PCR application for aquatic animal health management in Asia

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Application of PCR in Asia

- Over the last 10 years PCR technology is being widely used in Asia for:
  - Aquatic animal health research (e.g. diagnosis, epidemiology, molecular epidemiology)
  - Provision of diagnostic service to the shrimp farming sector (e.g. testing of brood stock and seed for WSD, TS, IMN)
  - Provision of aquatic animal health certificates for import/export of live aquatics (e.g. KHVD)
  - Strengthening national surveillance and disease reporting programs

Background

- NACA has been associated with several projects over the last 10 years in Asia where PCR technology was used.
- This presentation will focus on work done in India

1. MPEDA-NACA Risk Factor Study

Andhra Pradesh, East Coast of India

- Longitudinal epidemiological study to identify risk factors for shrimp disease outbreak and poor production
  - 2001
  - Collaborative project (MPEDA, CIBA, COFM India; AusVet, Australia, NACA) funded by MPEDA, India
  - Samples and data collected from 365 ponds
  - **PCR used for screening samples**
  - Several risk factors identified and management interventions (Better management practices =BMPs)developed for pilot testing

1.1 MPEDA–NACA Demonstrations

- 2002
- Interventions (BMPs) pilot tested and outputs evaluated
- **Use of PCR screened seed** was one of the key BMPs
- Pilot demonstrations successful

1.3 Expansion of MPEDA-NACA Program

- 2003-2006
- Farmer group approach (cluster farming) more effective in implementing BMPs
- Concept of group/cluster farming and adoption of BMPs widely promoted
- Concept of contract hatchery system developed (backward integration)
- **Selected hatcheries had to use PCR for screening broodstock and seed and at the same time allow representatives of farmer groups to take samples for testing outside**
- Only negative seed stocked in clusters
- Disease impact reduced in project sites compared to outside
- Project considered a success by participating farmers and the industry
- **Cluster farming and BMP adoption** were seen as way forward for small scale farmers to minimize disease impact and sustain their livelihoods

1.4 Reduced Disease prevalence

Andhra Pradesh

Year	Demo ponds	Non demo	+
2003	82%	89%	+ 7%
2004	37%	52%	+20%
2005	15%	42%	+27%
2006	17%	44%	+27%

Karnataka

Year	Demo	Non-Demo
2003	100%	-
2004	71%	-
2005	33%	46%
2006	0%	55%

Tamilnadu

Year	2006
Demo	4%
Non Demo	67%

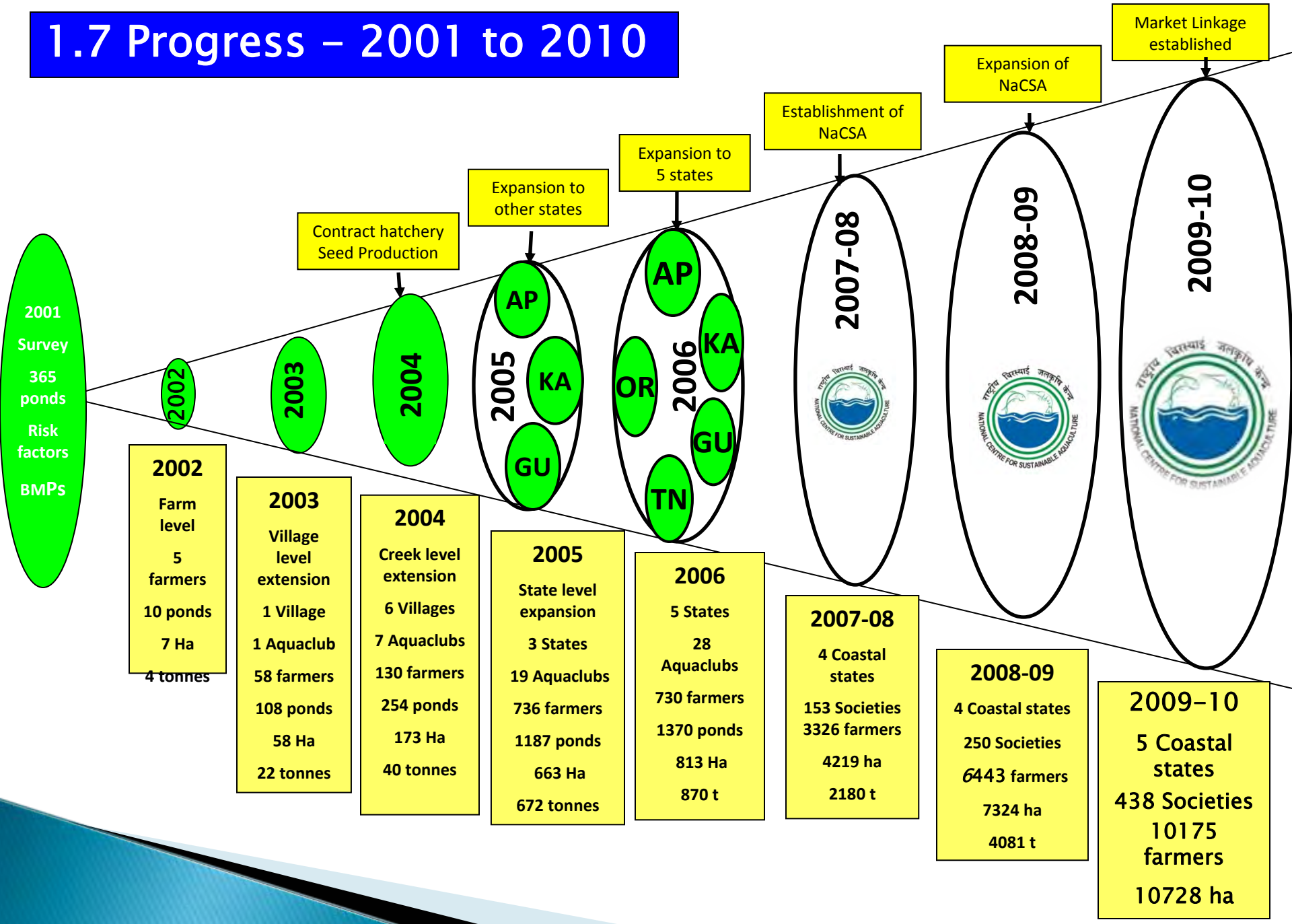
1.5 Institutionalization of MPEDA-NACA project

- 2007
- Considering the impact of the project and the vast potential to expand the model of cluster farming and BMP adoption, MPEDA established an outreach organization exclusively to promote BMP adoption through cluster farming and help small scale shrimp farmers to access modern markets and sustain their livelihoods
- National Centre for Sustainable Aquaculture (NaCSA) was born in 2007

1.6 NaCSA

- 2007-till present
- Very actively working at the grass root level promoting the concept of group/cluster farming and BMP adoption
  - **Stocking PCR screened seed** is still the most important BMP
- BMPs expanded to cover social, food safety and environmental issues
- Linking farmer groups to modern markets
- Facilitating group/cluster certification

1.7 Progress – 2001 to 2010



2. ACIAR Epidemiology project

- Application of PCR for improved shrimp health management in Asian region
- 2005-2007
- Collaborative project (CSIRO, Australia; COFM, India; CIBA, India; MPEDA/NaCSA, India; Centex Shrimp, Thailand, NACA)
- 3 longitudinal studies conducted in Andhra Pradesh, India
  - PCR was the main tool used
  - Several key findings, including genotyping
  - Helped to refine/revise some of the BMPs
  - Very clearly validated the ongoing BMP program in India

2.1 Inter-laboratory PCR calibration

- Over 90 PCR service providing labs are offering PCR testing service to farmers and hatcheries in India
- Key decisions (buy seed or not; go for emergency harvest or not) were made based on PCR results
- Quality of PCR results coming out of PCR service providing labs proved to be very important
- Need for a quality assurance program so that farmers can get seed tested in reliable service providing laboratories

2.2 PCR laboratory inter-calibration

- Inter-calibration procedure
  - 10 coded samples (5 DNA, 5 tissue; WSSV positives and negatives)
  - Rigorously validated in several laboratories
  - Laboratories can use test of choice
  - Report results to project team
  - All laboratories see all results but can identify only their own lab code
  - Advise to all labs on action according to categories of performance
  - Program completed in India, Indonesia and Vietnam

2.3 Comparison of laboratory performances – India, Indonesia and Vietnam

Result	Interpretation	India I	India II	Indonesia I	Indonesia II	Vietnam I	Vietnam II
Perfect scores	Fine	17 (46%)	6 (19%)	10 (30%)	7 (23%)	14 (44%)	14 (58%)
Failed to identify only weak positives	Sensitivity not optimized	3 (8%)	13 (40%)	4 (12%)	6 (20%)	7 (22%)	6 (25%)
Failed to identify moderate/severe positives	Major sensitivity problem	6 (16%)	6 (19%)	10 (30%)	8 (27%)	3 (9%)	0 (0%)
Failed to identify negatives	Contamination problem	9 (24%)	2 (6%)	4 (12%)	4 (13%)	3 (10%)	1 (4%)
Failed to identify both positives and negatives	Total system failure	2 (6%)	6 (19%)	5 (15%)	5 (17%)	5 (15%)	3 (12%)
TOTAL responses		37	32	33	30	32	24
Non-responses		12 (26%)	19 (37%)	1 (3%)	0 (0%)	13 (29%)	4 (14.3%)

2.4 Quality assurance to small scale farmers

- Only 40-60% of PCR service laboratories in India, Indonesia and Vietnam are functioning reliably
- National PCR laboratory registration and program of regular inter-laboratory calibrations established in India
- Request for regionalization of the program

3. PCR application in national surveillance programs (source=QAAD)

Year	Thailand (Number of samples tested for WSSV)	Myanmar (Number of samples tested for WSSV)	Philippines (Number of samples tested) for WSSV)
2004	14129	150	288
2005	8613	225	118
2006	7380	183	2355
2007	6424	199	1317
2008	3419	157	574

Conclusions

- Modern tools have immense benefits
- Application of modern biotechnological tools to address real field problems and benefit small scale farmers should be looked into seriously
  - Offers scientific solutions to the industry
  - benefits small scale farmers sustain their livelihoods
- It takes long time to see the IMPACTS (should have patience!!!!!)