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Abstract

**NEW AGRICULTURE TECHNOLOGY, SKILL FORMATION, FOOD SECURITY AND POVERTY REDUCTION IN RURAL ASIA:
A Comparison of Three Projects from India, China and Bangladesh**

By

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Table of Contents	Pages
<i>Abstract</i>	<i>1-2</i>
<i>1. Introduction and Objectives</i>	<i>2-3</i>
<i>2. Background/Context of Three Projects Areas</i>	<i>3-6</i>
<i>3. An Inter-Comparison: Approaches and Institutional Arrangements</i>	<i>6-7</i>
<i>4. An Inter-Comparison: Human Capacity Building and Technology</i>	<i>8-11</i>
<i>5. An Inter-Comparison: Capacity Building and Project Outcomes</i>	<i>11-14</i>
<i>6. Proximate Factors Shaping Outcomes & Challenges</i>	<i>14-18</i>
<i>7. Concluding Remarks</i>	<i>18</i>
<i>References</i>	<i>18-19</i>

ABSTRACT

Agriculture technology is undergoing rapid changes across the globe and Asian countries such as India, China, Bangladesh and many other countries are undertaking different policy initiatives to help farmers to build capacity to adopt new/improved technology towards bettering farm production, reducing poverty, human development and improving food security. Latest experience, during the last 5 years in three Asian countries – India, China and Bangladesh, provides interesting bases for cross-country comparison of rural areas, given similar socio-economic context of project areas and infusion of agriculture technological change. Though project instruments of such changes and their strategies/approaches are quite different, such comparative study helps to understand the actions/impacts of such differential strategies on the

ground and helps to provide a platform to analyse cross-country achievements, constraints and lessons learnt in the sphere of agriculture technology and rural development.

In the above context the present paper compares the strategies, capacity building processes and outcomes/impacts of three projects during the period 2005-10. The project areas covered by the study are located as follows:

- (i) *Jhalda-2/Burra Bazar/ blocks in Puruliya district of West Bengal (India),,*
- (ii) *Luo Yang Township of Huang Jiang County in Guangxi province(China) and*
- (iii) *Greater Rangpur in Bangladesh*

The above projects located in three most poor and deprived areas of the three countries under reference, help to provide important lessons in transfer of agriculture technology and human capital formation. The study uses both secondary and primary data and compares both quantitative and qualitative indicators as available from the field and arrives at comparative assessment based on both numerical and qualitative aspects and also stylized facts.

1. INTRODUCTION AND OBJECTIVES

Agriculture technology is undergoing rapid changes across the globe and Asian countries such as India, China and Bangladesh are undertaking different policy initiatives to help farmers to build capacity to adopt new/improved technology towards bettering farm production, reducing poverty, human development and improving food security. Latest experience, during the last 5 years in three Asian countries – India, China and Bangladesh, provide interesting bases for cross-country comparison of rural areas, given similar socio-economic context of project areas and infusion of agriculture technological change. Though project instruments of such changes and their strategies/approaches are quite different, such comparative study helps to understand the actions/impacts of country-specific strategies on the ground and also helps to provide a platform to analyse cross-country achievements, constraints and lessons learnt in the sphere of agriculture technology and rural development.

It is well documented that improvements in agriculture technology has proved to be one key variable to drive efficiency levels in agriculture production and thereby affects small and marginal farmers' income, labour opportunities, food prices, environmental sustainability and linkages with rest of the economy¹. The adoption of technology requires awareness building, capacity enhancement, institutional ownership, reasonable incentives for producers and investments and also markets for inputs and outputs. Agriculture technology has been defined² as “application of techniques to control the growth and harvesting of animal and vegetable products” and includes³:

¹ ODI/DFID Paper “Technology and its Contribution to Pro-Poor Agriculture Development” DFID and ODI paper (dfid-agriculture-consultation.nri.org/summaries/dfidwp4.pdf)

² Encyclopaedia Britannica

³ See footnote 1

- (i) Introduction of new crops,
- (ii) Bio-technology,
- (iii) Improved management practices relating to crops, livestock and farmers, mechanization,
- (iv) Infrastructure development,
- (v) External inputs (e.g. chemicals, bio-control products and veterinary products)
- (vi) Local inputs (e.g. soil amendments, mulches, other) and
- (vii) Dissemination of such technology also plays a key role

In the above context the present paper compares the strategies, capacity building processes and outcomes/impacts of three projects during the years 2005-10 located in three most poor and deprived areas of the three countries under reference and draws policy conclusions on that basis. The study uses both secondary and primary data and compares both quantitative and qualitative indicators as available from the field and arrives at comparative assessment based on both numerical and qualitative aspects and also stylized facts.

2. BACKGROUND/CONTEXT OF THREE PROJECT AREAS

It may be mentioned that the location of a project in a certain country and a region places it into a context in terms of the exogenous factors such as socio-ethno-geographic-related and institutional settings, which tend to affect the project. Relevant background of the three project areas under reference and the host countries namely, Puruliya district in West Bengal (India), Huang Jiang county in Guangxi province (China) and greater Rangpur of Bangladesh have been described below.

2.1 India – West Bengal – The State of West Bengal⁴ has 72 per cent of its people living in rural areas where the proportions of the scheduled caste and the scheduled tribe population are 28.6 per cent and 5.8 per cent respectively⁵. Implementation of agrarian reforms, since the early eighties and a three tier *Panchayati Raj* System, since 1977, accelerated agricultural productivity in the State after 1983 coincided with a period of fall in the incidence of rural poverty though poverty rates for the SC's, ST's and female-headed households show a much higher degree of impoverishment (Meenakshi et.al: 2000). One of the most deprived set of people is the long-neglected tribal population where many of them reside in the forested areas of the conflict zone⁶ in Puruliya, Paschim Medinipur and Bankura districts.

2.1.1. Puruliya District – Puruliya is a drought-prone region with low retention of rainwater capacity and severe runoff resulting in upland soil loss and limiting soil depth. The agriculture pattern is limited to mono cropping of rice, which accounts for 90 % of the crop area in this region. Crop yields are rather poor due to double damage - soil acidity and water scarcity. Puruliya has huge infrastructural gaps and lack of good

⁴ is located in the Eastern part of India with a population of 82 million⁴, covers an area of 88,752 Sq km with 12 agro-ecological zones. Accounting for 7.8 per cent of country's total population

⁵ census data, 2001

⁶ affected by armed conflict between India's para-military forces and Maoist

governance. Of the tribal households in Puruliya, only 57.26 % reside in livable housing; 17.13 % avail banking services; 3.47 % have electricity and 1.59 % are able to have access to toilet facility⁷. As per Human Development Index (UNDP: 2004), the district of Puruliya ranks amongst the bottom ones, which is 14th amongst the 18 districts of West Bengal.

Jhalda 2 and Burra bazaar blocks of Puruliya district have many villages located in their interior areas with considerable proportion of land of inferior quality including wasteland. With acute water crisis, cultivation is not easy though some paddy is cultivated in the rainy season where yield is considerably low. There is lack of infrastructure facility and electricity and proper road connections and lack of easy access to health sub-centers. Many schools are virtually dysfunctional for want of good management and irregular attendance of teachers.

2.2 China –It may be mentioned that China is committed to protecting all legitimate rights of the ethnic minorities, safeguarding equality and solidarity amongst different ethnic groups and promoting their economic development so as to speed up its economic development⁸. In this context the period during the 11th Five Year Plan (2006-2010) is one where China made plans to devote more attention to the issue of social equity and social development. China's policy goal was to build a well-off and harmonious society and to attain the Millennium Development Goals (MDGs) (UNDP: 2005). In recent years though China's educational strategy has concentrated on the Western region it has failed to meet the targets for reducing youth illiteracy and compulsory education.

2.2.1 Guangxi province – Guangxi, (or Guangxi Zhuang Autonomous Region) located in the southern part of China has a population of about 49 million, and encompasses an area of 236,700 square meters. It has a large proportion of ethnic minorities and rural poor ethnic population⁹ and its numbers¹⁰. Guangxi is one province, amongst others which has failed in its target of 2002 by 30 % for reducing youth illiteracy and enabling compulsory education and has also suffered from the outflow of talented people due to lack of local employment opportunities. Standards of health also tend to be much lower in western China with maternal mortality rate and level of malnutrition much below China's national average. Average life expectancy was 68.4 in the West and 71.9 in the East of China. The rural elderly receiving government assistance was 5.8 per cent, which was the lowest in the Western region as compared to 10.99 % and 6.03 % in Eastern and Central region of China. Though the human development indices and overall education index show

⁷ Source: Estimates based on Census data, 2001 West Bengal and NSSO data, Government of India

⁸ In China, Yao, Zhuang, Uygur, Hui, Yi, Tibetan, Yao, Miao, Manchu and many other ethnic minority groups are relatively disadvantaged and marginalized. In those areas and regions of China with high concentration of distinct ethnic minority population, a system of self-governance has been implemented. In recent years, the government of China has also started promoting a revival in ethnic minority customs to attract more foreign tourists. Apart from this the minorities have been given special treatment in education and certain exemptions on China's family planning of 'one child policy'. (Google web page on "Meet China's Bai Minority", July 1, 2000). The State Forestry Administration has been implementing the "Ethnic Minorities Development Plan (EMDP) for the Sustainable Forestry Development Project (SFDP) since March 2001.

⁹ 17.94 million in Guangxi

¹⁰ 12 ethnic minorities in Guangxi

improvement over time in Guangxi province over the period 2003 to 2006, its life expectancy indicate deterioration (UNDP: 2005, 2008).

2.2.2 *Huangjiang* – Huangjiang Maonan autonomous county is located in the north of Guangxi and the Maonan people¹¹ are largely scattered in this county, which make up more than 80 % of their total population. It is a part of the Karst region¹² in China which is similar to the desert edge with fragile ecological environment, which is doubly problematic in terms of environmental degradation and poverty and also limestone quarrying. Locally grown plants include rice, corn, sweet potato, mulberry leaves and sugar cane. There are 8 townships in Huangjiang county¹³ and Luoyang – the township under study, started with a relatively large chunk of poverty¹⁴ in the pre-project period as compared to at least 6 other counties. Luoyang had a poverty break-up of households as follows: 35.1 per cent as hard core poor, 54.7 per cent as poor and 10.2 per cent as ordinary poor.

2.3 Bangladesh – Bangladesh is one of the most densely populated countries of the world with 150 million people, of which 49 % live below the national poverty line. Bangladesh has recorded some success in reducing infant and child mortality though maternal mortality remains high. With social protection expenditure as 3.25 % of GDP, the overall coverage of safety nets is about 13% of all households in Bangladesh while it is 15.6% in rural areas ((Ahmed and Rehman: 2000). Though Bangladesh has made steady progress in terms of ensuring food availability, such progress varies in different parts of the country. According to the 2005 Household and Expenditure Survey of Bangladesh Bureau of Statistics the poverty headcount rate for the entire country was 40 per cent while in the greater Rangpur region the poverty rate was 57 per cent. The extreme poverty (persons who cannot meet the 2100 calorie per day on food) was 25 per cent nationally as compared to 43 per cent in the greater Rangpur region.

2.3.1. *Greater Rangpur, Bangladesh* – In the Greater Rangpur region including Rangpur, Nilpahari, Kurigram, Lalmonirhat and Gaibandha, there was an acute problem of seasonality or *monga* (famine-like situation), which imply chronic entitlement failure twice in a year – one is during March-April while the other is during September to November. There was seasonal scarcity of employment during such *monga* periods which was accompanied by sharp decline in per capita food consumption and income of the marginal households. However, the intensity of *monga* during the period March-April was reduced during the last three decades with the introduction of *boro* (irrigated) rice during 1970's, which generated some employment of labourers, who were not employed. However, the second period of *monga* during September to November was critical for the poor farmers and wage labourers since such acute seasonal poverty implied starvation,

¹¹ The Maonan people are an ethnic group in China with a very small population that resides in mountainous area. They are the aboriginal ethnic group of Lingxi area. They have their own language though no written language.

¹² As per scientific facts low development capability of limestone and long term karstification cause water leakage and deep sink, frequent droughts or floods and desertification.

¹³ Counties in Huangjiang – Si En, Shiyuan, Luoyang, Chuarshan, Xianan, Minglun, Longyan and Xunle

¹⁴ Poverty situation judged by the following criteria: (i) Income per-capita; (ii) Grain consumption per-capita; (iii) Problem of food security; (iv) Completion of primary school, illiteracy rate; (v) No. of cattle per household; (vi) No. of households not getting drinking water; (vii) Natural villages not having road access.

malnutrition, migration, distress sale of household assets, costly borrowing and advance sale of labour. Flood as climate risk also increased the vulnerability of marginal communities¹⁵. The vulnerable areas were Rangpur, Nilpahari, Kurigram, Lalmonirhat and Gaibandha where such *monga* problem was compounded by problems of degrading natural resource base, soil erosion and flooding¹⁶. Though there was a multitude of responses to *monga* or famine-like situation, they met with limited success due to lack of coordination amongst stakeholder agencies such as vulnerable group feeding (VGF), vulnerable group development (VGD), enterprise development, skill development, training, special micro credit programme, relief and food for work (FFW).

3. AN INTER-COMPARISON: APPROACHES AND INSTITUTIONAL ARRANGEMENTS

The project areas covered by the study were located as follows:

- (i) Puruliya district in West Bengal (India) - Jhalda-2/Burra Bazar/ blocks,
- (ii) Huangjiang county in Guangxi province (China) - Luo Yang Township and
- (iii) Greater Rangpur region (Bangladesh)

For the sake of convenience in this study we call the projects by location such as the one located in Puruliya as the “Puruliya project”, the one located at Huangjiang as “Huangjiang project” and the one at greater Rangpur as “greater Rangpur project”. Though all the three projects had one key strategy of reducing poverty through improving agriculture technology and bringing about changes in human and productive capacity, the objectives, strategies and approaches varied widely in the three projects of the three countries under reference. This also meant differential outcomes, which were gradually emerging. While in case of the greater Rangpur project in Bangladesh, a renowned agriculture-based NGO¹⁷ of Northern Bangladesh formed multi-stakeholder group and started with a pilot project and helped local farmers to grow a shorter duration paddy variety during their food deficit season¹⁸; for Puruliya project, it was a watershed approach adopted by a well reputed NGO¹⁹ in 2 blocks of Puruliya district in West Bengal which was bringing about a perceptible change in the local conditions in terms of agriculture productivity; The Huangjiang project in China, an integrated local area development approach as established by the government²⁰ covered three provinces²¹ and

¹⁵: Ban-eco.blogspot.com/2009_10_01archive.html

Food Insecurity and Climate Change: Contemporary Issues, 10/01 by Bangladesh Economy Contemporary Issues at [11:46 PM](#), accessed from net on 22nd June 2009.

¹⁶ An analysis of household expenditure and income survey data shows that seasonal income greatly influences seasonal consumption. However lack of income and consumption smoothing is more acute in greater Rangpur, the north wets region causing widespread seasonal deprivation (Kandhkar (2009).

¹⁷ RDRS, Bangladesh with other actors from the government of Bangladesh and private sector enterprises

¹⁸ Possible to harvest three rice instead of twice in a year from same piece of land, just utilize the fallow land in between boro and aman rice season. Normally Boro harvested in late April and aman transplanted in late July or early August in same land.

¹⁹ PRADAN, India

²⁰ Poor Rural Communities Development Project covering Sichuan, Guangxi and Yunnan

²¹ see footnote 20

attracted relatively much bigger investment as compared to the other two projects under reference and was emerging as a viable rural agro-social change model.

3.1 Puruliya Project – The Puruliya project was integrating livelihoods, health and education based on a variety of inputs in remote (often) forested areas where marginalized groups were residing in scattered areas and were prone to malaria. As mentioned earlier, the road network to these villages (for example in Rigdi gram panchayat²² in Jhalda -2) was grossly underdeveloped and there were gaps in critical infrastructure and the need for huge investments in roads, bridges, culverts etc.

The project model of Puruliya had much emphasis on organizing the poor households into self-help groups for strengthening their local livelihoods and diversifying them by means of bettering agriculture and horticulture practices. This was based on a watershed approach including rain-water harvesting, land leveling and treatment, integration with NREGS for providing man days of labour, horticulture with improved variety, organic cultivation practices and others. The project mandate was clearly in terms of providing social and technical support towards strengthening local livelihoods, local capacity for group work including awareness raising and also improving education and health.

3.2 Huangjiang Project - In Huangjiang county of Guangxi province the project work since 2005 covered an area of 4572.31 square kilometer in 148 administered villages with 13 ethnic minorities residing in it. It was an integrated project where capacity building for agriculture technology was one of the key project activities, which was a part of strengthening livelihoods of rural communities apart from the support provided by project investments in schools, rural clinic, irrigation, drinking water, agriculture loan and other rural infrastructure. The project objective was that of poverty reduction through local participation.

3.3 Greater Rangpur Project – The project objective was to bridge “seasonal food insecurity in ecologically vulnerable and economically weak parts of north western Bangladesh primarily caused by an employment and income deficit before *aman*²³ was harvested. It mainly affected those rural poor, who had an undiversified income that was directly or indirectly based on agriculture (Zug: 2003).” Based on a capacity development model with 3 staff from Bangladesh Rice Research Institute, 15 RDRS staff (local NGO) were trained, which, in turn, trained 300 farmer promoters.

3.4. Convergence of Aims - The three projects under reference, broadly aimed to reduce poverty and to strengthen local livelihoods through local capacity building and agriculture development (integrated agriculture and infrastructure development as in case of Guangxi, China) in the areas concerned based on farmers’ participation. In terms of institutional patterns, one key aspect to reckon with was that while changes through agriculture technology were being brought about by agriculture-based NGOs in both

²² Project activities started in the year 2008, where 32 self-help groups (of 10-20 members, each) of a total of 105 members were formed along with formation of their clusters

²³ *Aman* is the rice grown in monsoon season.

India²⁴ and Northern Bangladesh²⁵, it was being brought about by a provincial government project in South-West China.

4. AN INTER-COMPARISON: HUMAN CAPACITY BUILDING AND TECHNOLOGY

In terms of technology and human capacity building, there are at least seven aspects of the project which can be compared. One aspect to begin with was supporting local capacities for introduction of improved varieties for which all the three projects were intensely engaged. Improved management practices were undertaken by all the three projects with more efficient application of inputs and better treatment of pests as facilitated by capacity building in such aspects. In terms of supportive infrastructure development for agro-eco systems the Puruliya project facilitated fast implementation of water harvesting structures through participation of local women's self-help groups. The Huangjiang project was, however much broader in scope than that of Puruliya or even the greater Rangpur project and included irrigation channels and efficient terrace cultivation and social infrastructure such as schools, clinics and drinking water system and also construction of village roads and culverts. The greater Rangpur project was quite focused on introducing a short duration rice variety through field experimentation in the *monga* season through building capacity of local farmers so as to provide employment in a deficit season and thereby bridge local gaps in food security.

Table 1 shows the types of technology transfer under the three referred projects. All the three projects under reference utilized local inputs and disseminated technologies in different ways so as to have impacts on a larger section of people and areas concerned. More specific types of technology transfer and capacity building are described below for each project under reference.

Table 1 – Agriculture Technology Transfer Through Human Capacity Building: The Three Study Projects

Aspects of Agriculture Technology Adapted/Adopted	Puruliya (India)	Luo Yang (China)	Greater Rangpur (Bangladesh)
(i) Introduction of new crops	Yes	Yes	Yes
(ii) Bio-Technology	-	-	-
(iii) Improved management practices relating to crops, livestock and farmers, mechanization	Yes	Yes	Yes
(iv) Infrastructure development	Yes	Yes	-
(v) External inputs (e.g. chemicals, bio-control products and veterinary products)	Yes	Yes	Yes
(vi) Local inputs (e.g. soil amendments, mulches, others)	Yes	Yes	Yes
(vii) Dissemination of such technology	Yes	Yes	Yes

²⁴ PRADAN

²⁵ RDRS successfully cultivated pariya paddy in 132 bigha land involving 132 farmers in Rangpur, Kurigram, Gaibandha, Lalmonirhat and Nilphamari and got excellent yields last year. "We are finally cultivating pariya in 1,500 bighas this season involving 1,500 farmers were engaged by providing them 7.5 tonnes of pariya seeds in Rangpur, Gaibandha, Nilphamari, Kurigram and Lalmonirhat districts," Mr. M. C. Neogi Head of RDRS Agriculture said..

4.1`Puruliya Project - In terms of specific agriculture interventions Puruliya project was engaged in promoting the following activities (Charaborthy:2005):

- (i) Introduction of quality seeds by adopting new varieties
- (ii) Preparing nursery beds with proper drainage facility
- (iii) Ensuring recommended doses of fertilizer/pesticides in nursery beds
- (iv) Timely transplantation and line transplantation
- (v) Ensuring basal fertilizer dose and top dressing
- (vi) Pesticide application as and when required

Some key intervention points identified with farmers as service providers were seed treatment, preparing wet bed nursery, line sowing, timely early transplantation, proper spacing, weeding and hoeing and proper application of inputs. Box 1 provides a glimpse of the micro level interventions undertaken by the Puruliya Project.

BOX 1 – An Indicative List of Puruliya project supported Activities in selected villages (illustration village Hallatanyar) of Rigid Gram Panchayat, Jhalda 2, Puruliya:

- (i) Formation of self-help groups (SHG's) and Village Committee
- (ii) Growing mango orchards, agro-Forestry – timber trees such as Gamar, Segun
- (iii) Vermi-composting
- (iv) Remodeling cow sheds (*goyal ghar dhalai*) for collection of cow urine (*go-mutra*) in a pit for organic farming
- (v) Preparation of organic fertilizers with cow urine and other organic materials
- (vi) Mosquito nets to prevent incidence of malaria
- (vii) Preparation of organic pesticide with cow urine and other organic materials
- (viii) Kitchen illumination for better lighting
- (ix) Construction of water storage structures (*jala kunda*) under special SGSY
- (x) Digging of wells
- (xi) Construction of *Hapa* (big water harvesting structure) depending on the area
- (xii) Digging of tube wells
- (xiii) Centre for adult literacy and child coaching
- (xiv) Implementation of Special SGSY scheme
- (xv) Constructing green house for plants – Green/White house with 50 % white shaded nets

Source: From the field notes of Neela Mukherjee and Madhumita Parihari, Purulia, 2010

Some data on the extent of farmers' involvement in NGO-support activities in Puruliya project are given below. Table 2 also provides an idea as to the extent of training of service providers (as farmers) and resource persons (technical personnel), which were groomed to bring about the technological change in agriculture. The project took help of video shows in different villages to orient the local farmers to adopt SRI.

Table 2 – Project Activities and Coverage in Puruliya

Activities and Extent of Coverage	Number of Units	Nos. of Old and New
No. of Farmers	3793	(old:1370, new:2423)
Area	528 hectares	
No. of service providers groomed	31	
No. of Resource persons groomed	71	
No. of video shows conducted	123	

No. of participants in video shows	4864	
No. of villages in which such video shows were conducted	123	
No. of villages where farmers have adopted SRI	124	Old villages: 38 and new villages: 86

Source: Report on SRI in Puruliya District, West Bengal. Kharif Season 2007

4.2 Huangjiang Project – The main activities for developing human capacity for changes in agriculture technology and other services, as supported by the project, since the year 2005 were as follows:

- (i) Organizing local communities for local need assessment, participatory planning, implementation and monitoring/maintenance of project-related activities
- (ii) Demonstration and extension in **better growing practices, better seeds, growing of cash crops, better usage of pesticides/insecticides, pest control, better harvesting techniques**
- (iii) Technical and social capacity building of farmers, both women and men
- (iii) **Provision of agriculture loans to expand and diversify agriculture production, agro-forestry and livestock** – Those able-bodied poor households with enough labour for sustenance got agriculture loans for undertaking activities such as pig-raising, cattle raising, mulberry crops and more lately chicken-raising and sugar cane growing
- (iv) Construction of basic infrastructure such as irrigation channels, drinking water, village and inter-village road, primary school building, health and coordination with line agency to implement suitable components
- (vi) State-subsidized insurance integrated into the project for livestock, especially for the female pig in case of pig-breeding activity

4.2.1 Cumulative Investment in Huangjiang project - Such an integrated approach helped the change the development process, which gathered momentum in 148 administered villages with 13 ethnic minorities residing in them as covered by the project. A cumulative investment of 48,918 RMB was made in Huangjiang project by the end of 2009, where 23,710 RMB was invested in sustainable mountain agriculture activities alone, 17421 RMB in building rural infrastructure and 759 RMB in capacity building of local farmers (excluding investments in capacity building by line agencies). Capacity building of farmers was done in different ways by means of classroom lectures, practice sessions, visits to sites, providing handouts, posters, videos and projections, which were continuously improved upon based upon feedback and need assessments from time to time. Both women and men from the local communities participated in such exercises and gained from them. Activities were monitored by an internal team and also by an independent team based on which suitable changes were brought about as and when required. Capacity building activities were not only in terms of training and workshops but also in terms of strengthening backward linkages through offer of agriculture loans,

procurement of good seeds, provision of livestock insurance, provision of better quality inputs etc.

4.3 Greater Rangpur Project – There was a range of government and non-government mitigation initiatives to bridge *monga* as indicated in section 2.3.1 though it was realized that the a common forum for such a huge task was essential, which could help to build joint capacity of farmers and field workers and help to bridge gaps in the system . It was also realized that sharing of human, financial and physical resources for a common cause through group activities in a common forum could help to meet the challenge. The interest, initiative and leadership of a regional actor²⁶ were expected to help in better facilitation (in a decentralized manner) of the whole process of change that was being envisaged (Magor and Salahuddin: 2009). Two main areas of work for the common forum were that of ‘providing seeds’ and ‘enabling the voice’ of the farmers.

In the greater Rangpur project, the northwest local area forum²⁷ was constituted in 2002 for moving towards a common forum. This was done from amongst those institutions active in that region, especially in the area of rice and in agricultural research and development-related activities. Such institutions included farmers’ representatives, agro-federations, government agencies, NGO’s, private sector seed agencies and marketing agencies. The Secretariat of the forum was managed by an NGO called the RDRS. IRRI was engaged with the local area forum and utilized this opportunity to improve upon the *monga* mitigating technology through a package of technology that comprised direct seeded BRRIDhan33 (Mazid et.al: 2009). For capacity development of workers and farmers, the forum organized training of trainers for field workers and then trained RDRS-led FFS farmer promoters who then trained the other farmers. BIRRI staff trained 15 RDRS staff who trained 300 farmer promoters and who in turn trained 2500 rice growing farmers (Salahuddin: 2009). The technology and the approach adopted by the forum were widely accepted by the local institutions and the local farmers.

5. AN INTER-COMPARISON: CAPACITY BUILDING AND PROJECT OUTCOMES

In this section, selected project outcomes have been compared of the three projects under reference.

5.1 Puruliya Project – The project aimed to (especially) enable poor women’s Self Help Groups to improve upon livelihoods of poor households in a sustainable manner by diversifying livelihoods, resources and enhancing productivity so as to achieve food security and increase in income throughout the year. One main vehicle for achievement of such objective was through extension practices for improving agriculture technology

²⁶ A forum emerged under a project named PETRRA (Poverty Elimination through Rice Research Assistance) managed by International Rice research Institute in close partnership with the Bangladesh Rice Research Institute and other government and non-government actors and private sector enterprises. RDRS nominated as Secretariat to the forum where the members collectively decided to share resources.

²⁷ See footnote 26

including adoption of SRI paddy production²⁸. A major outcome of Purulia Project was an overall increase in yield from Kharif paddy from both conventional practice as well as the SRI method (see table 3). As table 3 shows that though the district average yield for Purulia was 2.5, the project-related yield was higher in case of both SRI and the conventional variety.

Table 3 – Puruliya – Yield from Paddy: SRI and Conventional

Yield type	Tons/ha
Average SRI yield (in tons/ha)	7.14
Average conventional yield (for SRI farmers) (in tons/ha)	5.43
District average yield (in tons/ha)	2.5

Source: Report on SRI in Puruliya District, West Bengal. Kharif Season 2007

As regards improvement in food security it was quite remarkable as shown by table 4 where incremental yield increased by 1.2 over the conventional yield.

Table 4 – Puruliya - Incremental Changes in Food Grain Supply through SRI

Farmers adopting SRI (N= 3793, Coverage of Area: 528 Hectares)	Increase in grain supply (tons of paddy)	Increase in cash received (INR lakh)	Increase in food grain available (Kg per family)	Incremental food sufficiency (in months)
Incremental Yield over Conventional Yield	902.88	58.69	143	1.2
Incremental Yield over District Average	2449.92	159.24	388	3.2

Source: Report on SRI in Puruliya District, West Bengal. Kharif Season 2007

With regard to generation of cash income from kharif vegetable production, table 5 shows the extent of incremental cash income. All these steps helped poor farmers to move towards improving their livelihoods and enhance the average income by INR 3354/- per household as shown in table 6.

Table 5 – Puruliya - Cash Income From Kharif Vegetable Production

Degrees of Investment and Risk	Crops	Investment per 10 decimal (in INR)	Lowest Income (in INR)	Highest income (in INR)	Average Income (in INR.)	Average Profit (in INR)
Low investment plus low risk	Radish Cowpea	180	400	4,019	2,196	1,994
Medium investments plus medium risk	Beans, chilli, bottle gourd, bitter gourd	300-450	600	12,182	3,535	2,844
High investment plus high risk	Tomato, ladies' finger, cucumber	580-650	465	15,766	4,197	3,335

Source: Report on SRI in Puruliya District, West Bengal. Kharif Season 2007

²⁸ Issues in labour and draft power for SRI promotion were managed by 10 power tillers, which helped to boost local agriculture production. As a result ploughing took shorter time and was better in quality. This led to increased demand for power tillers.

Table 6 – Puruliya - Change in Average Return per Household (in INR)

Average Return	(In INR)
Average Investment per family (in INR)	608
Average income per family (in INR)	3,354
Average profit per family (in INR)	2,657

Source: Report on SRI in Puruliya District, West Bengal. Kharif Season 2007

The women’s self-help group members were motivated due to the changes happening in their lives and livelihoods and were determined to overcome the constraints in accessing basic services in their neighbourhoods. The local communities had become aware of their basic entitlements and were determined to pursue the local authority for better services. Operating as self-help groups and experiencing better returns from agriculture made local women and men stronger and determined to explore more ways for their overall progress. Much remains to be seen as to how the tide turns in favour of the local communities in accessing better infrastructure and basic services from the local authority. The NGO – supported activities in agriculture and social networking helped to build steam for social progress in a backward and remote area, especially amongst the local women groups.

5.2 Huangjiang Project – In case of project outcomes we may consider Luo Yang Township in Huangjiang county, which has 19 natural villages and 20 hamlets. There was a total of 558 households with a total population of 2049. The project brought about far-flung changes in the status of poor households in terms of reducing poverty as shown in table 7. Since 2005, agriculture training along with agriculture loans at considerably low rate of interest changed the life line of many poor households. For example in one village²⁹, training in silk worm breeding helped the farmers learn about ways to control silk worm diseases by different treatments and improve upon the quality and yield of silk cocoons. For poor households the cash income got exactly doubled when they applied such training to their silk worm breeding process. Around 500 RMB that they got 7 times a year until 2007 from silk worm processing became 1000 RMB per lot after such training. Quality and yield of silk cocoons also improved with a 100 per cent rise in income.

Agriculture loans under the project were there not only for the growing crops but also for livestock rearing, silk cocoon processing and cash tree planting. The Village Implementation Committees (VIC) at the village level not only organized and monitored project activities but also urged local people to make the best use of the project.

Table 7: Changes in Poverty Status of Poor Households: 2005 and 2010 in Luoyang, Huangjiang County

Criteria	2005	2010
Number of Households	530	558
Specially Poor Households (e.g. too many young children)	158	130
Poor Households (have too many members, less	323	300

²⁹ Quegu

farmland, less stable income)		
Ordinary Households (have stable income, better housing, have motorbikes)	49	130

5.3 Greater Rangpur Project - At first RDRS conducted a large number of field experiments and found that higher yield was observed in the rice variety BR 33 by direct seeding method. Some such experiments showed that BR 33 planted on 30th June in 2006 produced the highest yield in ton/ha, which was 4.142 as compared to other planting dates. Similar results were also obtained with direct seeding of BR11 where both 15th and 30th June planting provided yields such as 4.49 ton/ha and 4.5 ton/ha respectively. Crop duration was reduced to 100 days with 30th June planting of BRRi Dhan33 and 128 days with BR11 variety under direct seeding method compared to all other planting dates of BRRi Dhan33 (120 days) and BR11 (150 days). For harvesting purposes, the 30th June planting of BRRi Dhan33 under direct seeding method proved a better option during the peak *monga* period (during October) vis-à-vis the harvesting in October of 15th June of BRRi Dhan33 planted through transplantation.

Table 8: Comparison of Labour Employment in Greater Rangpur, Bangladesh: Direct seeding Vs. Transplanting (unit: one ha of land)

Sl. No.	Activities	Transplanting	Direct Seeding	Remarks
1	Seed-bed preparation, seed sowing and maintenance	10	0	No seedling raising required in direct seeding
2	Seedlings uprooting and transplanting	30	0	No transplanting required in direct seeding
3	Boundary of main land preparation and drain making including organic and basal fertilizer use and laddering	10	12	
4	Ploughing (Power tiller) 5 times	10	10	
5	Seed sowing by drum seeder	0	10	
6	1 st weeding (manually)	30	45	Direct seeding enhances more weed than transplanting
7	2 nd weeding (manually)	20	25	Same
8	3 rd weeding (manually)	15	15	
9	Irrigation	4	7	Direct seeding requires more irrigation (in number not volume) than transplanting
10	Pesticide spray	2	2	
11	Harvesting	15	15	
12	Bunch and carrying the harvested rice to threshing point and threshing	38	38	
13	Drying and cleaning	5	5	
14	Storing	2	2	

	Total	191	186	
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Source: Neogi et.al (2009)

As far as labour inputs were concerned, they varied under the two different systems. Under the transplanting system as shown in Table 8 the labour requirement was higher in activities such as seed bed preparation, and maintenance, seedlings, up-reporting and transplanting while for the direct seeding method it was higher for laddering, manual weeding and irrigation. In case of use of herbicides labour requirement under transplantation system was considerably higher than that of drum seeding.

6. PROXIMATE FACTORS SHAPING OUTCOMES & CHALLENGES

In this section some key factors have been discussed across the three projects under reference, which can help to understand the contribution of human capacity building towards outcomes in the rural agro sector covered by the three projects under reference. These are listed below.

- (i) Learning mechanisms
- (ii) Infrastructure status
- (iii) Villages' location
- (iv) Inter-Agency co-ordination and collaboration
- (vi) Food security aspects
- (vii) Community participation and social capital
- (viii) Livelihoods' diversification
- (ix) Overcoming agriculture constraints

6.1 Learning Mechanisms – The learning mechanisms varied under the three projects under reference and such mechanisms both structured and unstructured helped to draw quick lessons by the respective project teams to improve upon their strategies and actions. Both the projects in Rangpur (Bangladesh) and the one at Puruliya were NGO-driven and hence had more flexibility and scope for informal learning and action. However, in case of government project in Huangjiang, capacity building of project staff and village leaders in participatory processes helped to gradually change the attitude of project officials and local leaders for bettering communication with local farmers and engaging the latter in implementation of project activities. Over time, mindsets of project staff underwent a change for the better to understand the limitations of a centralized top-down approach in terms of reaching pre-set targets and favoured a interactive process towards meeting and consulting local communities and seeking their participation in project activities. The project staff also updated their skills in interacting with local farmers, which also helped them to bring about such change. That was indeed a big change to reckon with especially for project officials normally used to working under China's centralized planning system. It was observed that project officials from Huangjiang improved upon their communication skills and continuously interacted with project communities and were motivated enough to pick up a range of communication skills. In Huangjiang, capacity building of poor farmers in agriculture practices was undertaken both by the project and the concerned line agencies though there were limits set due to

insufficient time, lower coverage of remote communities³⁰ and constraint in practical orientation.

In case of Puruliya project, one high point of the project staff was the culture of iterative learning cycles with ‘embracing of errors’ and lessons learnt which were then shared with other stakeholders through notes/papers shared in meetings/conferences and posted on websites. Periodic open discussions of project teams, farmers and other stakeholders helped to consolidate lessons learnt, adopt fast track action points and find ways to overcome limitations and challenges. The situation in greater Rangpur, Bangladesh was also similar where multi-stakeholder partnership helped in continuous sharing of information and lessons learnt. In fact, the greater Rangpur project had one of the rarest multi-stakeholder forum, which also meant sharing and validating information amongst a range of project partners with different backgrounds and strengths, which was not always easy though a rich learning process.

6.2 Infrastructure Status - Infrastructure gaps proved to be crucial both for the NGO-driven Puruliya project and to a certain extent for the Huangjiang project, especially for its remote villages. In Huangjiang, the capacity building of farmers took place in townships which were attended by farmers with better road linkages. Holding training in remote villages for remote communities was limited due to high training costs. However, since the Huangjiang project was an integrated one and included construction of basic infrastructure such as drinking water, roads, clinics etc. in selected project villages³¹ it helped the local farmers to learn and adapt agriculture technology, increase production and also market their produce easily with higher returns and save labour cost. Project investments, for example, in drinking water led to saving of time of around 3 to 4 hours daily spent in carrying water and 80 % reduction in costs of seeing doctor, which made way for spending more time in growing more mulberry, raising pigs and other activities.

6.3 Villages’ Location – The village location included many remote and scattered villages in both Huangjiang projects and Puruliya project. One major problem of Huangjiang county was approaching scattered poor households in remote areas, which meant increased operational cost and also difficulties in building sufficient technical capacity of farmers in many remote villages and also to monitor such activities. Some villages had higher project investments while it was difficult to effectively target many remote villages due to higher cost. For the Puruliya project, lack of roads and approach roads proved a hindrance to approaching more farmers, bettering communication, cross-village sharing and marketing of produce.

6.4 Inter-Agency Co-ordination and Collaboration - Inter-agency co-ordination and collaboration was the weakest in case of Puruliya project. Since Puruliya is one of those districts where the level of local governance is weak with limited capacity, the support from such governance was lacking towards the NGO-operated project and to that extent development activities of civil society were yet to be integrated with mainstream

³⁰ though many poor and remote villages were prioritized in the project, training sessions were mostly held in the township due to lack of domestic matching funds

³¹ as per community preferences

Government machinery. Though the central government of India had engaged the NGO to implement the special SGSY scheme, the local government had not realized their full worth in the backward district. For both the Huangjiang project and the greater Rangpur project, inter-agency roles and coordination was definitely one high point for project success.

6.5 Food Security Aspects - Both the Puruliya project and the greater Rangpur project had major emphasis on food security aspects and they tried to make a difference in the lives of local people and to build local capacity to that extent. The NGO engaged in Puruliya worked with self help groups towards sustainable livelihoods of poor households through building capacity, diversifying resource-use and adding to productivity so as to ensure food security throughout the year. In this context, some lessons shared by the Puruliya project on the experience of promoting SRI for the last 5 years (PRADAN: 2007) included net drop in number of farmers adopting SRI³², thin spread of technology³³, lack of engagement from local government and elected bodies³⁴ and heavy dependence for extension on limited NGO staff.

While, learning from experience and exploring new ways in 2007, the NGO facilitating Purulia project developed both direct and indirect approach. The direct approach was to adopt an integrated approach in the working villages of the 5 blocks in Puruliya and look at the whole agriculture crop basket of the poor including cash crops and vegetables apart from paddy and improve backward linkages such as quality seeds, fertilizers and access to credit. The indirect approach was moving to new villages to introduce capacity to grow SRI paddy though it was not easy for farmers to change practice and adopt SRI as their major paddy crop. For the local administration at block/panchayat levels SRI inception workshops were held in 2 blocks on the role of SRI to meet food deficit. In terms of scaling up, the NGO in Puruliya conducted a similar exercise in 17 panchayats³⁵ so as to reach 30 new villages³⁶.

6.6 Community Participation and Social Capital – For an evolving process in the Puruliya project, the fulcrum of the entire project was based on building local capacity through mobilizing self-help groups, especially those of women. It was to enable the women groups engaged in the project to take decisions, plan and bear responsibility of project implementation. Similarly, Huangjiang project was essentially based on community decision-making, prioritization of activities, planning and implementation as facilitated by local village implementation committees at village level and the project personnel. In both the Puruliya and Huangjiang projects, targeting and helping to build social capital increasingly became the fulcrum for adopting technological and other

³² Though new farmers adopted SRI, a sizeable numbers were dropping and also reporting fall in yield mainly because they could not manage labour.

³³ Scaling up difficult

³⁴ so difficult to reach a critical mass, institutional inter-linkages could help.

³⁵ where the farmers (experienced in SRI) played the role of local service provider together with a village resource person shared their experience in the presence of the local elected leader

³⁶ The achievements in this regard are given in Table 2.

innovations and bringing about livelihoods' strengthening of poor households and other socio-economic changes. Such group capital also helped in quicker implementation of project-related activities. Decision-making processes supported through community networks and open forums helped the validation process and also helped to augment group solidarity.

6.7 Livelihoods' Diversification – Support towards livelihoods' diversification was an important aspect of the Puruliya project where agro-technical change also meant a systems approach to watershed activities by integrating agriculture, plantation, horticulture and livestock so as to strengthen local capacity related to livelihoods, increase earnings from multiple sources and to diversify risks. Similarly, Huanjiang project supported diversification of livelihoods into crops, agro-forestry and livestock though not as a systems approach as in Purulia project and also benefited from buy-back arrangements of government with regard to sugarcane and mulberry plantations. In addition, almost each household in Huangjiang had a member as a migrant to a city and earned remittances to be ploughed back. In the sense of strengthening livelihoods Huangjiang project also met a basket of basic needs of local people such as drinking water, schooling for children and rural clinic services, which were not the main focus for the other two projects under reference. In Huangjiang project, the government backup in insurance of female pig owned by poor households was also a point of considerable advantage which Puruliya project lacked.

6.8 Overcoming Agriculture Constraints –Capacity building activities on a regular basis helped to overcome agriculture constraints faced by farmers, though such efforts differed in the three projects under reference. Huangjiang had made prudent arrangements for agriculture loans at very low rates to support agriculture change towards strengthening of livelihoods of poor farmers, which became a popular programme. Puruliya project did not have any special loaning arrangements but took help of government scheme such as NREGS/special NREGS to generate local employment for watershed activities and strengthening agriculture and supporting local livelihoods. In addition, future marketing was an aspect to be considered in the Puruliya project given the future volume of marketable surplus expected by farmers from horticulture practices in face of given infrastructure bottlenecks such as lack of good roads and access to markets.

7. CONCLUDING REMARKS

A comparison of the three projects under reference in the three countries demonstrates that human capacity development, sustainable agriculture development and poverty reduction can have different investment strategies and much depends on how the change is brought about and what capacities are created in the process with what types of investments and what outcomes. The findings from the study also indicate that human capacity building for agriculture change when sustained through institutional changes, appropriate inputs, periodic monitoring and sustained learning mechanisms can yield better dividends in terms of absorption of agriculture technology, strengthening of livelihoods, human capital, social capital and agriculture resource development.

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