POPULARISATION OF HYBRID MAIZE IN ORISSA (INCL. 'PROJECT GOLDEN DAYS'): A FACT-FINDING REPORT

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BACKGROUND

Project on "Popularisation of Hybrid Maize in Orissa as part of Green Revolution in Eastern India" (incl. Project Golden Days):

Orissa government has started implementing a PPP (Public Private Partnership) project in the state centred around promotion of hybrid maize under the "Green Revolution in Eastern India" programme that the Government of India had announced in its 2010 Budget[1]. In the case of Orissa, proposals for 79.67 crores have been evolved under the Green Revolution programme (six eastern states of India – Orissa, Chattisgarh, Jharkhand, Bihar, Eastern UP and West Bengal, with Assam added later on, have been chosen for the Green Revolution in Eastern India programme with an initial 400-crore budget outlay in 2010 for these states). The shares of different states in 2010 included:

* Bihar	63.94 crores
* Chattisgarh	67.15 crores
* Jharkhand	29.60 crores
* Orissa	79.67 crores
* Eastern UP	57.27 crores
* West Bengal	102.37 crores

In the case of Orissa, the following is the percentage breakup of the Green Revolution proposals as per GoI data, where the main focus is on hybrids, pulses, SRI and E-pest surveillance.

Component	**%age**
Mechanisation	16%
Hybrid Maize	15%
Sugarcane Development	14%
More Accelerated Pulses Production Programme (A3P)	13%
Hybrid Rice	12%
SRI	11%
Hybrid Sunflower	5%
E pest surveillance	3%
Others: Bio-fertilisers, Liming, Capacity Building, Herbicides, Bund Plantation	11%

While the data above is from the presentation of the Joint Secretary-Crops in GoI during the Rabi Campaign Planning process in 2010-2011, the following is the data as per the Government of Orissa, in ten thousand rupees.

[1] http://agricoop.nic.in/Rabi10.htm

Programme/ intervention	**Total**	**Funds for 2010-11**
System of Rice Intensification	816.69	596.44
Sugarcane Development Package for Sugar Factory Areas	572.00	99.00
Integrated Technological Approach for sustainable Sugarcane Cultivation	185.40	125.70
Bio Fertiliser Application for Sustainable Crop Production	355.07	111.43
Popularization of Hybrid Maize Cultivation in the State	1481.50	1210.00
Management of Acid Soils	284.38	234.28
Capacity Building of Extension Personnel	198.06	198.06
e-Pest Surveillance	269.50	269.50
Intensification of Hybrid Sunflower Cultivation in Orissa	802.00	402.00
Hybrid and HYV Paddy Minikits	8.20	8.20
Total	4972.80	3254.61

The Project referred to as "Popularisation of cultivation of hybrid maize" in government records and also as "Project Golden Days" in the literature of corporations like Monsanto, has 37% of the funds for 2010-11 allocated to it, as per the Orissa government's presentation during the Rabi Campaign Planning in September 2010 (as opposed to the numbers presented by Joint Secretary-Crops in the Ministry of Agriculture in GoI)! It is apparent that this is being prioritized as the main vehicle for the Green Revolution to be brought about in Orissa.

This is a project where, at the rate of Rs. 2000/ha for 20 kgs of seed, and at a project spread of 30000 hectares in its first year for a select set of hybrid maize brands of a select number of companies, the government spent 6 crores of rupees on seed procurement from seven companies, out of the 12.10 crores allocated here.

BRANDS, DISTRICTS & AREA OF DIFFERENT CORPORATIONS IN THIS PPP

Company	Brands	Districts	Area covered in PPP (Ha)
Monsanto India	Prabal, Double	Kalahandi, Nuapada, Bolangir, Nayagarh, Khurda	8000
Pioneer Seeds	30R77	Gajapati, Rayagada, Ganjam, Mayurbhanj, Sambalpur, Bargarh	9000
Nirmal Seeds	Nilesh (N-51)	Keonjhar, Kandhamal	4000
Charoen	CP818	Koraput, Malkangiri, Angul	5000

Pokphand			
Kaveri Seeds	Kaveri-218, Kaveri-280	Sundergarh, Dhenkanal	3000
Mahyco Seeds	MRM-3838, MRM-3845	Jharsuguda	500
J K Seeds	JK-502	Deogarh	500

MAIZE IN INDIA AND IN ORISSA

Maize is the third largest cultivated crop in India after Rice and Wheat. Kharif maize contributes to over 80 percent of the maize output in the country. About twelve states in India produce maize in significant areas and the yield levels range from 650 kgs per hectare to 1650 kilos.

Maize in India is slowly expanding its presence due to incessant promotion by private companies and animal feed market, to the extent that it is now contributing close to 7% of the national "foodgrain" basket.

Area (in Mn Ha), Production (in MT) & Yield (Kg/Ha) of Maize over the years at the national level:

Year	Area	Production	Yield	Area under irrigation (%age)
1950-51	3.16	1.73	547	11.4%
1960-61	4.41	4.08	926	12.6%
1970-71	5.85	7.49	1279	15.9%
1980-81	6.01	6.96	1159	20.1%
1990-91	5.90	8.96	1518	19.7%
2000-01	6.61	12.04	1822	22.4%
2001-02	6.58	13.16	2000	20.5%
2002-03	6.64	11.15	1681	19.5%
2003-04	7.34	14.98	2041	19.1%
2004-05	7.43	14.17	1907	20.5%
2005-06	7.59	14.71	1938	21.1%
2006-07	7.89	15.10	1912	21.5%
2007-08	8.12	18.96	2335	NA
2008-09	8.19	19.29	2355	NA

Source: Agricultural Statistics At A Glance 2009, Ministry of Agriculture, Government of India

Maize Yield, in kilos per hectare in different states between 1999 and 2009:

State	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Andhra Pradesh	3257	2994	3404	2825	3435	3142	4073	3395	4607	4670
Karnataka	2644	3193	2502	2068	1957	2955	2915	2829	2924	2827
Bihar	2125	2413	2504	2236	2390	2355	2098	2578	2274	2500
Madhya Pradesh	1574	1449	1968	1738	2052	1395	1450	976	1288	1361
Rajasthan	1038	1047	1454	885	1863	1211	1098	1086	1860	1736
Maharashtra	1541	920	1804	2005	2035	1759	2106	1983	2664	2283
Gujarat	1289	753	1995	1706	1717	898	1124	698	1375	1481

Himachal Pradesh	2272	2293	2550	1612	2444	2272	1839	2326	2643	2182
Punjab	2577	2794	2721	2039	2981	2740	2723	3123	3405	3404
Jharkhand	_	1267	1495	1799	1604	1497	1315	1230	1509	1500
Tamil Nadu	1587	1717	1615	1582	1568	1562	1189	3838	3627	4055
West Bengal	1986	2501	2595	1995	2275	2977	2533	2968	3166	3425
Orissa	1500	1267	909	954	1420	1631	1602	1677	1987	2015
All India	1792	1822	2000	1681	2041	1907	1938	1912	2335	2355

Source: Agricultural Statistics At A Glance 2009, Ministry of Agriculture, Government of India

Maize In Orissa- Area, Production & Yield over the years

Year	Total Maize Area	HYV area	%age HYV	Irrigated Area	Maize Yield	Total Maize Production
2000-01	176.05	119.96	68.14	NA	1235	217.43
2001-02	164.43	115.40	70.18	NA	1128	185.42
2002-03	158.03	113.28	71.68	NA	1123	177.45
2003-04	175.27	129.03	73.62	18.99	1116	195.59
2004-05	184.76	138.71	75.08	21.79	1322	244.2
2005-06	187.39	145.69	77.75	22.69	1496	280.27
2006-07	199.45	157.32	78.88	16.36	1602	319.48
2007-08	214.55	171.63	80.00	34.06	2245	481.56
2008-09	224.23	186.40	83.13	37.89	2291	513.77

As can be seen from the above table, the total maize area in the state of Orissa has been on a steady increase – between 2000-01 and 2008-09, there has been a 28% increase in the area. The pace at which maize seed is shifting to High Yielding Varieties and Hybrids is equally rapid – from 68.14% of total maize area in 2000-01 to 83.13% in 2008-09. Similarly, area under irrigated maize is growing rapidly and has nearly doubled between 2003-04 and 2008-09. Maize yield has nearly doubled during this period along with total maize production in the state. It is important to note that irrigated maize area is also increasing phenomenally as per data in different years above shows. Districts like Nawarangpur, Ganjam, Kalahandi, Koraput, Malkangiri and Kandhamal have the highest areas under irrigated maize in the state.

Production is higher than demand in the country by a few million tonnes. ***Currently, 49% of India's maize output is used as poultry freed, 25% as food for human consumption, 13% in starch and other industries, 12% in animal feed and around 1% as seed.*** It is therefore important to note that this crop, though classified as a food grain in official classifications, is actually going into poultry and animal feed mostly. In that context, arguments that maize is to be promoted for food security of this country also need to be firmly re-visited.

HYBRID MAIZE

Maize is the third largest cereal crop grown in India. In 2008-09, the largest maize extents were cultivated in the following states: Karnataka (13.08%), Rajasthan (12.88%), Andhra Pradesh (10.42%), Madhya Pradesh (10.29%), Uttar Pradesh (9.78%), Maharashtra (8.01%) and Bihar (7.84%). In terms of irrigated maize area, Punjab tops the list with 64.4% of its maize area under irrigation, followed by Bihar (60.3%) followed by Andhra Pradesh and Karnataka. Only 2.7% of Rajasthan's maize area was under irrigation in 2007-08.

It is reported that today in the country, 42% of the country's maize produce comes from hybrid seeds[2]. The potential value of maize seed market, if all of it is converted into hybrids is pegged at Rs. 10 billion (20 million acres, with a seed rate of 5 kilos on an average per acre, with each kilo of hybrid seed at around Rs. 100/-). Players in the hybrid corn seed segment include Monsanto, Pioneer Hi-Bred (DuPont subsidiary), Syngenta India, Shriram Bioseed Genetics, Kaveri, Kanchan Ganga etc.

Monsanto alone has a (maize) product portfolio of nearly 14 high-yielding hybrid maize seeds for different agro-climatic zones, says its Annual Report of 2010 – it is reported that 20 lakh Indian farmers grow Monsanto's Dekalb brand maize hybrids. Within the corn hybrids segment, Monsanto claims that Dekalb hybrids are grown on 4 out of every 10 maize acres in India[3]. It is estimated that out of the hybrid corn seeds market in India, Monsanto has a 39% share (2008). There is a steady demand for maize from the domestic poultry feed and starch industry as well as exports[4].

On the other hand, the Directorate of Maize Research has developed and released as many as 234 cultivars since its inception, with the active support of an All India Coordinated Research Project on Maize. 132 of these are hybrids. Nearly 48 are public-bred single cross hybrids for cultivation in different agro-climatic conditions of the country. 56 proprietary hybrids of the private sector have also been released so far through the AICRP. HM 9 is a hybrid from Haryana Agriculture University meant for adaptation in Orissa amongst other states, with the average yield pegged at 60 quintals per hectare. Similarly, Malviya Hybrid Makka 2 is also a public sector hybrid from Benaras Hindu University, with 54 quintals per hectare as the average yield, meant for growing in the state of Orissa. Others include Vivek 27, HIM 129, D994, Gujarat Makai 6, Gujarat Makai 4 and Dewaki Composite Makka are also supposed to be suitable for Orissa.

Pinnacle of Monsanto, NK6240 of Syngenta, SMH 3904 of Shakti Seeds are some of the notified hybrids of private sector meant for cultivation in Orissa amongst other states.

It is important to note that Prabal, a notified proprietary hybrid from Monsanto, which is also part of the current project in Orissa, is meant for cultivation in Maharashtra, Andhra Pradesh, Tamil Nadu and Kerala, with the average yield pegged at 60-75 quintals per hectare[5].

About the current project in Orissa:

Maize is grown on around 2.3 lakh hectares in Orissa. Kharif maize alone accounts for about 2.2 lakh hectares. It is cultivated mostly in Ganjam, Gajapati, Keonjhar, Koraput, Nabarangpur, Mayurbhanj and Kalahandi districts.

"Maize cultivation is mostly confined to inland districts of the State which contribute more than 80 percent of production in the State. A Special programme for popularization of hybrid maize has been taken up in 20 districts namely Bolangir, Mayurbhanj, Koraput, Keonjhar,Sundargarh, Gajapati, Kandhamal, Kalahandi, Nuapada, Rayagada, Nayagarh, Deogarh, Angul, Ganjam, Khurda, Jharsuguda, Sambalpur, Baragrah, Dhenkanal & Malkangiri of the State in PPP mode. Seven seeds companies namely Monsanto India Limited, Pioneer Seeds Pvt. Ltd., Nirmal Seeds Pvt. Ltd., Charoen Pokphand Seeds (India) Private Ltd, Mahyco Hybrids, Nuziveedu and Kaveri Seeds Pvt. Ltd have been involved in the programme for timely availability of hybrid maize

[2] http://business.outlookindia.com/article.aspx?101599: 'Across the Great Divide", Rajiv Bhuva, Outlook Business, October 18, 2008
[3] http://www.monsantoindia.com/monsanto/layout/pressreleases/pressreleases/hybrid2707.asp
[4] http://www.thehindubusinessline.com/2008/09/06/stories/2008090650451200.htm
[5] Maize Hybrid and Composite Varieties Released in India (1961-2010), 3rd Edition, Directorate of Maize Research, New Delhi. Technical Bulletin No. 2010/3, pp80

seeds and proper training & extension. It has been programmed to take up massive demonstrations programme in an area of 30,000ha in these districts with an outlay of Rs.1210.00 lakh" - Activity Report of Agriculture Department 2009-2010, Dept of Agriculture & Food Production, GoO.

FACT FINDING VISIT: OBJECTIVE & VISIT DETAILS

OBJECTIVE: *To understand and analyse the objective, design, implementation, performance and potential implications of the current project on Popularisation of Hybrid Maize in the PPP mode in Orissa, this fact finding effort was undertaken.*

Apart from meeting with a maize-breeding expert, we met with government officials, farmers in the project, farmers growing maize outside the project, maize processors, NGO representatives etc. as part of the fact-finding. Visits were made to the following villages in Rayagada and Bolangir districts of Orissa:

- Bijaypur village in Gunupur block and Dedipada village in Bisham Cuttack block in Rayagada district (31st March 2011) – the first village was visited as recommended by the DDA of the district; the second was visited because it is a tribal community (Tallia Kondhs) which had always grown maize in small quantities
- Bahabal village in Belpara block and Matiabhata village in Khaprakhol block in Bolangir district (1st April 2011) – these villages were chosen based on information obtained by a local network working on drought mitgation (Community Action for Drought Mitigation, Bolangir – CADMB) that was contacted for support by the fact-finding team.

Near Kantabhanji in Bolangir district, the team visited Shyam Agro Industry to get more details on maize processing and end-uses. The opportunity to meet a representative of one of the seed companies of the project in Bolangir did not materialize.

The two districts visited covered experiences of hybrid maize of Pioneer/Dupont and Monsanto.

FACT FINDING TEAM MEMBERS: Kavitha Kuruganti, Convenor of Alliance for Sustainable & Holistic Agriculture (ASHA); Saroj Mohanty, Paschim Odisha Krushak Sanghatan Samanvay Samiti; Rajesh Jhankar, Living Farms; Ananthoo, Safe Food Alliance, Chennai. The team was joined by Bhajaman Sahu, Convenor, CADM Bolangir;

MAIN FINDINGS OF THE FACT FINDING

1. **No ex-ante impact assessment taken up for the project:** Even though this project is known to be undertaken in thousands of hectares, with tens of thousands of farmers to be involved, especially in some of the poorest tribal and other pockets of Orissa, no ex-ante impact assessment was taken up for the project. This project will obviously have implications on many fronts: socio-economic (including the fact that for the corporations, hybrid maize is about laying the grounds for herbicide-tolerant GM maize also which will have direct implications for employment generation in entire poor regions of Orissa), food and nutrition security (given that this maize is replacing traditional rice- and pulse-growing areas and hybrid maize is going into poultry/animal feed), environmental implications (including on soil fertility given the increased chemical fertilizer use and chemical pesticide use, along with increased herbicide use), implications for farm economics (while yields might increase, cost of cultivation is also higher with risk of failure also thrown in) etc. It is only appropriate that this be seen as a large intervention

where an ex-ante impact assessment should have been taken up, including learning from such projects elsewhere.

2. **Serious procedural problems with the PPPs – the MoUs and the ToRs**: The fact-finding team went through the MoU and the Terms of Reference in this PPP project and finds that there are several problems with these.

    a. For instance, why was there **no bidding process adopted for the project**? Why were costs for the exchequer not kept the lowest, even if it is a fully centrally-sponsored scheme?
    b. What is the rationale, criteria and transparency standard adopted in the project while selecting companies and brands and locations for implementation of the project?
    c. For instance, what **is the basis of fixing the "negotiated seed price"** for the hybrid seed being supplied in the project. By what rationale has this been fixed?
    d. What is the **rationale in distributing different brands** of different companies across various districts in the project?
    e. Where are the results of the tests done for the suitability and performance of various brands that were included in the project? The fact-finding team found from speaking to some reliable sources in the government establishment that **no such testing was actually taken up**.
    f. The fact-finding found that there are **liability mechanisms lacking in the project**. The MoU has been created to be in favour of the company concerned and not the farmer participating in the project, as a MoU between IMAGE, ATMA Project Director of Khurda district and M/s Monsanto shows, as an illustration. In the case of failure of germination, the company concerned is bound to replace the seed. Failure of other kinds finds no mention at all! Further, a farmer would lose a whole crop season and would have no income to fall back on, if the crop fails, even if everything is supplied free of cost in the project and this has not been taken into consideration in the project as though it does not matter. More important is the fact that the current statutory regulatory framework in India has penal clauses for failure of seed etc., however weak such clauses are, whereas this MoU seeks to circumvent such regulation!

3. **Public sector efforts on Maize & Farmers' traditional varieties:**

It is estimated by a maize expert that when it comes to seed source for maize crop in India, the current situation could be that 20% is from public sector, 20% from traditional sources/farmers and 60% would be private sector hybrids. The private sector in the country has not released even one OPV variety for very obvious reasons – that they want their markets to continue, season after season, with technologies such as hybrids.

As mentioned elsewhere, there have been many OPVs and hybrids that have been evolved in the public sector of India with regard to maize suitable for many locations, with specific traits. This project makes no attempt to promote public sector seed and does not seek to utilize other media like the Orissa State Seeds Corporation or the Seed Village Programme to promote such public sector seed that is suitable for Orissa's specific growing conditions. Rather, it takes the easy route of providing ready markets for private corporations because easy money is coming in from the Centre/Government of India.

Maize breeding experts pointed out that seed production is not difficult since de-tassling of female plants is the only additional task needed to be undertaken. In fact, it is reported that public sector hybrids outperform some of the popular private hybrid brands as has been seen in

several all-India coordinated trials, with the popular private hybrids kept as a check for the public hybrids, where the latter performed better. It is also reported that several private sector hybrids have taller plants, which prove to be disadvantageous. The public sector also has "synthetic" lines released, including ones suitable for Orissa, where the yield is reported to be lower than hybrids but the seed can be saved by farmers, and the yields are higher than in some traditional cultivars.

OSSC supplied 572 quintals of maize seed in 2009-10, for instance. Within this, Navjot seed was supplied to an extent of 85.61 quintals and this is a synthetic line of maize, which farmers can re-use.

What is striking is that public sector seed does not hold any prominence in such efforts, even though the risk of various public sector bodies making themselves irrelevant in future by PPPs like this is very apparent. There is also no effort in participatory varietal development as has been shown in the civil society in some cases, like in Karnataka. More importantly, there is also no thinking on seed sovereignty issues when proprietary hybrids are promoted through such projects.

4. Unviable Farm Economics

The fact-finding team found what others have pointed out to, that the farm economics of hybrid maize cultivation would be unviable for small and marginal farmers. Admittedly, there would be yield increases when farmers switch to hybrid seed, which is also being accompanied by chemical fertilizer use and increased irrigation. However, this is also accompanied by increased costs of cultivation – it is also apparent that yield increases are certainly not as expected or projected.

This has been reported from Gujarat too – "a farmer will need to have a yield of at least two tonnes per hectare in his fields to justify the additional cost of hybrid seeds. In fact, those farmers who cannot afford to invest in extra inputs such as fertilizers will find it difficult to even recover their costs", says a Outlook Business report on the subject[6].

Before the village visit was made, it was reported by the government representative met that while the traditional maize yielded only 1.5 to 3 quintals per hectare, the hybrid maize yield in unirrigated lands was easily 10-12 quintals per hectare. The per-quintal price fetched in the market is around Rs. 700/-, which means the gross income per hectare was Rs. 7000/- to Rs. 8400/-. This itself is very low, given that the project itself estimates the cost at around Rs. 8000/hectare, out of which seeds are distributed free of cost by the project along with 70% of fertilizers, pesticide etc.

The indicative cost norm as per the project's ToR and Operational Guidelines is as follows, per hectare, in rupees:

Item	Req/Ha	Tentative Cost per kilo	Cost per hectare	Scheme share	Farmer share	Total
Seed	20 kg/Ha	100/-	2000/-	2000/-	0	2000/-
Fertiliser (80:40:40)			2500/-	1500/-	1000/-	2500/-
Farmyard manure	5 ton/Ha		2000/-		2000/-	2000/-
Micro			550/-	200/-	350/-	550/-

[6] http://business.outlookindia.com/article.aspx?101599

nutrient						
Biofertiliser			150/-	150/-		150/-
Need based spraying			500/-		500/-	500/-
Misc.				150/-		150/-
Total				**4000/-**	**3850/-**	**7850/-**

The project also throws in capacity building and extension support in the form of district level and block level trainings.

But the above project costing norms just about get covered with the kind of returns that are projected in the project.

However, in reality we found that yields were far lower than projected. In Bijaipur village, the team found that the farmers obtained 70-80 bundles of 100 cobs each per acre, sold at Rs. 80/bundle. The cobs, in good years, fetch upto Rs. 150/bundle of 100 cobs. If we take an average price of Rs. 120/bundle, the gross income is Rs. 9600/-. As per the farmers, the cost of cultivation per acre is Rs. 8000/- to Rs. 10,000/-. The seed cost is Rs. 300/acre, the cost of fertilizers used is Rs. 3000/-, the cost of de-weeding once is Rs. 1000/-, the cost of ploughing, sowing etc., comes up to Rs. 1800/- and around Rs. 1800/- for 3 tractorloads of FYM. All of this means around Rs. 8000/- per acre of cultivation, while the return in good years is about Rs. 9500/-; the gross return this year was only Rs. 6400/- per acre. It is apparent that there would only be negative net returns once the project stops and free supply of inputs is stopped.

In Dedipada village, the average yield was 4 quintals per acre, which was sold at Rs. 8/kg of grain (not as green cobs here) – that means gross income of Rs. 3200/- per acre. Against this, traditional maize yielded 3 quintals per acre, it was reported. The desi maize cultivation is done without the need to purchase inputs from outside – either seed or fertilizers. This is also not sold in the market but used for consumption.

In Bahabal village in Bolangir district, there was a mixed performance. In Birinchi Pradhan's field (a big farmer with irrigation, access to information, political clout etc.), the kharif unirrigated cultivation of maize yielded 15 quintals per acre (25% loss due to rains, it was reported). He was able to sell his produce at Rs. 950/quintal, for poultry feed. His estimated cost of cultivation was Rs. 6000/acre. However, for the other farmers met in the village, the yield ranged from 4.5 quintals to 7 quintals per acre. The gross returns then, are between Rs. 3500/- to 5250/- per acre. It was also reported that the grain quality got affected due to unseasonal rains and the price could have been Rs. 850/- or more too if the quality was unaffected. Even then, the farmer just about breaks even!

In Matiabhata village, only one farmer from the project could be met, along with others who grow maize in the village. The average yield was 6 quintals per acre. The price fetched was Rs. 800/quintal.

In Dedipada village, where farmers from Dedipada and Bedangpadar assembled, there was a firm belief that the traditional maize will also perform as good as hybrid if more inputs are provided and better management undertaken.

Further, as data from the Government of India shows (http://agmarket.nic.in), it appears that hybrid maize fetches a lower per-quintal price than other maize even though this was not the case in the villages visited as part of this fact-finding.

It is obvious that the farm economics in hybrid maize cultivation are not as attractive as projected or claimed and that this kind of cultivation would actually imply negative net returns for many farmers once the project stops. It is apparent also that there are highly variable differential impacts in different situations and for different farmers.

5. Risk Analysis for Hybrid Maize

Hybrid maize cultivation and a large scale orchestration by the state towards this is not without its risks. The large-scale failures of hybrid maize crop in different states over the last decade are well-reported. Further, the Monitoring and Evaluation report on Project Sunshine from Gujarat shows that borrowing for agriculture and animal husbandry, *after* the project intervention is reported to be higher than before the project intervention. This could be related to higher investments that hybrid maize calls for. Generally, the risks to be assessed include:

- Higher investments in terms of cost of cultivation on hybrid maize (seed, fertilizer, chemical pesticides etc.); this could be borrowed from external sources, including moneylenders at high interest rates given the problems of institutional credit coverage for farmers – during crop failure, this also means a greater setback;
- Orissa is already a disaster-prone state in several ways, going by the records;
- Smallholders, tribal farmers and others are at a disadvantage when it comes to crop insurance coverage, which is also linked to credit coverage; in any case, in reality, crop insurance actually insures the bank loan more than tiding out the farmer;
- Climate change adds to the greater possibilities of risk;
- Stress tolerance of hybrids is lower than that of local varieties; further, practices around mono-cropping that hybrid cultivation encourages, would add to the risk too.

6. Local Diet, Maize Consumption & Nutrition Security

In the tribal community met during the fact-finding, maize is part of their regular diet in the form of "Javu", at least twice a day. Here, everyone grows maize. There was a uniform view that desi maize is sweeter and that it cooks more easily than hybrid maize. Hybrid maize is not as tasty, when ground into flour, they reported. Now, they don't use hybrid maize in 'Javu' anymore. All hybrid maize is sold in the market and traditional maize consumed locally. This is a matter of concern, given that this community is very poor and hybrid maize cultivation poses questions on their diets and nutrition security. In villages like Bahabal, maize is also eaten as Peetha. Here too, they say that desi maize is tastier – however, the consumption of peetha has not stopped with the advent of hybrid maize. In Matiabhata village, it was reported that desi maize for household consumption is planted as a few plants in the courtyards/kitchen gardens while hybrid maize is not consumed. In Bijaipur village, some green cobs are consumed for a 10-15 day period each year, before marketing of all produce is done.

When it comes to cattle too, it was reported that livestock liked feeding on desi maize compared to hybrid maize – further, while all parts of traditional maize are consumed by animals, they eat only green leaves of hybrid maize.

As macro-data shows along with these field level findings, hybrid maize, which is pushing maize expansion in the country, goes mostly into poultry and animal feed and to promote this in the name of food security is a false argument.

7. Seed Prices

It is not clear how the project fixed its negotiated price at Rs. 100/kilo of hybrid maize seed. This has to be looked into, given that the company is not spending anything on marketing its produce

in this project. There are no distribution and advertising costs involved and it is not clear why the negotiated price should be so close to the retail price.

On another front, the retail prices of hybrid maize seed are a cause of concern for viability of cultivation. The fact-finding team collected information on MRPs of different hybrid maize brands of Monsanto, for instance and found that a product like Pinnacle costs Rs. 1043/- per packet of 3.5 kilos of seed. This is Rs. 298/- kilo. Prabal was Rs 170/- per kilo. A 3.5 kilo seed packet was around Rs. 600/-. Traditional maize apparently is Rs. 30/kilo, while the public sector seed is around Rs. 60/- a kilo. The price differential in that sense is 5-fold, between the public sector seed and one brand of Monsanto. Experience from other countries like the USA shows that seed prices are on the rise, exponentially there. USDA data shows that corn seed prices have risen 135% since 2001, including the sharp increases witnessed in 2009, while Consumer Price Index rose only 20% in that period[7].

In Gujarat, an official Concurrent Monitoring & Evaluation Report of Project Sunshine, a PPPP similar to the PPP being implemented in Orissa had this to say on seed prices: "Where the value of seed was reported to be Rs. 156/- on an average per acre over five districts studied in 2007, it was Rs. 1194/- in 2008 and Rs. 1145/- in 2009".

This increase in seed price is a predictable implication from this hybrid maize expansion and is a matter of great concern, especially given the conditions of seed monopolies and oligopolies being built by a variety of means, including projects such as these.

8. Agronomic Practices and Implications (intercrops, soil fertility, subsequent crops, toxic chemicals etc.):

The project is **promoting chemical fertilizer use** in unirrigated conditions by providing such fertilizers free of cost, along with bio-fertilisers. When asked, farmers reported that they do not divert the use of these fertilizers to other crops or fields but have used the same in cultivating the seed provided in the project. This means use of 100 kilos of chemical fertilizers per acre (one of the farmers reported using upto 170 kilos per acre in an irrigated plot), while the average use of chemical fertilizers in Orissa is 62 kilos per hectare. This obviously has implications for soil fertility in the areas where such fertilizer use is taking place and also has cost implications, both for farmers and for the State, in terms of subsidies to be borne, incl. in the future.

Further, **intercropping is not being taken up in hybrid maize** in several of the locations visited. In the tribal village, it was reported that traditional maize cultivation goes along with other crops including vegetables like Bhindi (okra), cowpea, pigeonpea etc. Hybrid maize cultivation does not have all these crops thrown in as inter-crops. What's more, the yield mentioned for traditional maize is only for that crop whereas the farm yields other produce too. This then has implications again for food and nutrition security of the family.

Given that **traditional maize is harvested at least 25-30 days earlier than hybrid maize**, farmers are able to cultivate other crops like mustard, linseed and tomato right afterwards. This is not possible in hybrid maize cultivation, it was reported.

Both of the above points (intercrops like pulses and vegetables, and subsequent crop) obviously have a positive implication for food and nutrition security, which is not the case with hybrid maize cultivation.

[7] http://www.nytimes.com/2010/03/12/business/12seed.html

The project is also **promoting the use of extremely toxic chemical pesticides like triazophos and chlorpyrifos** for control of pests in hybrid maize cultivation. To the credit of farmers, the fact-finding team found that they have not used the pesticides given free of cost in the project. However, storage of these pesticides at home is also a hazardous proposition and it is shocking that funds being spent on extension support are not promoting latest technologies like NPM or organic farming of maize but are giving WHO Class I pesticides to farmers in the project.

9. Maize and food security

There are many points worth noting about Maize being promoted on grounds of food security and this fact-finding team would like to highlight these since Malthusian arguments around food security were used by different government representatives met on the issue of hybrid maize in Orissa.

a. Most maize is going into poultry and animal feed industry, along with starch industry; in fact, hybrid maize is rapidly shifting the use of maize in human consumption away from this use.
b. Traditional maize cultivation in different pockets of Orissa had intercropping practices with pulses and vegetables – hybrid maize is changing this situation and this obviously has implications for food and nutrition security
c. Hybrid Maize cultivation is risky, especially in its intensive cultivation model, as some recent large failures of hybrid maize in Bihar and Madhya Pradesh have shown. On the other hand, traditional rice cultivation by farmers in the pockets where hybrid maize is being brought in, could be less risky. It has to be remembered that Orissa is very disaster-prone (droughts and cyclones being a regular feature), that most of Orissa's farmers are smallholders and that most of Orissa's agriculture is rainfed, including its maize cultivation. In the era of climate change, it is obvious that smallholders need resilient systems for better adaptation. In such a situation, it is important to re-look at the stress tolerance of hybrid maize as compared to traditional maize and traditional rice cultivation and then plan out the interventions based on such intelligence.

The specious arguments around hybrid maize and food security have to be certainly re-looked at.

10. Corporations involved in the PPP

In Orissa, Monsanto, DuPont, a Thai company called Charoen Pokphand, Mahyco, Nirmal Seeds, Kaveri, JK Seeds etc., were brought into this PPP. Monsanto in particular is known for its aggressive profiteering agendas, at the expense of farmers' welfare, environment and health. Monsanto is already on its way to monopolising the hybrid maize seed segment in India. This necessarily has implications for seed sovereignty, seed choices for farmers, seed prices etc. It is apparent that the state government of Orissa has not thought through these implications for future, even though Monsanto is known to have even jailed and sued hundreds of farmers in the USA on claims of patent infringement.

It is apparent that with its own hands, the state government is making its seeds corporation and agriculture department powerless and redundant in providing any benefits to farmers in the state by projects such as this.

11. Public Private "Partnership"?

Though this project is being called Public Private "Partnership", there is nothing apparent that shows that this is indeed a partnership. The companies are under no obligation other than to replace seed in case of failure of germination. They are obviously in a position where their marketing departments are becoming redundant (which means further savings for the corporation on marketing costs) and the government does the job of marketing for these companies! It is unclear why this should be called a "partnership" rather than "public expenditure for private markets".

12. Late availability of Seeds – Farmers don't need all these inputs – GoI funds available, therefore, implementation?

It has been reported in Bolangir that availability of seeds on time in this project was an issue – therefore, farmers took the seed but used them as gap-filling in cotton crop that has already been planted in some instances. There were also at least three locations where unused seed was shown to us, still lying in the packets. Similarly, extremely toxic pesticides were given to the farmers which they did not need or use.

It does appear that this project design was not well thought through for its need or implications in the short, medium and long term, with the concept just borrowed from elsewhere (probably Gujarat?). It also appears that the Government of India's announcement on 'Green Revolution in Eastern India' caught the state government off the guard and these proposals were put together in a hurried manner and implemented in a similar rush. However, the livelihoods of thousands of farmers are at stake here and therefore, this project should not be continued without studying all these aspects.

13. Sustainability questions

The fact finding team admittedly found that farmers have no complaints with the project – free inputs are being given and performance in Kharif 2010 has not been bad (though significantly lower than projections – however, farmers are not comparing the performance with such projections at this point of time) and farmers who participated in the project had nothing negative to report.

However, it appears that this project has not thought through any sustainability questions – the worrisome aspect is not just that this project may not deliver on its promises and might end up wasting public funds but that it might actually impoverish poor farmers further, could make their farm economics unviable, their productive resources eroded, could take away real choices from them, could make them more vulnerable to risks etc. Given that all of these appear to be quite possible in this project, it is unacceptable that the state government is experimenting on such a large scale at the expense of farmers.

ISSUES ARISING FROM THE PROJECT & RECOMMENDATIONS

The following issues emerge from the project and the current fact-finding effort:

- Maize promotion *per se* does not enhance food or nutrition security, especially in its hybrid maize promotion-framework; food and nutrition security of farmers in the project villages has to be immediately compared in an ex-ante impact assessment with the current rice and maize cultivation practices and experiences.

- The farm economics for farmers in this project are unviable as experience at the end of 2010 Kharif shows, and things appear positive now only because of the subsidies being

pumped in for free inputs to farmers; this project could push farmers towards indebtedness and credit traps with input providers; no risk analysis framework is applied for understanding differential risks in hybrid maize cultivation vis-à-vis OPV maize vis-à-vis traditional rice cultivation by these farmers.

- Differential impacts and implications for different farming communities and farmers are already apparent in terms of economics, food/nutrition security, ability to sustain themselves in hybrid maize cultivation etc., and the project has not taken this into consideration

- Even if maize has to be promoted, the options with regard to public sector maize seed, that too in the form of OPVs has not been thought through or planned for

- Further, farmer-level seed self-reliance has not been planned for, including through participatory varietal improvement, selection etc. and through programmatic approaches around community seed banks, seed village programme etc.

- Seed choices narrowing down for farmers, along with mixed cropping getting affected is worrisome given the current situation of climate change

- Projects like this providing ready markets with public funds to large, profit-hungry corporations, known for their anti-farmer operations, is a matter of urgent concern; the project should not intentionally or unintentionally strengthen the hands of such corporations at the expense of farmers' interests and rights

- Environmental implications of increased chemical fertilizer and pesticide use as promoted in projects like this has to be foreseen and prevented

Keeping all the above in mind, the Fact Finding Team strongly recommends the following to the Government of Orissa:

1. ***Immediate stoppage to the current project and its implementation in Orissa; Immediate cancellation of MoUs with the corporations if any under the project.***

2. ***Re-designing of programmes under Green Revolution in Eastern India with participation from farmers' organizations and other civil society groups, to ensure economic and environmental sustainability in livelihood improvements for farmers of the state***

3. ***Focus on building seed self-reliance for farming communities across various crops including maize, with public sector facilitating this both at the research and extension level***

4. ***All policies and programmes to ensure that yield improvements of one or two crops do not happen at the expense of other important variables in the livelihood security of lakhs of poor farmers in Orissa***