist expertise. The World Bank will cover the time costs of these experts.

The international consultants will have expertise and experience in international crop insurance programmes, including area yield insurance and weather derivatives. They will have relevant expertise and experience in crop insurance design and ratemaking or premium setting techniques.

Partnerships / interactions with local institutions will be needed in order to tap their relevant expertise and contribution to the successful outcome of the project. The relevant Ministries in the Government may need to be closely involved in issues that affect subsidies and their method of delivery to the farmers through the AICI.

The team will work in close collaboration with AICI and the World Bank. AICI will provide access to existing crop yield and weather database and technical documentation on Indian crop insurance.

The consultants will undertake the following:

### Phase 2: Designing weather / rainfall insurance products and developing actuarially sound ratemaking techniques

The purpose of this phase is to design weather/rainfall insurance products and to develop underwriting and ratemaking procedures for these new products to be used as stand-alone products or as early payments under the area-yield insurance programme. The main output of this component is the development of a series of pilot weather insurance schemes to be implemented by AICI during Rabi season 2007/08 and based on the results of this pilot, expanded subsequently to a larger area/coverage.

Key activities will include:

1. Weather (e.g., rainfall, temperature, etc) data collection review
  - a. Analyse the current weather station network in India (e.g., secure stations, reliable historical data, real time reporting of data), including both public and private weather stations, and develop a detailed action plan to further improve the weather station network (acquisition of automatic weather stations, etc.), based on international standards.
2. Data analysis
  - a. Analyse and consolidate the weather database and crop yield database provided by AICI (data consistency, data limitations, data suitability, data quality, etc).
  - b. Analyse deviations in patterns of weather parameters over time and suggest the period of time to be used.
  - c. Discuss the potential impact of climate change on weather trends and variability.

- d. Develop a method of estimating missing weather data and other measures necessary to carry out contract design and rating.
  - e. Propose a method to apply a correction factor to account for differences between data collected from automatic weather stations and data collected from manual weather station.
  - f. Simulate historical weather data (for a new weather station), based on historical weather data collected from neighboring weather stations.
3. Weather based contract design
- a. Review weather insurance products (e.g., India, USA, Canada, Japan). This review includes, but is not limited to, contract design, rating techniques, underwriting process, claim settlement process, etc.
  - b. Review weather insurance products offered by AICI, including, but not limited to; contract design, rating techniques, underwriting process and claim settlement process.
  - c. Define insurance units (jurisdiction) to be effectively brought under each weather station on the basis of weather patterns, available weather data, cropping density, isotherms, latitude etc.
  - d. Analyse the impact of weather deviations (rainfall, temperature, etc.) on crop yield losses (for selected crops and insurance units). This will rely on statistical analysis and agro-meteorological analysis.
  - e. Design weighted weather indices (rainfall, etc.) and weather insurance indemnity schedules to match as close as possible crop yield losses (to reduce potential yield basis risk).
  - f. Design payment schedule of area yield claims based on weather indices, and test the proposed schedule for sample crops and insurance units.
  - g. Simulate indemnity payment rates for each weather / rainfall insurance product and compare with actual yield losses.
  - h. Organise focus groups with farmers to discuss the design of the proposed weather insurance products and based on this also provide suggestions on the possible appropriate, communication/promotion channels that AICI could use in selling the product.
4. Ratemaking
- a. Review existing rating methodologies (e.g., USA, Canada, India) and discuss their limitations.
  - b. Develop, based on international experience, and validate through testing for sample crops/seasons an appropriate ratemaking methodology based on the data/design constraints/characteristics identified in India
    - i. Pure base rates (impact of extreme events, credibility)
    - ii. Loaded rates (disaster reserve load, excess load, other loads)
  - c. Provide suggested weather insurance premium rates.
  - d. Assist AICI in implementing the proposed ratemaking methodology.
5. Weather insurance pilots

- a. Identify areas, crops and seasons (Kharif and/or Rabi) to pilot-test the recommended weather insurance products.
- b. Identify weather insurance delivery channels (e.g., rural banks, micro-finance institutions, input providers, etc.) and draft any contractual agreement.
- c. Draft weather based insurance policies.
- d. Develop the operational manual including, but not limited to; eligibility criteria, contract features, underwriting process, product pricing, weather data collection, contract monitoring process, claim settlement process.
- e. Develop an Excel spreadsheet to support the contract monitoring process and the claim settlement process.
- f. Provide advisory services for the implementation of the weather insurance pilots.

*Deliverables Phase 2:*

1. Report presenting the data collection review and the data analysis, as described in Activities (1) and (2).
2. Report describing the design of rainfall insurance contracts (by crops, insurance units and seasons), as described in Activities (3).
3. Report presenting the proposed ratemaking procedure and the recommended premium rates, by crop, insurance unit and seasons, for sampled crops/seasons/states, as described in Activities (4).
4. Pilot Project Implementation Manual, with the Excel spreadsheet, as described in Activities (5)
5. Database developed under this assignment.
6. Three day training workshop for AICI staff, to be delivered in India.

*Phase 3: Portfolio Risk Management*

This component will assess the risk exposure of AICI book of crop insurance business and will propose a cost-effective risk transfer strategy based on (parametric) reinsurance and/or alternative risk transfer mechanisms (e.g., weather derivatives or contingent debt). This TA will focus on finding a balance between individual insurance policies and diversification of the insurance portfolio to ensure a maximum coverage for a given amount of risk capital.

Key actions will include

1. Review of agricultural reinsurance market
  - a. Review the traditional and non-traditional crop reinsurance market and weather market,
  - b. Examine current practices regarding retention, co-insurance, attachment and exhaustion points, and premium rating applications on reinsurance markets, and discuss them in the Indian context.
  - c. Identify risk transfer arrangements (e.g., traditional reinsurance, weather reinsurance) available for AICI.
  - d. Analyse the role of government as a reinsurer in crop insurance programs (e.g., USA, Canada, Mexico) and suggest an appropriate model for India.

2. Portfolio risk assessment
  - a. Assess the risk exposure of AICI insurance book of business in terms of claim liability, probability of crossing the expected claim figure crop-wise, probability of ruin, amount of reserves / initial surplus, solvency margin required to be held by the company, etc. In particular, the consultants will assess (i) the portfolio of area yield crop insurance contracts, and (ii) the portfolio of weather-based insurance contracts, and (iii) the portfolio of miscellaneous of insurance contracts.
  - b. Assess the catastrophe reserve fund on account of contingency loading by incorporating sales projection and incidence probability.
3. Portfolio risk modelling
  - a. Develop a stochastic financial model (e.g., dynamic financial analysis model) to:
    - Simulate AICI portfolio of business (under different scenarios)
    - Estimate the income and balance sheet values of AICI.
    - Evaluate (traditional and non-traditional) reinsurance solutions.
  - b. Analyse the impact of risk transfer strategies on the risk exposure of AICI portfolio.
4. Recommend risk transfer strategies and action plan for the reinsurance placement (e.g., layers of reinsurance), including contingent lending by international financial institutions, taking into account the country-specific characteristics (e.g, compulsory reinsurance).

*Deliverables Phase 3:*

1. Report presenting
  - a. Identification of risk transfer mechanisms and potential market players, as described in Activities (1).
  - b. Risk assessment of the AICI portfolio of insurance business, as described in Activities (2).
2. Report presenting the Portfolio Risk Model, as described in Activities (3).
3. Prototype software of the portfolio risk model, with its user manual, as described in Activities (3).
4. Report presenting recommendations on cost-effective risk transfer strategies, as described in Activity (4).
5. Database developed under this assignment.
6. Three day training workshop for AICI staff, to be delivered in India.

*Reporting time lines*

It is expected that Phase 2 and Phase 3 be carried out within a period of six months following the date of award of the contract. However, the team will remain available for the launch of the pilot expected to be launch in early 2007.

The consultant team will provide AICI, FIRST and the World Bank with unlimited access to

the resources used in this project (database, source code, etc). The consultants should remain available for strategic decision making on the placement of reinsurance and/or any other risk transfer instrument (e.g., contingent debt) under terms to be assessed on completion of the project.