

# **BioTech development in developing countries: case of Vietnam**



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# Development background

- Multiple transition: planned economy to market economy; agricultural economy to industrial economy
- Challenges of globalization
- MDG (Millennium Development Goals)
- Favourable growth: stable GDP growth (7-8% in ten years), large market (86 mln.)
- Entering a middle income status (GDP per capita is higher than 1,000 USD)

# Science, Technology & Innovation structure

- Ministry of Science and Technology
- National centres for R&D: VAST, VASS, VAAS
- R&D institutes under line ministries: industry and trade, transport, healthcare, construction, agriculture, environment, etc.
- University faculties: little research, mainly teaching
- Innovation in firms: most are SME (80%)

# STI: positive features (1)



- Leadership commitments
- A system of S&T personnel and institutions to carry out R&D activities
- Set up a system of supporting organizations for innovation: standardization, quality, IPR, information and libraries, consultancy, etc.
- Technology intensive sectors: airlines, oil and gas, telecom, transport, textile-garment, banking, finance, manufacturing.

# STI: positive features (2)



- S&T programs and techno-economic programs
- Increased investment for R&D and higher education
- 19 national key laboratories: ICT, Bio, Material, etc.
- Two high-tech parks: Hoa Lac (North), HCMC (South) and others (maybe in Danang)

# STI: issues at stake



- Numerous S&T personnel: qualification, structure, location; aging issues
- Despite improvements, poor infrastructure
- Network of S&T organizations: strong imbalance and weak linkage with firms
- Weak capability of self-adjustment and respond to change
- Implementation of policies: formal coordination, fragmentation

# Recent changes



- S&T Strategy to 2010 (2003)
- Development of Technology Market (2005)
- International integration in S&T (2007)
- Law on S&T (2001); Law of IPR (2005); Law on Technology Transfer (2006)
- Firms' Innovation program (2003)
- Funds for S&T and innovation (2007)
- State Agency for Technology Innovation (2007)
- High Tech Law (2008)

# Innovation in firms



- Firms' innovation: minor/incremental changes
- Innovation by bringing embodied technology
- Technology transferred from MNCs of parent company
- Limited cooperation with local R&D organizations and other enterprises
- Unclear technology spillover of FDI



# Obstacles for innovation

- Lack of technology information
- Technology acquisition: choice and negotiation of technology transfer agreements
- Access to capital for innovation
- IPR issues: law enforcement
- Poor local sources of innovation

# Biotech: the Orientation



- Priorities technologies by S&T Strategy until 2010: ICT, **Biotech**, Automation, Advanced material, New energy, Mechanical engineering, Environment technologies
- High-tech priorities by Government Action plan 2005-2010: ICT, **Biotech**, Automation, New Material and nano, Mechatronics
- New S&T&I Strategy 2020 being drafted
- Government Resolution No.18 to develop **Biotech** (1994)

# Biotech: the Activities



- National Program of Biotech development in agriculture: 2006-2015
- National Committee for Biotech Development
- Budget 70 mln. USD, administered by Ministry of Agriculture and Rural Development
- Similar programs for Biotech in Healthcare (Ministry of Health) and Environment (Ministry of Environment)
- R&D Biotech programs (Ministry of S&T)

# Biotech: overall players



- *R&D institutes* (40 in agriculture and 20 in healthcare/medicine), most are governmental
- *Universities*: 80 working in agriculture and healthcare biotech
- *Firms*: around 4,500 in agro-business and 180 in modern medicines production and 300 in complimentary/alternative medicines production; 30% having GMP (Good Manufacturing Practice)
- 10 *FDI firms* in pharmaceutical manufacturing

# R&D institutes (1)



- Sixty labs, half are in tissue culture, production of crop plants, fungi, medicinal fungi, microorganism fertilizers, biological pesticides, etc. for agriculture. The capacity around 4 million plants per year per lab
- Six national key biotechnology laboratories
- Institute of Biotechnology (IBT) under Vietnam Academy of Science and Technology (VAST): five major fields of biotechnology: (i) Genomics and proteomics; (ii) Biotechnology of microorganisms; (iii) Enzyme biotechnology; (iv) Plant biotechnology; (v) Animal biotechnology

# R&D institutes (2)



- Agriculture: Institute of Agricultural Genetics (IAG) under MARD; Mekong River Delta Rice Research Institute; SOFRI (Southern Fruit Research Institute) and RIFAV (Research Institute for Fruits and Vegetables)
- Healthcare: National Institute for Hygiene and Epidemiology (NIHE); Pasteur Institute in Ho Chi Minh City and Nha Trang; Institute of Vaccines and Biological Substance in Quy Nhon; Hospitals

# Agro-Bio R&D institutes

- Agricultural Genetics Institute
- Cuu Long Delta Rice Research Institute
- Food Crops Research Institute
- Institute of Agricultural Science of South Vietnam
- National Center for Inspection of Drugs and Bio-Products
- National Center for Variety Evaluation and Seed Certification
- National Institute for Plant Protection (NIPP)
- National Institute for Soils and Fertilizers (NISF)
- National Institute of Animal Husbandry (NIAH)
- National Institute of Veterinary Research (NIVR)
- National Maize Research Institute (NMRI)
- Oil Plant Institute of Vietnam (OIP)
- Research Institute for Fruits and Vegetables (RIFAV)
- Southern Fruit Research Institute (SOFRI)
- Southern Sub-Institute of Agriculture Engineering and Post Harvest Technology (SIAEP)
- Vietnam Agricultural Science Institute (VASI)
- Vietnam Institute for Agricultural Engineering and Post Harvest Technology (VIAEP)
- Western Highlands Agro-Forestry Science and Technology Institute (WASI)
- Tea Research Institute of Vietnam (TRIV)
- Southern Institute of Agricultural Science
- Institute of BioTechnology (IBT)

# Medical-Pharma R&D institutes

- The National Institute of Pediatrics
- Center Institute of Malaria, Parasitology and Entomology (IMPE)
- National Institute of Hygiene and Epidemiology (NIHE)
- Vietnam National Institute and Hospital of Acupuncture
- Institute of Malariology, Parasitology and Entomology, Quy Nhon
- Institute for Clinical Research in Tropical Medicine (ICRTM)
- National Institute of Hematology and Blood Transfusion (NIHBT)
- Institute of Vaccines and Biological Substances 2 Dalat (DAVAC)
- Viet Nam Cardiovascular Institute (VTM)
- The National Institute of Burn (NIB)
- Viet Nam National Institute of Dermatology and Venerology (NIDV)
- National Institute of Drugs Quality Control
- National Institute for Meteria Medical (NIMM)
- Pasteur Institute Ho Chi Minh City
- Pasteur Institute in Nha Trang
- Institute of Vaccines and Biological Substances, Quy Nhon

# Universities



- Hanoi University of Technology, HCM University of Technology, VNU, Hanoi Medical University, etc.
- Trained 4,000 biotech personnel, of which degrees for 1,500 BSc, 400 MSc and 100 PhD
- International training: US-Vietnam Education Foundation (10 mln.USD per year), 322 program (government scholarship, 8 mln. USD per year), AusAid development scholarship,.

# Biotech for Agriculture



- Plant biotechnology:
  - New seeds of crops (rice), self-sufficiency of 25% (benefit of 40 mln. USD per year)
  - Disease and draught resistance of new crops
- Animal biotechnology:
  - Vaccine production for veterinary: self sufficiency of nealry 100%
- Aquaculture:
  - Early detection of species disease for shrimp, etc.

# Biotech for Healthcare: pharmaceuticals



- Vaccine production of 10 types to serve the vaccine program in eliminating polio. Millions of doses per year to support the vaccine program (for children), and for export to India, South Korea, and Japan. Two types of vaccines have met 100% and the rest have met 40-60% of domestic demand.
- Genetic engineering, transgenic and GENE-CARD technologies applied to identify the remains of dead from the war; to recognize blood-relations; in criminal investigations, etc.

# Biotech for Environment



- Biotech application for dioxin-intoxicated soil treatment
- Micro-organic technology applied in oil-polluted treatment
- Weaker than in agriculture and healthcare

# The Issues

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- Insufficient investment
- Lack of human resource to run facilities
- Management issue: sharing biotech facilities, lab, etc.
- Weak incentive system
- Network is scattered, fragmented, lack of cooperation
- Firms lack of R&D capability

# New perspective



- New effort of creating Centers of Excellence
- HCMC Center of Biotechnology
- 100 mln. USD investment for the first phase
- Production of recombinant vaccine, 4 zones: production, training, clinical test, vaccine production, 12 labs
- 1,000 staff, need to train 100 MSc and PhD overseas with budget of 5 ml.,USD



# International collaboration

- International organizations: IDRC on policy for cooperation; UNEP on biodiversity, UNIDO on green and clean tech
- Bilateral cooperation partners: Germany (Heidelberg and BioValley), International Vaccine Institute, Korea (joint vaccine production), Sweden (joint R&D lab with Karolinska Institute in infectious disease), US, ASEAN on influenza and swine flu, etc.

# Business opportunities: cases

- ***Hanoi Biotech Park***: Irish investor, 1 bln. USD, production of medical equipment
- ***Hanoi High Tech Park (Hoa Lac)***: JV with Korea on medical diagnostic equipment
- ***Mekostem***: stem cell bank in HCMC; 2/2009; 560,000 USD investment; JV with Singapore Cell Research Corporation; stem cell isolation technology
- ***Mamprotech***: stem cell bank in Saigon HighTech Park; 11 mln. USD investment; JV with Mamprotech Pty.Co. of National Innovation Center in Sydney (linked to NSW University); producing proteins, test kits, Inteferon Beta for cancer treatment, etc.

**More to come...?**





**Thank you**