Public-Private Partnership in Agbiotech: The Case of Genetically Engineered Eggplant in India*

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* Research supported by USAID/ ABSP II Project

Current scenario of ag-biotech

- Private sector investing $ 2.5 B annually in agbiotech

- Developing countries invest at but 5% level of private sector so applications must come from private sector

Why less public investment in Ag-biotech in developing countries?

- Costly novel traits
- High regulatory costs
- Poor technology transfer due to lack of proper IPR regulations in Developing countries
- Lack of human capital and R&D infrastructure

Solution?

- Humanitarian donations/public-private partnerships

- But, the question is whether these partnerships are feasible, and if so under what conditions

Two-Tiered Approach:

- SMALL FARMERS:

HUMINITARIAN DONATIONS and PARTNERSHIPS

Not a real cost for firms if mean ‘non commercial market’ – issue is segmenting markets

- COMMERCIAL FARMERS:

Enhance incentive to transfer agbiotechnologies by selective strengthening IPR

Partnerships contd.

- Enhance access to technology for resource-poor farmers
- Generate public-good will
- National capacity build-up

BUT RISKS

- Loose control over technology
- Low-quality products from the partner
- Liability

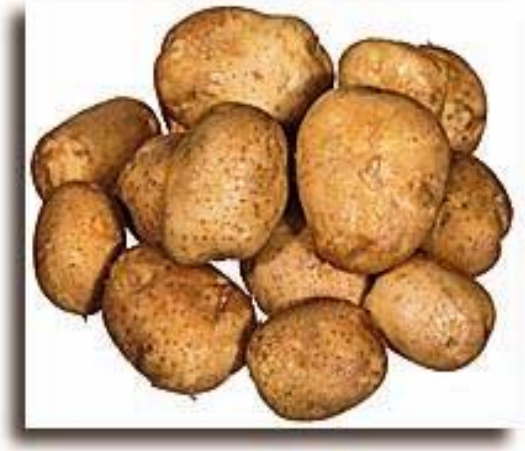
Both jeopardize commercial interests

Partnerships contd.

REQUIRES

- Developed seed sector and potential for market segmentation based on: crop & region,
  variety,
  trade status,
  community income level, or production system
- Trust between partners

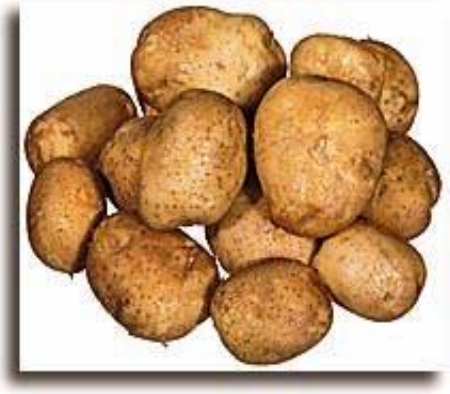
Partnerships contd.



For example,

- Monsanto donated virus-resistant technology to Center for Research and Advanced Studies (Mexico), under royalty-free license agreement. The transfer was brokered by ISAAA to develop virus-resistant **local varieties** (not for processing types) of potatoes in **Mexico** (1991) .

Humanitarian Donations (contd.)



But Mexican project was not economically viable

- virus infection was not the major constraint for the potato growers (less market value)
- Virus damage not readily visible
- cost of transforming and propagation relatively high

However, Monsanto's profits were not threatened because small-scale farmers were difficult to reach in the commercial market

Public-private partnership

Another Example: Bt eggplant in India

- One of the important non-seasonal vegetable crops in India
- Both hybrids and open pollinated varieties grown by farmers
- Nationally 30% of farmers use hybrids

Bt eggplant (contd.)

- Eggplant shoot and fruit borer (ESFB)is the most destructive pest, reduces yield up to 70%
- ESFB damage readily visible
- Farmers use pesticides to control the pest, in many cases over-use is reported

Bt eggplant (contd.)

- Mahyco (Indian seed company, Monsanto owns 26% share) developed *Bt* hybrid eggplant providing resistance to targeted pest (ESFB)
- Donated *the technology* to public institutions in India to develop **Bt OPV varieties of eggplant**, while company focuses on *Bt* hybrid eggplant.
- Donated the toxicology package they have for Bt hybrid eggplant

Bt eggplant (contd.)

- Bt hybrid eggplants received regulatory approval for large-scale trials.
- Bt OPVs are under development by institutions such as TNAU, UAS , Dharwad

Large scale trials of Bt hybrid eggplant (photos by Dr. Frank A. Shotkoski)

TNAU Bt OPV eggplant trials

UAS Dharwad, Bt OPV seedlings in GH

Is the public-private partnership feasible?

- ISSUES: will existence of low-priced Bt OPVs cannibalize the Bt hybrid market?
- What are the conditions for the co-existence of Bt hybrid and Bt OPV technologies?
- Is it replicable for other crops in other countries?

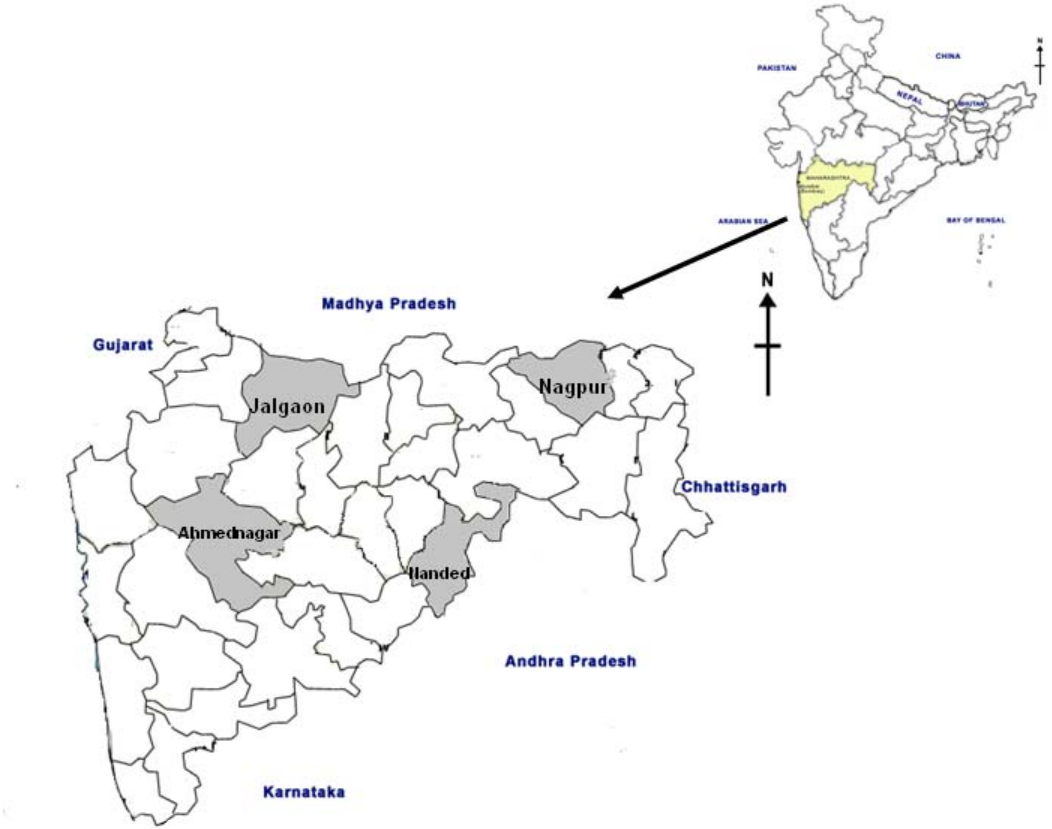
Data Collection

- Farm-level survey in Maharashtra 2004-2005 to collect data on eggplant production practices, farmers' willingness to pay for Bt technology, etc.
- 249 eggplant farmers and 41 non-eggplant vegetable farmers participated

Eggplant production practices

- Hybrid eggplant yield 47% higher than OPV
- Hybrid farmers spend 1.5 times more on pesticides
- Hybrid farmers have better access to credits, markets, irrigation
- Hybrid farmers have higher land value

Fig 1:Map of the study area



Field trials of hybrid *Bt* eggplant

- Report 52% decrease in pesticide use, and 39% decrease in the number of sprayings of *Bt* plots
- Average yield from *Bt* plots 117% higher than non-*Bt* counter parts.
- Trials pending for *Bt* OPV but assume same proportional benefits in yield and pesticide use

Results from partial budget analysis for hybrid growers

	Cost/return	Hybrid to Bt hybrid (Rs/ha)	Hybrid to Bt OPV (Rs/ha)
i	Pesticide savings (40%)	13076	25380
ii	Yield benefits (48%)	47086	584
iii	Sub-total returns	60162	25964
iv	Seed prices 1 est. WTP 2 est. WTP	 12004 (max) 6625 (average)	 1163 (average) 0
v	Net returns (iii-iv1) (iii-iv2)	 **48158** **53537**	 **24801** **25964**

Results contd.

- Hybrid farmers gain more from adopting Bt hybrid than low-priced *Bt* OPV
- Hence no incentive to switch to low priced *Bt* OPVs once available

Results from partial budget analysis for OPV growers

	Cost/return	**OPV to *Bt* OPV (Rs/ha)**	**OPV to *Bt* hybrid (Rs/ha)**
i	Pesticide savings (40%)	5165	-7405
ii	Yield benefits (48%)	32115	78243
iii	Sub-total returns	37280	70838
iv	Seed prices 1 2	 1163 0	 12004 (max WTP) 6625 (average WTP)
v	Net returns (iii-iv1) (iii-iv2)	 **36117** **37280**	 **58383** **64213**

Results contd.

- Resource limited farmers could gain more from adopting *Bt* hybrid mainly because of the yield benefits.
- However, there are constraints for this adoption: capital, market access, risk, etc.
- Earlier study reported OPV farmers have higher probability to adopt *Bt* OPV due to socio-economic and production characteristics

Results from sensitivity analysis shows similar trend

Conditions facilitating co-existence of Bt hybrids and Bt OPVs

- Production systems of hybrid and OPV eggplant are different (access to irrigation, access to credit, markets, land value)
- Scope for market segmentation
- Hybrid growers have higher WTP for *Bt* technology

Conclusion

- Royalty-free *Bt* OPV will not affect company profits
- Mahyco benefits from the public institution participation by building public relations.
- This kind of segmentation is possible for other crops when different levels of production technologies are used based on access to irrigation, market, credit and land values.

Thank You