EA1624

Environmental Assessment and Environmental Management Framework for the Bihar Rural Livelihoods Project

CEE
Centre for Environment Education

Contents

Executive Summary

Introduction
The Government of Bihar has initiated the Bihar Rural Livelihoods Project on rural livelihood promotion with support from World Bank. This is being implemented through the Bihar Rural Livelihoods Promotion Society (BRLPS). BRLPS through the BRLP aims to improve rural livelihood options and works towards social and economic empowerment of the rural poor and women.

Objectives
The stated objectives of the project are:

- To improve rural livelihoods and enhance social and economic empowerment of the rural poor.
- By developing organizations of the rural poor and producers to enable them to access & negotiate better services, credit and assets from public and private sector agencies and financial institutions.
- To invest in building capacity of public and private service providers.
- To play a catalytic role in promoting development of microfinance and agribusiness sectors.

Components
The components of the BRLP include the following:
Community Institution Development: Formation and strengthening of Self Help Groups (SHGs), Producer Groups and Federations; Strengthening and forming producer and economic groups around key commodities, non-farm products and services; and, expanding membership of poor in existing commodity cooperatives and producer groups.
Community Investment Fund: Group level investments for rural livelihood enhancement and for social services and social action.
Technical Assistance Funds: Including Civil Society Organization Capacity Building Fund, Agribusiness Development Facility, Innovations Grant Fund and Micro Finance Technical Assistance and Innovations Fund.

The institutional arrangements for the BRLP include state level and block level staff. The community institution partners of the BRLP – that is, the SHGs of the poor are federated at the village and block levels.

Objective of the Environmental Management Framework
The BRLP focuses on rural livelihood enhancement for poverty reduction. An Environmental Management Framework (EMF) has been developed for the BRLP with the objective of ensuring that the livelihood activities supported by the BRLP are environmentally sustainable besides meeting all regulatory requirements (the laws and regulations of the Governments of Bihar and India as well as the Safeguard Policies of the World Bank). The orientation of the EMF is on enabling the community institution partners (SHGs and their federations) to utilize the existing (Government schemes) and

newly created support systems (CRPs and para professionals) for ensuring environmental sustainability of their livelihoods.

Process of development of the EMF
The EMF was developed by Centre for Environment Education (CEE) in consultation with the BRLP team and representatives of the World Bank. Discussions were held with a range of stakeholders of the BRLP including: SHG members, community members; BRLP functionaries at the state and block levels; Line department representatives (agriculture, animal husbandry, fisheries, irrigation, etc.) at the state and district levels; NGOs; and Academic institutions. Field visits were made to Gaya, Nalanda, Muzaffarpur and Madhubani. Secondary research was undertaken. The exercise was undertaken during February and March 2007.

The EMF includes Technical Environmental Guidelines (TEGs) and an Environmental Implementation Monitoring Manual (EIMM) for the BRLP. The following paragraphs give a brief overview of the components of the EMF:

Environmental Profile of Livelihoods
The EMF document presents an environmental profile of the various livelihood sectors that are the focus of BRLP's intervention (Agriculture, Fisheries, and Small Enterprises) with a view to flag issues that the EMF will address.

Legal and Regulatory Framework
The EMF examines the legal and regulatory framework relevant to the BRLP. This section presents a brief listing of the various Acts, Rules and Policies of the Government of India, Bihar as well as the safe guard Policies of the World Bank. The alignment of the proposed BRLP livelihood interventions with respect to these is examined.

Technical Environmental Guidelines
The Technical Environmental Guidelines (TEGs) are developed based on the environmental profile as well as the legal and regulatory requirements.

The TEGs are of three types:

Screening TEG: This consists of two sections: Section A – Non-permissible activities and Section B – Screening for deciding the level of environmental assessment

Generic TEG: These are generic in nature and are to be used for conducting the environmental assessment of any activity that does not have a Specific TEG

Specific TEGs: These are specific to the nature of the activity being undertaken and have been developed for the key livelihood interventions identified in the 'Livelihoods Study and Value Chain Analysis' document provided by the BRLPS.
Each Specific TEG is presented in two parts:

- Backend Reference Document: This is for the use by the BRLP functionaries and community institution federation members and provides an outline of the issues, technical and management guidelines for action.
- Frontend Document: This is for use with the SHG members, Commodity or Produce Groups during the discussions that precede an application for credit support. It is to be annexed to any such application form (sub-project proposal, micro-credit plan or livelihood enhancement plan) for further action.

The TEGs are presented district-wise for
The TEGs have been developed for the following activities:
Gaya: Paddy Cultivation, Dairy, Incense stick making
Nalanda: Paddy cultivation, Vegetable cultivation, Dairy
Purnea: Banana cultivation, Jute cultivation, Winter paddy cultivation, Cultivation and processing of aromatic plants (mentha, lemon grass)
Madhubani: Dairy, Fisheries, Vegetable cultivation, Fruits cultivation (Makhana, Mango), Paddy cultivation
Muzaffarpur: Dairy, Fisheries, Vegetable cultivation, Fruits cultivation (Litchis, Mango), Maize, Bee Keeping
Khagaria: Dairy
Other livelihood activities: Tourism, Textile weaving, Madhubani paintings, Fruit processing, Betel leaf cultivation, Leather processing, Stone cutting, Artisan handicrafts, Bangles, Aromatic plants, and Sugarcane

All the TEGs as well as the generic framework for environmental management include guidelines for insuring/mitigating/coping, with regard to the floods.

Environmental Management Implementation and Monitoring Manual
The EMF includes an Environmental Management Implementation and Monitoring Manual that gives details of the following aspects of the implementation of the Environmental Management Framework (EMF):

- Integration of the EMF in the project activity cycle
- Institutional Arrangements for Environmental Management
- Capacity building strategy
- Monitoring strategy
- Budget

Integration of the EMF in the project activity cycle
Environmental assessment is viewed a part of the overall appraisal of the proposals. It checks both the individual and cumulative impacts of the proposed sub-sector interventions. The assessment process involves two steps: Screening and Assessment.

Screening helps to ensure that the legal and regulatory requirements of the project are met and that environmental assessment is done at the required level of detail and scale. The *Screening TEG – Section A – Non-permissible activities* and the *Screening TEG – Section B – Screening for deciding level of assessment* are to be used for this purpose.

The E1 level of assessment is for activities that are taken up at the SHG / Producer Group level and have short term negative or positive environmental impact
The E2 level of assessment is for activities that are taken up at the SHG / Producer Group level and have long term negative environmental impact and for all activities taken up at the Cluster / Block level (for checking cumulative impacts)
The E3 level of assessment is for activities that are likely to have significant negative environmental impacts that require specific technical inputs for mitigation and for all E2 sub-projects operating at the level of a district (for checking cumulative impacts).

The assessment for the proposed sub-sector intervention has to be done by the individual/agency prescribed in the *Screening TEG – Section B – Screening for deciding level of assessment*.

The E1 level of assessment is done by the Community Coordinator.
The E2 level of assessment is done by the Cluster Level Support Unit / Cluster Resource Team / Block Resource Team.
The E3 level of assessment is done by an external agency with facilitation by the State Level Resource Agency.

In case a *Specific TEG* is not available the *Generic TEG* needs to be used.

The environmental assessment process involves detailed interaction with the concerned Producers' Groups and/or the relevant Federations as well as field visits. The TEGs are to be used as guidelines to study the impacts and make suitable recommendations. Based on this, the TEG Front-End form is to be filled and attached to the proposal document of the sub-sector intervention.

Institutional Arrangements
The overall responsibility for implementation of the EMF will lie with BRLPS. It will liaison closely with the community institution partners and ensure that all the provisions of the EMF are adequately met. It will also take on the responsibility of recruiting additional technical assistance (a State Level Environment Support Agency) for the implementation of the EMF from relevant government departments, NGOs, academic institutions in Bihar. The responsibility of reporting back to the World Bank periodically also lies with BRLPS.

At the community institution level, the Self Help Group (SHG) and the Commodity Based Groups or Producers' Groups are the key institutions for integration of EMF in livelihoods. The SHGs will ensure that all members integrate the TEG into the relevant livelihood activities. The Village/cluster level federation (Gram Sanghatan) is the key institution for liasion with line departments. The Community Resource Persons (CRPs) are the key functionaries for capacity building of community institution partners in the block.

Capacity Building Strategy
The capacity building of the various stakeholders in the BRLP and the community institution partners is aimed at enabling them to execute the above mentioned tasks effectively on a continued basis.

In order to make the capacity building strategy resource efficient the following is recommended in the EMF:

- The focus should be more on skill enhancement for environmental management of livelihood activities at the community level so that the expertise generated will be relevant and accessible to the SHGs
- Convergence with existing institutions such as the Departments of Agriculture, Fisheries, Animal Husbandry and Krishi Vignan Kendras (as well as with NGOs) will make the capacity building efforts sustainable

Initial orientation and refresher programmes for the EMF are planned for the BRLP funcationaries at various levels from the state to the block. For the communty institution partners the focus of the capacity building will be on enabling them to integrate the recommendations in the TEGs in their livelihood practices. This includes understanding of the environmental implications of livelihood activities; awareness of existing technical and financial support available from line departments, NGOs and other relevant institutions; awareness of regulatory requirements; etc. Selected Community Resource Persons will be trained as Skilled Extension Workers to provide specific skill-based services to the SHGs such as soil testing using mobile soil testing kit, integrated nutrient management, integrated pest management and pesticide safety, fodder cultivation (choice of species and varieties, agronomic practices), shed and compost management, monitoring of flood behavior, potential flood management measures, etc.

IEC materials including a manual on EMF, posters and flip charts on TEGs, documentation of case studies on good EMF practices at the field level are planned.

Supplementary studies to provide focussed recommendations on coping with floods, non-chemical agricultural pest management options and coping with household fuel needs are recoemmended.

Monitoring strategy
The monitoring of the EMF implementation is done at two levels: (i) monitoring by BRLP through its internal monitoring systems, and (ii) monitoring by BRLP by sourcing external assistance. The key parametres for monitoring are specified in the EMF. The EMF specifies both the key aspects to monitor and the frequency of monitoring.

While the BRLP is not expected to cause any significant negative environmental impact, an audit of the EMF will be conducted by an external agency in the second, third and fifth years of the project. The audit will include a review of SHG livelihood activities in various sectors as well as the activities taken up by Commodity Groups or Producer Groups. A sample covering all types of activities in different livelihood sectors in all districts and all livelihood sectors will be drawn up for the purpose.

The EMF is viewed as a dynamic document that will evolve to intelligently meet the environmental management requirements of the BRLP overtime. Efficient implementation of the EMF will contribute to promoting *sustainable* livelihoods.

Budget

The budget for the four years of implementation of the EMF is Rs. 55.5 lakh approximately.

1. Introduction

The Government of Bihar has initiated the Bihar Rural Livelihoods Project on rural livelihood promotion with support from World Bank. This is being implemented through the Bihar Rural Livelihoods Promotion Society (BRLPS). BRLPS through the BRLP aims to improve rural livelihood options and works towards social and economic empowerment of the rural poor and women.

1.1 Project Objectives

The stated objectives of the project are:

- To improve rural livelihoods and enhance social and economic empowerment of the rural poor.
- By developing organizations of the rural poor and producers to enable them to access & negotiate better services, credit and assets from public and private sector agencies and financial institutions.
- To invest in building capacity of public and private service providers.
- To play a catalytic role in promoting development of microfinance and agribusiness sectors.

1.2 Project Components

The components of the BRLP include the following:

Community Institution Development:
Formation and strengthening of Self Help Groups, Producer Groups and Federations by improving the quality and capacity enhancement of the existing Self Help Groups and facilitating the development and strengthening of new Self Help Groups (SHGs) of the poor, particularly women and developing their federations and networks.
Strengthening and forming producer and economic groups around key commodities, non-farm products and services and expanding membership of poor in existing commodity cooperatives and producer groups.

Community Investment Fund:
Group level investments -

- for rural livelihood enhancement; to include skill development, seed funds for leveraging credit from financial institutions, technology support services and development of market infrastructure and support services.
- for social services and social action: for the poor to increase access to social services - health, nutrition, counseling, justice; special assistance to identified vulnerable groups, e.g. disabled and child labour.

Technical Assistance Funds:

- Civil Society Organization Capacity Building Fund
- Agribusiness Development Facility
- Innovations Grant Fund
- Micro Finance Technical Assistance and Innovations Fund

1.3 Institutional Arrangements

The institutional arrangements for the BRLP at the state level (that is, in the BRLPS) are as follows:

Executive Committee (BRLPS)
⇩
Chief Executive Officer
⇩
Addl. Chief Executive Officer
⇩
State Project Managers (CB, SD, LI, MF, IL, M&E, FMTSC)

The organizational structure at the block level is:

Block Program Manager
⇩
Area Coordinators (MF, LI, CB)
⇩
Community Coordinators
⇩
Community Resource Persons

The community institution partners of the BRLP – that is, the SHGs of the poor are federated at the village and block levels.

1.4 Requirement of EMF

The BRLP focuses on rural livelihood enhancement for poverty reduction. The Environmental Management Framework (EMF) is drafted to ensure that the livelihood activities supported by the BRLP are environmentally sustainable besides meeting all regulatory requirements (the laws and regulations of the Governments of Bihar and India as well as the Safeguard Policies of the World Bank). It is important to recognize that the orientation of the EMF in this project will be to enable the community institution partners (SHGs and their federations) to utilize the existing (Government schemes) and newly created support systems (CRPs and para professionals) for ensuring environmental sustainability of their livelihoods.

1.5 Methodology

1.5.1 Scope of the EMF

The current assignment is to develop Technical Environmental Guidelines (TEGs) and an Environmental Implementation Monitoring Manual (EIMM) for the BRLP. Both these are together referred to as the EMF.

1.5.2 Methodology

The EMF was developed by Centre for Environment Education (CEE) in consultation with BRLP. Discussions were held with:

- SHG members, community members
- BRLP functionaries at the state and block levels
- Line department representatives (agriculture, animal husbandry, fisheries, irrigation, etc.) at the state and district levels
- NGOs
- Academic institutions

Field visits were made to Gaya, Nalanda, Muzaffarpur and Madhubani. Secondary research was undertaken.

The exercise was undertaken during February and March 2007. A meeting between World Bank representatives, BRLP staff and CEE to share the EMF and invite inputs for its strengthening was organised on 27th March 2007.

2. Environmental Issues in Livelihoods

This section presents an environmental profile of the various livelihood sectors that are the focus of BRLP's intervention: Agriculture, Fisheries, and Small Enterprises with a view to flag issues that the EMF will address.

2.1 Agriculture

Bihar possessed about 3% of the total cultivated area of the country and 8% of the country's population, and produced about 6.9% (14.56 M tonnes) of the total food grains in 1999-2000. The average yield of food grains in the state was 1620 kg/ha as against the national average of 1697 kg/ha[1].

Agriculture contributes 43.6 percent of the state GDP which is higher than the national average. It provides employment to 76% of the work force. Agriculture in Bihar is dominated by cereals. 80% of the net sown area is occupied by rice and wheat. Horticultural crops occupy 12% of the net sown area and provides an important source of income to the farmers[2].

2.1.1 Agro-climatic zones

The Rajendra Agricultural University, Pusa, based on soil characterization, rainfall, temperature and terrain, has identified three main agro-climatic zones in Bihar. These are known as Zone-I, North West Alluvial Plains, and Zone-II, North East Alluvial Plain, consisting of all the districts of north Bihar; and Zone-III, South Bihar Alluvial Plains comprising of all the districts of south Bihar. A brief description of these zones are given in Table – 1[3].

Table 1 : Important features of agro-climatic zones of Bihar

Agro-climatic zone	*Districts*	*Total area (m ha)*	*Net sown area (m ha)*	*Irrigated area (m ha)*	*Main cropping systems*
Zone-I North-west Alluvial	W/E Champaran, Gopalganj, Saran, Siwan, Sitamarhi,	3.26	2.15 (65.95)*	0.86 (40.00)**	Rice-Wheat, Maize-Wheat, Maize-Arhar,

[1] Planning Commission, 2001, *Report of The Working Group on Agricultural Development in Eastern & North Eastern India for the Formulation of the Tenth Five Year Plan*, Government of India

[2] State Agriculture Extension Plan, Department of Agriculture, Government of Bihar

[3] Dr. Mangala Rai, 2002, Strategies for Enhancing Agricultural Productivity and Production During Rabi Season to Mitigate the Adverse Effects of Drought and Floods During the Kharif Season in Bihar, Proceedings of the Meeting Held at Patna Under the Chairmanship of His Excellency, The Governor of Bihar on 10th Sept. 2002, Indian Council Of Agricultural Research, New Delhi

plain	Muzaffarpur, Darbhanga, Vaishali, Samastipur, Sheohar, Madhubani				Maize-potato-moong, Maize-sweet potato-onion, Maize-mustard-moong, Rice-potato-maize, Rice-sugarcane
Zone-II (N/E Alluvial plain)	Purnea, Katihar, Madhepura, Saharsa, Araria, Akishanganj, Supaul, Khagaria, Begusarai	2.08	1.21 (58.17)	0.24 (19.83)	Jute-rice, Jute-wheat, Jute-rice-wheat, Jute-potato, Jute-Kalai-wheat, Jute-mustard, Jute-pea, Rice-wheat-moong.
Zone-IIIA (South Bihar Alluvial plain (East)	Banka, Munger, Jamui, Lakhisarai, Shekhpura, Bhagalpur	1.11	0.49 (44.14)	0.21 (42.86)	Rice-wheat, Rice-wheat-moong, Rice-gram-rice, Rice-potato-onion, Rice-rye-moong, Rice-berseem
Zone-IIIB (South Bihar Alluvial plain (West)	Patna, Gaya, Jahanabad, Nawada, Nalanda, Rohtas, Bhojpur, Aurangabad, Buxar, Kaimur.	2.92	1.68 (57.53)	1.37 (81.15)	Rice-wheat-moong, Rice-wheat-rice, Rice-gram-rice, Rice-gram-moong.
Total		9.37	5.53 (59.02)	2.68 (48.46)	

* Figures in parenthesis are % to geographical area
** Figures in parenthesis are % to net area sown.

Zone I – North West Alluvial Plains

This zone comprises the districts of West and East Champaran, Gopalganj, Siwan, Saran, Sitamarhi, Muzaffarpur, Vaishali, Madhubani, Begusarai, Sheohar, Darbhanga and Samastipur with an area of 32665 km2.

Soil and Physiography: The lands of this zone are alluvial plains that slope towards the south-east direction with a very low gradient as evident by the stream flow direction along the natural level before they finally meet the Ganga. As a result there are vast areas that get flooded and become waterlogged during rainy season.

Except for the northern portion and portion in west of the zone under the influence of Adhwara system of rivers, the entire zone is under the influence of rivers Gandak, Burhi Gandak, and Ghaghra. All these rivers originate in the lime rich foot hills of the Himalayas. Thus, the soils under the influence of Gandak, Burhi Gandak, and Ghaghra are mostly calcareous having different amounts of lime in them. The soils of Siwan and Gopalganj districts with less rainfall and more pronounced dry seasons have developed salinity as well as alkalinity. Similarly, the soils of nearly flat lands of East and West Champaran, Muzaffarpur and Vaishali districts are also salt affected. The soils of the northern part are not under the influence of the above rivers and those under the influence of Adhwara group of rivers are neutral, acidic or saline depending on the micro-relief and local physiography.

Zone II – North East Alluvial Plains

This zone comprises the districts of Purnea, Katihar, Saharsa, Supaul, Arariya, Kishanganj, Madhepura and Khagaria and covers 11.96% (20797.4 km2) of the total geographical area of Bihar.

Soils and Physiography: This zone, (consisting the alluvial plains of Kosi, Mahananda and its tributaries and Ganga -narrow strip in the South) has slightly undulating to rolling landscape mixed with long stretches of nearly flat landscape with pockets of area having sub-normal relief. The area is full of streams with abandoned or dead channels of Kosi river. Its frequent and sudden change of course has left small lakes and shallow marshes. In the south, in between the natural levees of Ganga on the one hand and Kosi and Mahananda on the other, there are vast areas, which remains waterlogged over a considerable part of the year.

Zone III – South Bihar Alluvial Plains

This zone is located in the south of the river Ganga and comprises the districts of Gaya, Aurangabad, Arwal, Buxar, Bhabhua, Jahanabad, Nawada, Rohtas, Bhojpur, Patna, Nalanda, Monger, Bhagalpur, Lakhisarai, Jamui, Banka and Shekhpura. The total geographical area is 40,875.5 km2, which represents 25.75% of the total area of the state. Soils and Physiography: This zone consists of the alluvial plains of river Ganga on its southern side. Sediments are received both from river Ganga and those flowing from the south having their origins in the Chotanagpur plateau which rise abruptly from the plains. The lands slope is towards north-east with gentle slope and moderate to low gradient. South of the natural levee of the Ganga, there is a vast stretch of backwaters known as “Tal” lands extending from Buxar to Pakur where most of the rivers and rivulets coming from the south get lost.

2.1.2 Crop productivity

Crop cultivation in Bihar is characterized by low productivity of cereals (high productivity in maize and pulses), low external inputs (irrigation, chemical fertilizers, organic manures, pesticides) and high risk (floods, droughts).

Table 2 : Agricultural productivity in Bihar and India (q/ha)

Year	Paddy		Wheat		Maize		Pulses		Oilseeds	
	Bihar	India	Bihar	India	Bihar	India	Bihar	India	Bihar	India
1993-1994	14.15	18.88	21.30	23.80	21.50	16.02	7.09	5.98	7.05	7.00
1994-1995	13.52	19.11	21.08	25.59	20.61	14.48	7.38	6.10	7.07	8.43
1995-1996	12.18	17.97	20.06	24.83	20.14	15.95	6.15	5.52	6.84	8.51
1996-1997	15.95	18.82	22.09	26.79	22.35	17.20	8.35	6.35	6.35	9.26
1997-1998	14.90	19.00	19.61	24.85	19.72	17.11	7.29	5.67	7.38	8.16
1998-1999	14.54	13.21	20.91	25.90	19.54	17.55	9.10	6.34	8.55	9.44
1999-2000	15.43	19.90	22.03	27.59	22.37	17.85	7.96	6.30	7.32	8.56
2000-2001	14.89	19.27	21.73	27.42	24.54	18.06	8.35	5.53	7.44	7.90
2001-2002	14.65	-	20.65	-	25.04	-	7.88	-	7.28	-

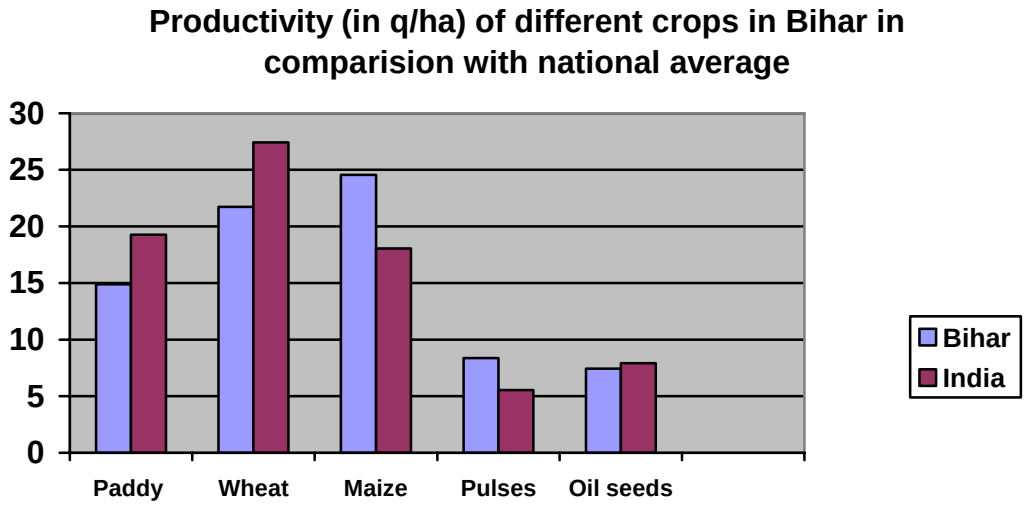


Table 3 : Consumption of chemical fertilizers (kg/ha)
Year 2001 – 2002

S.No.	*State*	*Fertilizer Consumption (N:P:K)/hectare*
1	Haryana	155.68
2	Punjab	173.38
3	Uttar Pradesh	130.44
4	Andhra Pradesh	143.47
5	Bihar	87.39

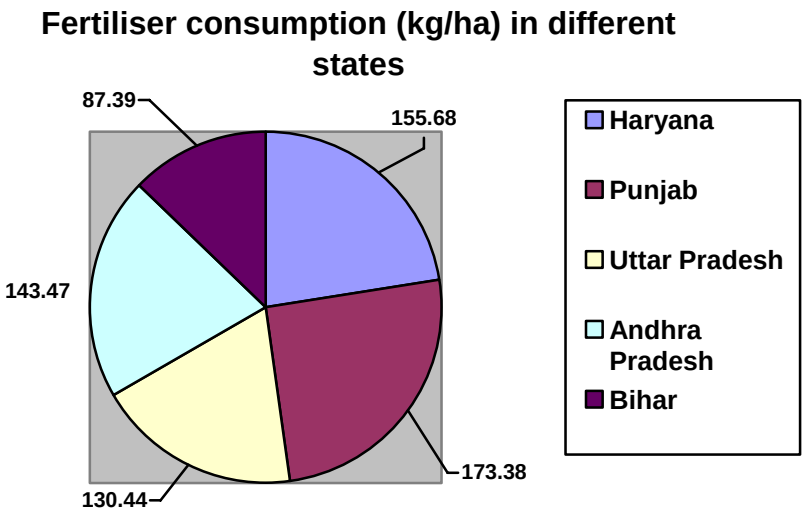
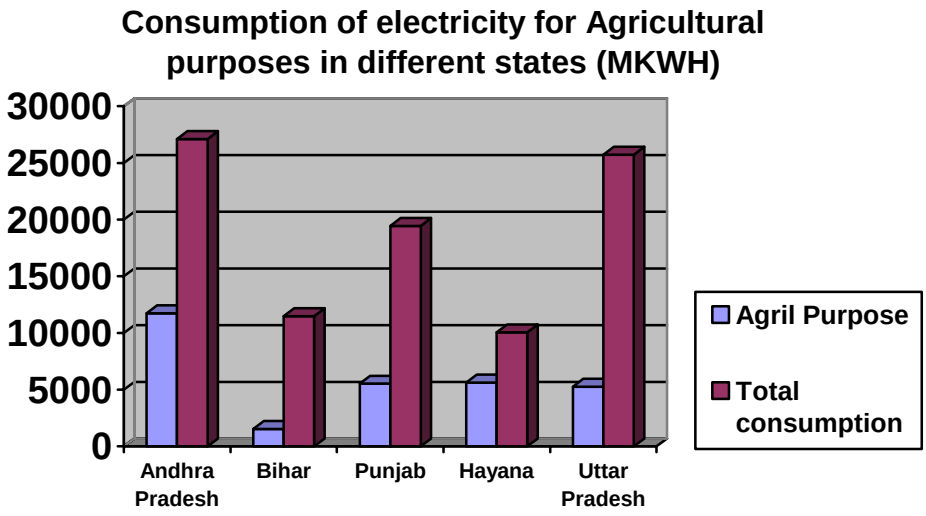


Table 4 : Consumption of electricity for agricultural purposes (in MKWH)

S.No.	*State*	*Consumption for agricultural purposes*	*Total consumption*	*% share of agriculture*
1	Andhra Pradesh	11748	27100	43.45
2	Bihar	1549	11485	13.52
3	Punjab	5534	19441	28.47
4	Haryana	5635	10051	45.12
5	Uttar Pradesh	5260	25732	20.44



Rice

Rice is one of the main crops of Bihar but its productivity is very poor. Out of the 37 rice growing districts in the state, 25 districts have low productivity. Only one district is falling under high productivity group i.e. yield more than 2,500 kg/ha. Area coverage under rice with high yielding varieties is about 65% and irrigation facility is available for about 40% rice area in the State. If the productivity of low productivity zone is increased, the rice production can be increased considerably without increasing the area under rice[4].

The package of cultivation practices recommended by the relevant Government departments for productivity enhancement include recommending the use of chemical pesticides such as Chlorpyriphos and Endosulphan (both classified as Moderately Hazardous – Class II), etc. These are not permissible in the BRLP. (See Annexure I; Also refer to chapter on Legal Framework)

[4] Directorate of Rice Development, Department of Agriculture and Cooperation, *State-wise Rice Productivity Analysis*, http://drdpat.bih.nic.in

Table 5 : Rice productivity of districts in Bihar

Number of Rice Growing Districts : 37

High Productivity Districts (> 2,500 Kg/Ha.)			Medium Productivity Districts (2,000-2,500 Kg/Ha.)			Medium-Low Productivity Districts (1,500-2,000 Kg/Ha.)			Low Productivity Districts (1,000-1,500 Kg/ha.)			Very Low Productivity Districts (< 1,000 Kg/Ha.)		
SL	District	Yield	SL	District	Yield	SL	District	Yield	SL	District	Yield	SL	District	Yield
1.	Rohtas	2,597	1.	Buxar	2,447	1.	Aurangabad	1,990	1.	**Nalanda**	1,487	1.	Begusarai	968
			2.	Patna	2,280	2.	West Champaran	1,863	2.	Nawada	1,486	2.	Darbhanga	886
			3.	Bhojpur	2,260	3.	Jehanabad	1,733	3.	Munger	1,432	3.	**Khagaria**	611
			4.	Bhabhua	2,197	4.	**Gaya**	1,657	4.	Banka	1,403			
									5.	Gopalganj	1,374			
									6.	Siwan	1,350			
									7.	East Champaran	1,348			
									8.	Vaishali	1,347			
									9.	Saran	1,343			
									10.	**Purnea**	1,319			
									11.	Katihar	1,316			
									12.	Madhepura	1,305			
									13.	Shekhpura	1,284			
									14.	Sheohar	1,276			
									15.	Saharsa	1,256			
									16.	Araria	1,248			
									17.	Bhagalpur	1,204			
									18.	Lakhisarai	1,193			

19.	Kishanganj	1,154
20.	Supaul	1,122
21.	**Muzaffarpur**	1,110
22.	**Madhubani**	1,104
23.	Jamui	1,087
24.	Sitamarhi	1,066
25.	Samastipur	1,038

Boro rice is grown in Chaurs (a saucer or bowl shaped area) in more than 2 lakh hectares[5] mainly in the districts of Katihar, Purnia, Saharsa, Supaul and Madhubani where rainfall is high and temperature not too low. In North Bihar which is flood prone, farmers mostly grow winter maize. The area is water logged for more than 9 months from June – July to February – March. Boro rice is usually sown in the months of late November – early December and is transplanted in February – March followed by harvesting in May – June[6].

Farmers follow Dapog method of raising seedling for the boro rice after mid November in their courtyard, terrace or even on broken door planks. Seeds soaked for 72-hours are covered with banana/bamboo leaves to provide warm environment for early germination. The seedlings are transplanted when they are 57-70 days old. Farmers sow the floating rices with soaked seeds in the same field 15 days before harvest of boro rice and leave the ratoons of boro for growing in kharif so that if flood comes, the old stubbles can withstand submergence and give some yield. Boro rice cultivation is a recent practice in the State during the last decade[7]. Government supports Boro rice cultivation by providing subsidy on seed and training[8]. Farmers also collect seeds from their own sources either from adjoining districts or sometimes even from Bangladesh[9].

Implications for EMF: Rice cultivation

The cultivation of Boro rice as a strategy for coping with water logging and flood may be explored further by BRLP in consultation with the Department of Agriculture, Government of Bihar. The following recommendations of the Department of Agriculture can be integrated into the EMF[10]:

- Use of high yielding disease resistant varieties: Gautam, Richharia and Dhanlakshmi
- Area expansion and adoption of Boro Paddy particularly in Chaur areas
- Integrated Nutrient Management for higher productivity

Sugar cane[11]

The Department of Cane Development, Government of Bihar notes that of the total cultivable area of around 54 lakh ha in Bihar, only around 2.30 lakh ha (approx 4.5%) is under cane cultivation (as against the approx 70% cane area coverage in the sugar sector areas in the state of Uttar Pradesh). Of the potential sites identified by the Department for sugarcane development, the following are relevant to the current BRLP project area:

[5] Rabi Conference, 2004
[6] Central Rice Research Institute, Annual report 2001-2002: Germplasm
[7] Central Rice Research Institute, Annual report 2001-2002: Germplasm
[8] Rabi Conference, 2004
[9] Central Rice Research Institute, Annual report 2001-2002: Germplasm
[10] Rabi Conference, 2004
[11] Department of Cane Development, Government of Bihar, http://gov.bih.nic.in accessed in February 2007

Nalanda-Nawada Area
The land in this region is very fertile with availability of more than three lakh hectares of cultivable area. Irrigation canals have been provided in this region, as also an effective coverage of state tube wells and private bore-wells. The water table is high with more than sufficient reservoir of underground water. Rainfall is adequate and conducive for cane crop cultivation. This region too has got a good potential of developing as a sugarcane producing region.

Gaya-Aurangabad Area
The land of these two districts is also very fertile. The area has a canal irrigation system along with adequate coverage of State tubewells and private borewells. The water table is high with substantive ground water reserves. Rainfall is also sufficient and favourable for cane cultivation. Sugarcane cultivation for juice and gur/khandsari manufacture is being undertaken in about 1500 ha in the season 2005-06. The region has more than 4 lakh ha of rich cultivable area, which is an ideal sugarcane producing area.

Saharsa-Araria-Kishanganj-Purnia Area
These are three important districts in the north east of Bihar. The Northern boundary of Araria & Kishanganj borders with Nepal while the eastern portion of Kishanganj and Purnea is adjecent to northern portion of West Bengal. The river Mahananda flows through Kishanganj & Purnea districts.

The soil of this region is highly fertile and is most suitable for cane cultivation. Sugarcane cultivation for juice and gur/khandsari manufacture in about 1500 hectares is estimated for the season 2005-06. The area has a canal irrigation system along with adequate coverage of state tubewells and private bore wells. The land scape is slopy from north and the water table is high with substantive ground water reserves. Rainfall is also sufficient and favourable for cane cultivation.

The region has more than 3.5 lakh hectares of rich cultivable area which can be converted into a sugarcane producing area with the setting up of a sugar complex in the region. The area can be surveyed for an appropriate site for sitting up of a sugar complex in any of the three districts.

2.1.3 Horticulture

The agro-climatic diversity in Bihar with its high rainfall distributed over a five-month monsoon and a reasonably long and moderate winter allows for a variety of horticultural crops to be grown[12].

Major fruits grown in the state are Mango, Litchi, Guava, Pineapple Citrus, Banana, Papaya and Ber; and the prime growing areas are Muzaffarpur, Vaishali, Bhagalpur, Darbhanga, Madhubani, Sitamarhi, Patna, West Champaran. Kishanganj, Purnea, Araria, Katihar and Saharsa districts. The major vegetables grown on commercial scale in the

[12] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.

state are cauliflower, okra, brinjal, tomato, onion, chillies, cabbage, gourds, peas, cowpea and melons[13].

Horticulture crops are currently grown over an area of 7.90 lakh hectares consisting of 3 lakh hectares (ha) under fruits, 4.90 lakh ha under vegetables. The state now ranks fourth in fruit production and third in vegetable production in the country. The state is also one of the leading producers of spices[14].

2.1.3.1 Vegetable cultivation

Presently the total area under different vegetable crops in Bihar is 4.90 lakh ha with a production of 7.5 lakh tonnes, the annual productivity being 15 m t /ha. The major vegetables grown on commercial scale in the state are cauliflower, okra, brinjal, tomato, onion, chillies, cabbage, gourds, peas, cowpea and melons. Many spices are grown commercially in the state. At present Bihar produces about 1 lakh tonnes of spices annually from an area of nearly 46,590 ha. The important spices are Ginger, Turmeric, Chilly, Coriander, and Garlic[15].

Marginal and small categories of farms are associated more with vegetable cultivation than large farmers. Cropped area under vegetables accounts for 29.57 per cent on marginal, 16.85 per cent on small, 14.67 per cent on medium and 11.17 per cent on large farms. Vegetable crops are largely grown on irrigated land[16].

Due to favourable agro-climatic conditions, plateau region districts are more suitable for vegetables cultivation but due to poor irrigation levels vegetables are not grown to a substantial level. The share of vegetable crops in irrigated area is high compared to unirrigated area. The cropping intensity for vegetables is around 131 per cent. There is no wide practice of double cropping of vegetables[17].

Among all the vegetable crops potato occupies the largest proportion followed by brinjal, tomato, cauliflower, cabbage and ladyfinger.

The productive efficiency of vegetable cultivation is reported to be high in the case of marginal farmers as compared to other farm sizes. Marginal farmers go for intensive cultivation with their own human labour capital which give them higher yield of their vegetables[18].

[13] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[14] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[15] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[16] Prasad, J., *Production and Marketing of Vegetables in Bihar*, A. N. Sinha Institute of Social Studies, Patna
[17] Prasad, J., *Production and Marketing of Vegetables in Bihar*, A. N. Sinha Institute of Social Studies, Patna
[18] Prasad, J., *Production and Marketing of Vegetables in Bihar*, A. N. Sinha Institute of Social Studies, Patna

2.1.3.2 Fruit cultivation

Bihar state is one of the largest producer of fruits and ranks first in Litchi, third in Mango and sixth in Banana in the country. The annual fruit production in the state is 30 lakhs tonnes in an area of nearly 3 lakhs hectares. Major fruits grown in the state are Mango, Litchi, Guava, Pineapple, Citrus, Banana, Papaya and Ber. Mango is grown all over the state, main growing areas are Muzaffarpur, Vaishali, Bhagalpur, Darbhanga, Madhubani, Sitamarhi, Patna and West Champaran. Litchi is mainly grown in Muzaffarpur, Vaishali, Sitamarhi, East and West Champaran and Darbhanga of North Bihar region. Pineapple is grown in north- eastern part of the state particularly in Kishanganj, Purnea, Araria, Katihar and Saharsa districts[19].

The National Horticulture Mission seeks to develop concentrated pockets of plantation in the State, rejuvenate old orchards and create post-harvest and marketing infrastructure. The cluster of areas and crops selected are listed in the following table[20]:

S.No.		*Districts*	*Crops*
1	Cluster I	West Champaran, East Champaran, Muzaffarpur, Samastipur, Vaishali, Dharbanga	Mango
		West Champaran, East Champaran, Muzaffarpur, Vaishali	Litchi
		Samastipur, Vasihali, Dharbanga, (Muzaffarpur), Khagria	Banana
		West Champaran, East Champaran, Vaishali, Jamui	Guava
2	Cluster II	Araria, Kishanganj	Pineapple, Mango, Banana
		Purnia	Litchi, Banana, Pineapple
		Kathiar	Banana, Pineapple, (Litchi), Mango
3	Cluster III	Bhagalpur	Mango, Litchi, Guava, (Banana)
		Banka, Munger, Jamui, Khagaria	Mango, Guava
4	Cluster IV	Patna, Gaya, Nalanda	Vegetable seed production, (Guava – for Patna and Nalanda only)
5	Cluster V	Araria, Dharbhanga, Kathiar and Purnia	Makhana
6	Cluster VI	Nalanda, Vaishali, Jamui, Aurandabad	Bael
7	Cluster VII	Aurandabad, Jamui, Gaya, Nalanda and Vaishali	Aonla, Bael

(--) crops included in Annual Agriculture Plan this year

[19] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[20] *Annual Plan of Action under National Horticulture Mission*, 2006-2007.

Mango

Bihar stands third in mango production in the country. Its share to the national production is nearly 12 % of cultivars like Maldah/ Langra, Sipias, Gulabkhas, Krishnbhog, Zardalu and Chausa. Productivity of Bihar is much higher than the bordering states and the national average.

Mango is the major fruit covers about 48.5% of the total fruit area in the state. The area under Mango has been decreasing from 146232 ha to 139283 ha in 2001-02 which is 4% decrease in last decade. Similarly, decrease in production have shown and it is 14% over 1991-92. The productivity has also gone down from 10MT/ha in 1991-92 to 9 MT/ha in 2001-02, which is higher than the national average level.

Muzaffarpur falls in the 'concentrated belt' of districts identified for promotion of Mango cultivation in Bihar.

The common constraints which are experienced in Mango production in most of the districts of Bihar are reported to be:

- Inadequate availability of disease-free planting material, especially new cultivars
- Predominance of senile and unproductive orchards
- Poor management, especially pest infestations and nutrient deficiencies
- Absence of agronomical practices
- Slow adoption of improved and commercially accepted cultivars and varieties
- Most of the orchards are owned by absentee landlords and being presently managed by contractors, so no proper care and management is taken.

The Annual Action Plan for the Horticulture Mission notes that there is an urgent need to adopt better growing practices like use of inputs, balanced nutrition, IPM practices, in the mango pockets. New plantations shall cover 900 ha with high-density concept, hybrid varieties coupled with modern system of irrigation management, etc. Simultaneously, activities of rejuvenation shall be started to increase productivity of the existing orchards of three thousand five hundreds ha (rejuvenation of old and senile orchards) shall include top-working, fertigation and gap filling in the existing plantations. The area for rejuvenation will be about 10,000 ha[21].

Integrated pest management practices for controlling mango-hopper, mealy bug, fruit fly, leaf-hopper, shoot-borer, bark-eating caterpillar and scale insects have been standardized by CISH, Lucknow, IIHR, Bangalore and SAUs. These need to feed into extension programmes for adoption by farmers[22].

[21] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[22] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.

Litchi

Bihar produces 70% of total litchi production of the country and occupies nearly 54% of the area under litchi plantation in the country. In this state litchi is mainly cultivated in the districts of Muzaffarpur, Vaishali, Sitamarhi, West & East Chaparan, Darbhanga and Samastipur. Litchi is grown in area of about 28 thousand hectare with total production of about 3 Lakhs tonnes and productivity 12 t/ha which is very high in comparison to average national productivity[23].

Muzaffarpur forms part of the concentrated cluster of districts identified for boosting litchi production.

Banana

In Bihar, Banana is grown over an area of 27000 ha and production is 540900 MT. It is grown in the districts of Bhagalpur, Samastipur, Vaishali, and Purnia. Fertility of soil is very important for successful cultivation, as banana is a heavy feeder[24].

Purnia is part of the concentrated belt of districts identified for promoting Banana cultivation.

The Banana Research Institute, Hariharpur provides technical support and training in extraction and use of banana fibre.

Guava

Guava is a hardy crop and can adapt itself to marginal lands. Further, it gives two fruitings per year. Guava occupies 27 thousand hectares (9.44 %) of area of the state, with a productivity rate of 12.0 t / ha. The state has maximum area under guava production in the country. Guava is grown all over the state. However, Rohtash, Bhojpur, East Champaran, West Champaran, Muzaffarpur, Vaishali are the main producers of guava[25].

Guava trees start drying after a few years due to *Guava wilt*, which is a serious problem, especially when soil pH value is above 7.5. This disease, once set, is difficult to control. Most of the nurseries are selling seedlings of guava, which are planted by the farmers, as these are cheaper. These seedlings are not true to type and give poor quality and yield. Farmers are ignorant about the grafted and layered plants, which are also not available in adequate quantities. Rainy season crop is affected by fruit fly and in turn affects the main crop in the winter[26].

[23] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[24] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[25] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[26] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.

Integrated pest and disease management interventions have been identified for Guava in Bihar. However, the recommended package of practices includes the use of hazardous chemical pesticides such as Thiram, and Chloropyriphos[27].

Pineapple

Pineapple is another important fruit crop of the state. The area under pineapple is 4019 ha. The commercial cultivation is mostly confined to three districts (Kishanganj, Purnia, Araria whose area ranges from 300-1400 ha) and the area is gradually increasing to other districts in recent years[28].

Purnia is one of the districts selected for concentrated interventions for pineapple cultivation in the state.

Implications for EMF

Integrated Pest Management (IPM) and Integrated Nutrient Management are already part of the Annual Plans of Action for Horticulture in the State. The BRLP needs to coordinate with the Department of Horticulture to ensure that the credit support to SHGs for undertaking horticulture activities includes technical support.

The IPM practices recommended by the Department of Horticulture however include certain chemical pesticides classified as hazardous. The use of these must not be promoted through the BRLP.

Extraction and use of banana fibre can be promoted as an enterprise along side banana cultivation.

2.1.4 Issues

Table 6 : Agro-ecological sub-regions in Bihar and their issues

Agro-Ecological Sub-region	*Rainfall (mm)*	*Soil*	*Cropped Area (m ha)*	*Cropping Intensity (%)*	*Major Crops*	*Major Issues*
9.2 Hot, dry sub humid	1000-1200	Deep, Loamy (Inceptisols)	5.5 (4.1)	172	Maize, Millet, Paddy, Pulses	Water-Logging and salinity Places of unjudicious water use Saline Sodic

[27] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.
[28] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.

13.1 Hot, dry/moist sub humid	1200-1500	Deep, Fine loamy to clay (Inceptisols pockets of Altisols)	6.0	150	Rice, Wheat, Pulses, Mustard, Sugarcane, Species, Condiments	Underground water Imperfect drainage Flooding Salinity/ Sodicity

2.1.4.1 Fertilizer consumption

The total fertilizer consumption (N + P2O5 + K2O) in Bihar in 2004-05 was 0.732 Mt. The consumption of N, P2O5 and K2O was 0.619, 0.071 and 0.042 Mt respectively. Fertilizer consumption per hectare of cropped area was 92.7 kg[29].

Fertilizer consumption in the state is highly skewed towards N. NPK use ratio was 14.7:1.7:1 in 2004-05. This sub-optimal and imbalanced nutrient usage is causing nutrient mining leading to depletion of inherent soil fertility. Using only, or largely using N, makes soils highly deficient in P, K, S and other nutrients, holding back yields, profits and N-use efficiency itself[30]. The following table shows that while a deficit of N exists, the deficit in the case of P and K is more severe.

Table 7 : Nutrient balance sheet for major crops of Bihar (1998-99)[31]

Crop	*Area ('000 ha)*	*Production (tonnes)*	*Nutrient Removal (kg/tonne)*			*Total Removal (tonnes)*		
			N	P_2O_5	K_2O	N	P_2O_5	K_2O
Rice	4976	6774900	20.1	11.2	30	136176	75879	203247
Wheat	2081	4159300	24.4	8.6	32.8	101487	35770	136425
Maize	690	1174700	8.2	3.1	15.5	9633	3642	18208
Total Pulses	918	646400	40	5	20	25856	3232	12928
Total Oilseeds	225	166000	54	14	46	8964	2324	7636
Sugarcane	110	5038619	1.7	0.2	2	8566	1008	10077
Jute	168	1456091	23.5	13	41.7	34218	18929	60719
Potato	167	146646	3.9	1.4	4.9	572	205	719
	Total removal by major crops					325471	140989	449959
	Total fertilizer consumption in Bihar					645543	159406	55865
	Consumption x Efficiency factor					290494	39851.5	39106
	Balance/Deficit					-34976	-101137	-410853

[29] International Plant Nutrition Institute, www.ipni.net accessed in February 2007
[30] International Plant Nutrition Institute, www.ipni.net accessed in February 2007
[31] International Plant Nutrition Institute, www.ipni.net accessed in February 2007

This excerpt from a study report on the Rice-Wheat cropping system in Bihar captures the issues with respect to nutrient management and the role that organic manures can play: The key constraints to sustainable rice and wheat production in Bihar are the emergence of multiple nutrient deficiencies, low fertilizer-use efficiencies, less use of organic manure and crop residues, and unbalanced use of fertilizers in this cropping system. The most common soil-nutrient deficiencies observed even with adequate application of NPK (nitrogen, phosphorus, potassium) fertilizers under regular adoption of rice-wheat cropping system are those of micronutrients such as zinc (Zn), boron (B), and iron (Fe) and secondary nutrients such as sulfur (S)[32].

The potassium status of the majority of the soils of Bihar fall under the medium category. Bihar soils are reportedly being mined of potassium over time due to insufficient use of the nutrient. The quantity of total potassium added through fertilizers is much less than the amount removed by the crops and this is causing severe depletion of native potassium reserves in the soil[33].

Table 8 : Potassium balance ('000 t) in the soils of Bihar[34]

Components of Balance Sheet	*North-West Alluvial Plain Zone I*	*North-East Alluvial Plain Zone II*	*South Bihar Alluvial Plain (East) Zone IIIA*	*South Bihar Alluvial Plain (West) Zone IIIB*
Removal	95.54	36.20	21.94	338.29
Addition	23.15	17.37	4.62	9.26
Gross Balance	-72.39	-18.83	-17.32	-329.03
Depletion (%)	75.97	52.02	78.94	97.26

Average rate of potassium application in the State is only 5.5 kg per hectare as compared to 77.8 kg of N application per hectare. The following table shows the productivity and profitability enhacement that application of Potash can provide[35].

[32] Prasad, B. and Sinha, S.K. 2000. *Long-term Effects of Fertilizers and Organic Manures on Crop Yields, Nutrient Balance, and Soil Properties in Rice-Wheat Cropping System in Bihar*. Page 105-119 in Long-term Soil Fertility Experiments in Rice-Wheat Cropping Systems (Abrol, I.P., Bronson, K. F., Duxbury, J. M. and Gupta, R. K. eds.). Rice-Wheat Consortium Paper Series 6. New Delhi, India: Rice-Wheat Consortium for the Indo-Gangetic Plains

[33] International Plant Nutrition Institute, www.ipni.net accessed in February 2007

[34] Mishra et al (2001). Fertilizer News 46(11), pp-21-43.

[35] International Plant Nutrition Institute, www.ipni.net accessed in February 2007

Table 9 : Effect of potassium application on yield and economics of production in Bihar[36]

Crop	*Yield without Potash (kg/ha)*	*Yield with indicated level of Potash (kg/ha)*	*Yield increase due to Potash (kg/ha)*	*Net return due to Potash (Rs/ha)*	*Net return Rs/Re invested on Potash#*
Rice	3210	4092 (60)	882	5027.4	11.28
Wheat	1860	3070 (80)	1210	7865	13.23
Maize	1870	4690 (67)	2820	15228	30.6
Sugarcane	67100	83330 (60)	16230	12984	29.13
Potato	17500	22500 (100)	5000	10000	13.5
Mustard	1330	1600 (60)	270	4630.5	10.4
Soybean	760	1550 (40)	790	7110	23.9
Ginger (Fresh rhizomes)	9180	25240 (120)	16060	192720	216.2
Turmeric (Fresh rhizomes)	15320	45170 (150)	29850	298500	267.8

Price of K2O is Rs. 7.43/kg; @ Values in parentheses are the applied rate of potash in kg/ha

Neither organic manure nor crop residues alone nor chemical fertilizers can achieve the yield sustainability where nutrients turnover in soil plant system is high (such as in rice-wheat cropping system) [37] or when crops are grown in soils that are poor in organic matter and fertility status[38].

Integrated nutrient management and nutrient recycling through organic manure and crop residue management can enhance soil fertility and crop productivity, guard against emergence of multiple nutrient deficiencies and deterioration of soil health[39]. To make Integrated Plant Nutrient Management (IPNM) a reality, farming system approach, consisting of crop husbandry, animal husbandry, horticulture, fishery etc. has to be adopted which generate organic matter for composting, to be used for supplying plant nutrients[40].

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[36] Potassium Use in Bihar Agriculture, PPIC-IP Publication, 1993.

[37] Prasad, B. and Sinha, S.K. 2000. *Long-term Effects of Fertilizers and Organic Manures on Crop Yields, Nutrient Balance, and Soil Properties in Rice-Wheat Cropping System in Bihar*. Page 105-119 in Long-term Soil Fertility Experiments in Rice-Wheat Cropping Systems (Abrol, I.P., Bronson, K. F., Duxbury, J. M. and Gupta, R. K. eds.). Rice-Wheat Consortium Paper Series 6. New Delhi, India: Rice-Wheat Consortium for the Indo-Gangetic Plains

[38] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.

[39] Prasad, B. and Sinha, S.K. 2000. *Long-term Effects of Fertilizers and Organic Manures on Crop Yields, Nutrient Balance, and Soil Properties in Rice-Wheat Cropping System in Bihar*. Page 105-119 in Long-term Soil Fertility Experiments in Rice-Wheat Cropping Systems (Abrol, I.P., Bronson, K. F., Duxbury, J. M. and Gupta, R. K. eds.). Rice-Wheat Consortium Paper Series 6. New Delhi, India: Rice-Wheat Consortium for the Indo-Gangetic Plains

[40] *Annual Plan of Action under National Horticulture Mission*, 2005-2006.

Implications for EMF: Fertilizer consumption

The support provided through the BRLP to SHG members for agricultural activities will need to include components such as soil testing, technical support for Integrated Nutrient Management, and promotion of use of biofertilizers and organic manures.

2.1.4.2 Pesticide use[41]

Pesticide consumption in Bihar is about 2000 tonnes per year (1994-95). This accounts for less than 3.5% of the pesticide consumption in the country. While Bihar ranks 12th in pesticide consumption in the country, use of hazardous pesticides, non-adoption of safety measures and poor extension support make pesticide use an important issue[42].

Pesticide application in agricultural crops in the catchment area and use of DDT in disease control are the main source of pollution in Bihar's water bodies.

Pesticide residues in various animal products in Bihar are a cause of concern. About 19.2% of the bovine's milk tested in Bihar was contaminated with DDT. HCH concentration recorded in certain fish species from Sukhaldari dam of Garhwa district and from Cheriya Bariyarpur of Begusarai district is reported to be high enough to pose threat both to wildlife and human beings. Fishes of Sukhaldari dam, Baghar beel, Chandil reservoir, and Goga beel were also reported to be unsafe for public consumption due to lead contamination.

Implications for EMF: Pesticide use

- While consumption of pesticides in Bihar is less compared to many other states, the use of pesticides classified as hazardous without any technical support or adoption of safety measures is a cause of concern. Recognizing this, the BRLP must explicitly discourage use of chemical pesticides in classes Ia, Ib, and II of the WHO classification and promote the use of safer pest management methods such as integrated pest management (IPM) or non-chemical pest management (NPM).
- The promotion of IPM and NPM must be pursued vigorously in the catchment areas of wetlands that are exploited for fisheries and/or cultivation of aquaphytes such as Makhana and Singhara.
- The National Standards for Organic Farming (Annexure II) will provide a useful framework for development of the TEGs related to agricultue.

[41] ENVIS Centre, Salim Ali Centre for Ornithology, www.wetlandsofindia.org accessed in February 2007
[42] TEDDY 2002/03, The Energy Research Institute (TERI)

2.1.4.3 Inadequate extension support[43]

The existing Government structure for delivery of extension support to farmers involves staff at the state, district, block and village levels. As the following table indicates, the existing Government staff may not be adequate to provide extension services to all farmers.

S.No.	Level/location	No. of administrative units at different levels	Designation of the post	Total number of filled posts
1	State Headquarters		Director	1
			Jt. Director	1
			Dy. Director	3
			Asst. Director	1
			Asst. Research Officer	2
2	Division/Region	9	Jt. Director	7
			Dy. Director	8
			Asst. Director	1
3	District Headquarters	38	District Agricultural Officer	26
4	Sub-divisional Headquarters	125	Sub-divisional Agricultural Officer	35
5	Block	533	Block Agricultural Officer	120
			Asst. Agricultural Officer	
6	Gram Panchayat	8471	Village Level Worker	570
7	Village			

There is no mechanism for extension support at the village level. Hence, a need for training selected Community Resource Persons (CRPs) to provide extension support to farmers on sustainable agriculture practices is necessary.

The Department of Agriculture conducts trainings, demonstrations, field days, kisan melas and other extension mechanisms to reach farmers. It appears that most of these are not conducted and/or utilized to the optimum. The BRLP needs to coordinate with the

[43] *Support to State Extension Programme for Extension Reforms Revised State Extension Work Plan for the Year 2005 – 2006*. State Nodal Officer & Director, Project Planning and Monitoring, Department of Agriculture, Government of Bihar.

Department of Agriculture in order to ensure that the SHGs benefit from the available Government support for sustainable farming.

Every district also has a Krishi Vignan Kendra (KVK) that provides extension support to farmers through a variety of channels. The BRLP needs to coordinate with the KVK for ensuring that the SHGs receive adequate extension support.

Implications for EMF: Inadequate extension support

- Extension support to farmers is a key input for enhancing agricultural productivity. Considering the fact that the extension machinery of the Government will be inadequate to meet the needs of the poor farmers, the BRLP needs to focus on creating a cadre of para-professionals from within the existing Community Resource Persons (CRPs).
- Existing institutions such as the Krishi Vignan Kendras can be tapped for providing long-term training and monitoring support to the CRPs.
- A package of existing extension materials available from the Rajendra Agriculture University, Krishi Vignan Kendras, NGOs, etc., can be put together as an extension kit. This extension kit needs to be provided to all CRPs trained as para-professional agriculture workers. One example of such material is the Adhunik Kisan Dairy published annually by the Rajendra Agriculture University.
- Convergence with the Department of Agriculture is critical for BRLP to ensure that the benefits of the available schemes (training programmes, field demonstrations, subsidies on agricultural inputs, etc.), flow to the SHG members.

2.2 Water Resources

Bihar has 14 river basins namely (i) the Ghaghra, (ii) the Gandak, (iii) the Burhi Gandak, (iv) the Bagmati, (v) the Kamla-Balan, (vi) the Kosi, (vii) the Mahananda, (viii) the Karmnasa, (ix) the Sone, (x) the Punpun, (xi) the Kiul-horhar, (xii) the Badua, (xiii) the Chandan, and (xiv) the main Ganga stem. All these rivers drain into the main Ganga stem which divide the state into North and South parts. The seven river systems from Ghaghra to Mahananda drain North Bihar, and the remaining six river systems drain the South Bihar.

Most of rivers in Bihar are seasonal and carry insignificant flows in the rabi season and often dry up during summer when the scarcity of water is acute. In North Bihar Kosi, Gandak and Ghaghra with their catchments in the glacial regions have perennial flow. Mahananda, Kamla and Baghmati with their sources in the Himalayan region have much less flow during dry months. The characteristic of these rivers in that about 80 to 90 per cent of the annual run off takes place during the 4 months of monsoons, the rivers are largely dry during 8 months of the year[44].

2.2.1 Irrigation

Bihar ranks fifth among the major states in the percentage of land under irrigation. The gross cropped area of Bihar is estimated at 7946435 ha and out of it the total irrigated area is 4040706 ha (60.92 %). Of this, the tube well irrigated area is 2351439 ha accounting for nearly 29.59 per cent of the gross cropped area. The percentage of tube well irrigated area to the total irrigated area is about 48.58 per cent. Tube wells do not have a major share in irrigation as they irrigate only 30 per cent of the gross cropped area and less than 50 per cent of the total irrigated area. Canals are the major source of irrigation in the state. But poor maintenance of canal irrigation structure in the state has affected its proper functioning. Most of canal beds have silted, and this has restricted the water flow.

Table 10 : Crop-wise percentage of irrigated land in Bihar[45]

S.No.	*Crop*	*Area (M ha)*	*Irrigated area (%) (1996-97)*
1	Rice	5.2	40.80
2	Wheat	2.10	88.40
3	Coarse cereals	0.85	36.40
4	Maize (kharif)	0.69	42.80
5	Gram	0.13	3.2
6	Arhar	0.07	-
7	Mustard	0.10	36.9

[44] Ugra Mohan Jha, 2004, *Economics of Bamboo Boring: A study of the North-East Region of Bihar, Planning Commission*, Government of India

[45] *Agricultural Statistics at a Glance* 2000, Department of Agriculture, Ministry of Agriculture, Government of India

8	Sugarcane	0.11	25.4
9	Jute and Mesta	0.16	-
10	Potato	0.19	NA
11	Onion	0.02	NA
12	Tobacco	0.02	82.4

As seen in the above table, the irrigated area in Bihar for most crops (excepting wheat and tobacco) is less than 50% of the total cropped area.

Access to irrigation is limiting factor for agricultural production in the state. Investment in creating irrigation potential through shallow bore wells coupled with efficiency in water management is necessary to enhance agricultural productivity.

Efficient use of available water (both ground water and rain water) is important for enhancing agricultural productivity. One of the factors influencing the efficient use of water is the time of planting[46]:

- Rice transplanted during the last week of June (in Kharif 1999 and 2000) gave consistently highest average yield of 6.85 t/ha. A delay of two weeks and four weeks till resulted in yield reduction of about 10 per cent and 25 per cent, respectively. Late transplanting during the last week of August caused about 50 per cent reduction in rice yield.
- Delayed transplanting not only causes reduction in paddy yield, but also requires more irrigation from tube-wells and more expenditure on diesel. Timely transplanted rice requires less irrigation from tube-wells after transplanting, but requires 2-3 irrigations to rice nursery (which is only 1/10th of the transplanted area).
- Transplanting of rice during the end of June and in July utilizes between 95 and 65 per cent seasonal rainwater. Transplanting rice during August utilizes less than 50 per cent of the seasonal rainwater in crop production. Thus, late transplanting not only causes low yields, but also results in less utilization of seasonal rainwater in rice production.
- Sowing of wheat after mid-November yields maximum crop yield of 5.5 tons/ha. Delayed sowing in December reduces crop yields by up to 50 per cent.

Implications for EMF: Efficient irrigation

- The timing of planting is critical for efficient use of irrigation and rainwater. The provision of timely credit to enable procurement of agricultural inputs is thus important. It has implications for efficiency in water use and crop productivity.
- Extension support to farmers emphasizing the importance of timely planting and other agronomic practices has to be done alongside the micro-credit plan facilitation process by trained Community Resource Persons (CRPs).

[46] Singh S.R., et al. 2002. *Ground Water Development to Enhance Surface and Rain Water Utilization and Agricultural Productivity in Southern Bihar*, International Water Management Institute

2.2.2 Ground water

Bihar is well endowed with ground water resources. The main alluvial tract covers entire north Bihar and a sizeable area south of the Ganga River. These alluvial formations constitute prolific aquifers where the tube well can yield between 120-247m3/hr. The potential of these aquifers decreases due south in the marginal tract. Auto flow conditions occur in the sub-Tarai region of Madhubani, Sitamarhi and West Champaran districts. In these areas, bore wells located near lineaments/fractures can yield between 10-50m3/hr[47].

Table 11 : Status of Ground Water Resources in Bihar[48]	
Annual Replenishable Ground water Resource	29.19 BCM/Yr
Net Annual Ground Water Availability	27.42 BCM/Yr
Annual Ground Water Draft	10.77 BCM/Yr
Stage of Ground Water Development	39 %
Developmental Monitoring	
Over Exploited Basins	NIL
Critical Basins	NIL
Semi-critical Basins	NIL

As the Table 11 shows, the level of ground water exploitation in the districts of Gaya, Nalanda, Khagaria, Purnea and Madhubani is below 40%. Only Muzaffarpur has the stage of ground water exploitation at 57%.

Unlike in Western and Peninsular India, where the uncontrolled proliferation of tube wells and diesel pumps has led to severe groundwater depletion and related problems, groundwater development in Bihar could reportedly help to mitigate susceptibility to floods and water logging[49].

Tube wells can be deep (tapping aquifers more than 300 ft deep) or shallow (tapping aquifers less than 200 ft deep). Deep tube-wells are generally fitted with high power water lifting machines of more than 15 h. p. capacity. The shallow tube wells are generally fitted with small power water lifting machines of about 3 to 8 h. p. capacity. Deep tube wells are not suited to the majority of the farmers of Bihar, since most of them are poor and their holdings are very small and scattered[50]. Hence low cost pumping devices for tapping ground water become important. Bamboo boring and treadle pumps are two possible options.

Bamboo boring is a low cost device for exploiting ground water introduced by the farmers of Saharsa district of Bihar. It is popular among small and marginal cultivators of North-Eastern Bihar (Saharsa, Purnea, Khagaria, Madhepura, Supoul, Katihar and some

[47] Central Ground Water Board
[48] Central Ground Water Board
[49] IWMI, Pedaling out of Poverty: Social Impact of a Manual Irrigation Technology in South Asia, International Water Management Institute, www.iwmi.cgiar.org
[50] Ugra Mohan Jha, 2004, *Economics of Bamboo Boring: A study of the North-East Region of Bihar, Planning Commission*, Government of India

parts of Bhagalpur). Bamboo borings (or Bamboo tube wells) are essentially shallow tube wells drilled up to a depth of only 50 ft. to 80 ft[51].

Treadle pumps are low cost pumps that are operated manually. They can pump up water from up to 25 feet deep. They also encourage water use efficiency. Farmers are unlikely to use more water than necessary because of the physical labor involved, and many attempt to reduce the amount of pumping required by engaging in water saving practices such as field contouring. The treadle-pump farmer also has more control over the application of water, because the output rate is much slower than a diesel or electric pump. It also has the advantage of being environmentally 'clean' irrigation[52].

Implications for EMF: Ground water exploitation

- Demand for credit support for irrigation bore wells is likely to be limited in the BRLP as many of the SHG members are landless and are unlikely to invest on digging of bore wells on leased land. However, in cases where such demand does arise (SHG members who own some land), the implication on the local ground water resource is likely to be minimal in view of the copious ground water availability in the state.
- Promotion of bamboo tube wells may be promoted by the BRLP in areas where they have traditionally been popular.
- Adoption of treadle pump technology especially for vegetable cultivation may be supported through the BRLP.
- The creation of local enterprise (through training, capital investment, etc., to selected SHG members) providing repair and maintenance of structures such as bamboo tube wells and treadle pumps will help in sustaining the functionality of these devices as well as provide income generation opportunity.

[51] Ugra Mohan Jha, 2004, *Economics of Bamboo Boring: A study of the North-East Region of Bihar, Planning Commission*, Government of India

[52] IWMI, Pedaling out of Poverty: Social Impact of a Manual Irrigation Technology in South Asia, International Water Management Institute, www.iwmi.cgiar.org

Table 12 : Status of ground water resources in BRLP districts (Central Ground Water Board)						
Head	*Nalanda*	*Gaya*	*Purnea*	*Khagaria*	*Muzaffarpur*	*Madhubani*
Geographical Area	236700	497600	322900	148600	317200	340100
Population (in thousand)	1998	2665	1879	887	2954	2832
Net Area Swon (in ha)	177100	196600	204300	81700	207800	203200
Annual Rainfall (in mm.)	977.9	1092	1421.6	1169.6	1131.8	1350.8
Geological Formation	Marginal Alluvium/Pre-Cambrian Form	Marginal Alluvium/Pre-Cambrian Form	Quaternary Alluvium	Quaternary Alluvium	Quaternary Alluvium	Quaternary Alluvium
Pre-monsoon average depth to water level	3.62	6.07	4.08	5.82	4.31	3.64
Post-monsoon average depth to water level	1.57	3.05	2.84	2.74	2.05	1.91
Total ground water resources (ha meter)	64865	116187	120448	45530	99824	93940
Irrigation potential created as on 01.04.1998 (in ha)	48665	88708	41940	24265	67566	36652
Ultimate irrigation potential (in ha)	124054	222208	141758	53585	117485	110560
Balance irrigation potential to be created (in ha)	75389	133500	99818	29321	49919	73908
Stage of ground water development as on 01.04.1998	39.23	39.92	31.18	45.28	57.51	33.15

2.2.3 Issues

2.2.3.1 Floods

Bihar is the most flood affected state of the country, accounting around 17% of the flood prone area of the country. Out of 94.16 lakh ha of geographical area in the state, 68.80 lakh ha is flood prone. 30 out of 37 districts of Bihar are flood-prone[53].

The total flood prone area lying in North Bihar is estimated to be 37.53 lakh ha and that in South Bihar 31.27 lakh ha. Most of the river systems of North Bihar originate in Tibet and Nepal and hence they become international rivers. The catchment areas of the seven river systems of North Bihar vary from 2.3% to 79.9% within Bihar. Any rainfall occurring in Tibet and Nepal directly affects the flow in these river systems. Consequently, even if there is deficient rainfall in North Bihar, the flood devastation of the area takes place due to run-off originating from Tibet and Nepal. Thus the control of flood in North Bihar is possible only by controlling flows of the rivers in their upper catchments, which lay in Nepal. The six river systems draining the southern part of Bihar originate primarily from Indian territories in the State of Bihar, Jharkhand and Chhattishgarh. The catchment areas of six river systems draining southern Bihar range from 22.5% to 100% within Bihar[54].

Implications for EMF: Floods

The BRLP needs to focus on providing support to enable coping with floods. These may include modifications in contemporary agricultural practices. The recommended practices for making farming more resilient are[55]:

- Timeliness of sowing of crops should receive highest priority while planning for increased agricultural productivity. Thus timing of credit support in order to provide for agricultural inputs for sowing in time is necessary. Early nursery raising and transplanting of rice will help in early harvesting, thereby making the fields available for timely sowing of wheat/ maize, lentil and potato.
- Catch crops like Toria, green gram, black gram and also may go for increasing cropping intensity by taking intercrops with Maize, Sugarcane, Potatos etc.
- Lowering cost of cultivation by adopting resource conserving technologies viz. Zero tillage, reduced chemical inputs, etc.

[53] Water Resources Department, Government of Bihar http://wrd.bih.nic.in accessed in February 2007

[54] Dr. Mangala Rai, 2002, Strategies for Enhancing Agricultural Productivity and Production During Rabi Season to Mitigate the Adverse Effects of Drought and Floods During the Kharif Season in Bihar, Proceedings of the Meeting Held at Patna Under the Chairmanship of His Excellency, The Governor of Bihar on 10th Sept. 2002, Indian Council Of Agricultural Research, New Delhi

[55] Dr. Mangala Rai, 2002, Strategies for Enhancing Agricultural Productivity and Production During Rabi Season to Mitigate the Adverse Effects of Drought and Floods During the Kharif Season in Bihar, Proceedings of the Meeting Held at Patna Under the Chairmanship of His Excellency, The Governor of Bihar on 10th Sept. 2002, Indian Council Of Agricultural Research, New Delhi

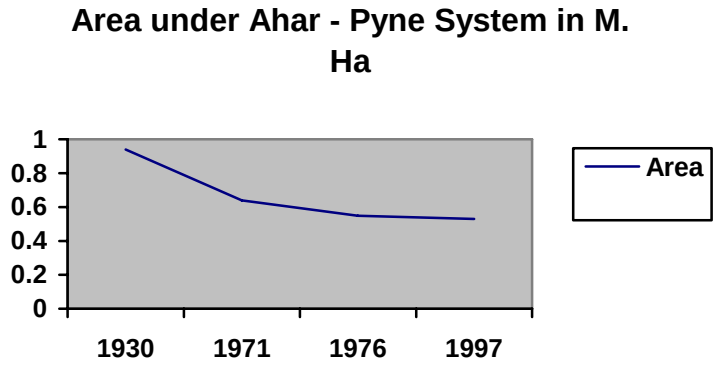
- Greater emphasis on cultivation of promising maize hybrids viz. Shaktiman -1 and Shaktiman –2 as they have high yield and better protein quality. Similar emphasis on promising varieties of wheat, chickpea, lentil, oilseeds etc (See Annexure 3).
- Boro rice cultivation where ever feasible should receive pin pointed attention.

A problem associated with the flooding of human habitations is the lack of safe drinking water (due to submergence or siltation of hand pumps). Temporary roof water harvesting structures may help to mitigate this problem. Training on the creation of these structures can be one of the areas that the Community Resource Persons focus on[56].

2.2.3.2 Decline of the traditional water harvesting system

Bihar has a rich traditional of community managed water harvesting systems that has been neglected in the past few decades. This system called as Ahar-Pyne is prominently developed in South Bihar which is characterized by scanty rainfall, rapid slope and dry or loose sandy soil that does not retain moisture. Ahars are formed by constructing a series of retaining embankments across the line of drainage. Pynes are long narrow artificial canals leading from the rivers. Water from the river is either directly transferred to the fields or impounded in Ahar. As the following table shows, the area under Ahars is reported to be declining over time[57].

Table 13 : Land area under Ahar-Pyne system in Bihar		
Year	Extent under the Ahar-Pyne system	Area
1930	0.94 million Ha	South Bihar
1971	0.64 million Ha	South Bihar
1976	0.55 million Ha	South Bihar
1997	0.53 million Ha	Whole of Bihar



[56] Eklavya Prasad, *Rain Water Harvesting in Flood Prone Bihar – A Case Study*, Megh Pyne Abhiyan
[57] Niranjan Pant, *Tanks in India: A Study of the Ahar-Pyne system in South Bihar*

The reasons behind the decline of the Ahar-Pyne system include lack of community involvement in maintenance due to changes in land tenure, the spread of tube well technology, poor integration of Medium Irrigation Projects, etc.

Implications for EMF: Traditional water harvesting

While handing back Ahars for community management is not a feasible option in view of the changed community structures, the revival of the Ahar-Pyne can be done by tapping from existing schemes like Swarna Jayanti Swarojgar Yojna. The possibility of the SHG federations taking up contracts from the Gram Panchyat for revival and maintenance of the Ahar-Pyne system could also be explored by the BRLP.

2.2.3.3 Chemical contamination of Ground Water

As the following table, shows certain districts in Bihar are affected by chemical contamination of ground water.

Table 14 : Ground Water Quality Problems in Bihar[58]	
Contaminants	Districts affected in parts
Salinity	Begusarai
Iron	Champaran, Muzaffarpur, Gaya, Munger, Deoghar, Madhubani, Patna, Palamau, Nalanda, Nawada, Banka
Fluoride	Giridih, Jammui, Dhanbad
Arsenic	Bhojpur and Patna

While the above table does not list a BRLP district as affected by Arsenic contamination. However, Khagaria has been identified as one of the districts affected by arsenic contamination[59].

Implications for EMF: Chemical contamination of ground water

- In all social infrastructure support activities that involve support for ground water extraction (bore wells, drinking water hand pumps, etc.) water testing prior to commencement of its use by the community is necessary.
- The use of community arsenic removal plants and domestic filters is to be explored in the risk-prone districts.

2.2.3.4 Water logging

In Bihar, nearly 9410 sq.km (10% of the geographical area of the State) is water logged[60]. Water logging refers to stagnation of water on the land surface or a situation where the

[58] Central Ground Water Board
[59] Chakraborti, D. et al. *Arsenic Groundwater Contamination in Middle Ganga Plain, Bihar, India: A Future Danger*, Environmental Health Perspectives, 2003, 111(9), 1194-1201.
[60] Water Resources Department, Government of Bihar http://wrd.bih.nic.in accessed in February 2007

water table is within 2 meters of the land surface or when there is an application of more than the required amount of water in the field with restricted drainage. Poor natural drainage, over flowing rivers and streams during the monsoon result in prolonged periods of water-logging in Bihar[61].

Bihar consists of large areas of Tal, Diara and Chaurs. Agricultural practices in these areas result in low yields, damaged crops, improper water management, high pest pressure, etc. The Tal area in Bihar extends from Fatuah to Lakhisarai over an area of about 1034 sq. km with a length of 105 km. The topography of tal area is such that rain water of 1150 sq miles area is accumulated and this accumulation goes up to a depth of 14 ft. Since the area is low lying and doesn't have drainage facilities, it remains inundated for 3 to 4 months in a year, for almost the entire kharif season. The Diara lands in Bihar constitute an area of 11.59 lakh hectare. The topography of this land is undulating with confused patterns of upland and low land. The Chaurs is a large tract of land in North Bihar which remains water logged for a variable period and represents a fragile and unstable eco-system. About 4 lakh hectares is chaur land with varying depths of water for varying periods of the year[62].

The water-logged areas are also affected with health hazards like Malaria, Kalazar, Elephantiasis etc. in human beings and liver-fluke disease in livestock[63].

Implications for EMF: Water logged areas

The following conservation measures and production systems[64] proposed for mitigating the impact of water logging needs to be supported through the BRLP:

A. Conservation measures:

1. Contour vegetative hedges
2. Repair of existing conservation/drainage measures
3. Contour cultivation on higher slope area
4. Shallow bore-well with pumping sets for encouraging vertical drainage
5. Percolation wells with pump sets
6. Deepening/renovation of village ponds
7. To develop water cavities/deepening of depressions for aquatic farming
8. Live-fencing

B. Production Systems:

[61] *Agricultural Statistics at a Glance* 2000, Department of Agriculture, Ministry of Agriculture, Government of India
[62] *Agricultural Statistics at a Glance* 2000, Department of Agriculture, Ministry of Agriculture, Government of India
[63] Planning Commission, 2001, *Report of The Working Group on Agricultural Development in Eastern & North Eastern India for the Formulation of the Tenth Five Year Plan*, Government of India
[64] Planning Commission, 2001, *Report of The Working Group on Agricultural Development in Eastern & North Eastern India for the Formulation of the Tenth Five Year Plan*, Government of India

1. Crop demonstrations
2. Agro-forestry, alley-cropping, boundary-plantation
3. Dry-land horticulture (hardy multipurpose species)
4. Organic farming systems
5. Over-seeding of grasses and legumes
6. Planting of shrubs
7. Planting of trees on rainfed lands, in low-lying areas with raised bunds
8. Fish culture
9. Makhana cultivation
10. Singhara cultivation
11. Homestead garden
12. Household biomass production/processing system for marginal and landless farmers

2.3 Fisheries

The Ganga river system is supposed to be home to some 269 fish species. However, human induced factors have resulted in sharp decline in certain fish varieties. According to one study, 21 species of fish from Indian waters, belonging to 4 family and 17 genera, are considered to be threatened or vulnerable, of which six species are from Bihar waters. A total of 27 fish species from Bihar, belonging to 12 family and 20 genera have been listed under the threatened, vulnerable and rare fish species category[65].

Bihar, according to the data of 1992-93, has 759 wetlands of the size 56.25 ha and above, covering an area of 1,776.83 sq km[66]. North Bihar criss-crossed by a large number of shifting rivers is known for its *chaurs* (land depressions), *mauns* (ox-bow lakes) and other wetlands. About 4.64% of total area of Madhubani district (16254 ha) is occupied by 84 freshwater wetlands[67]. These water bodies serve as the lifeline of the region by maintaining the ground water table and meeting the requirements of drinking and irrigation. These natural wetlands have great potential for development of fishery. Many of Bihar's wetlands are under private ownership.

Floodplain wetland resources of India[68]		
State	*Local name of wetlands*	*Area (ha)*
Assam	*Beel*	1,00,000
West Bengal	*Beel Charha & Baor*	42,500
Bihar	*Maun, Chaur & Dhar*	40,000
Manipur	*Pat*	16,500
Arunachal Pradesh	*Beel*	2,500
Tripura	*Beel*	500
Total		2,02,213

The wetland areas of North Bihar show some seasonal variation. While ponds, lakes and oxbow lakes do not show much variation, waterlogged areas show a reduction in the post-monsoon period. For example, in the district of Muzaffarpur:

[65] Prasad, P. S. *Status paper on endangered, vulnerable and rare fish species of Bihar*, Nature Conservators. pp. 25-29. 1994. www.csa.com assessed in January 2007.
[66] ENVIS Centre, Salim Ali Centre for Ornithology, www.wetlandsofindia.org
[67] Bazmi, S.H.; Shahabuddin, Md. *Biodiversity and wise-use of wetlands of Madhubani in Bihar*, Nature, Environment and Pollution Technology. Vol. 4, no. 4, pp. 507-514. Dec. 2005 www.csa.com assessed in January 2007.
[68] Sugunan, V. V. 1995a. Flood plain lakes - A fisheries perspective. In (ed.) Howes, J. R. *Conservation and Sustainable Use of Floodplain Wetlands*, Asian Wetlands Bureau, Kuala Lumpur.

Area in sq km			
Wetland class	Post-monsoon	Pre-monsoon	Variation
Ponds/lakes/oxbow lakes	21.49	15.60	5.89
Waterlogged	261.57	215.30	46.27
Total	283.06	230.90	52.16

2.3.1 Biodiversity of Bihar Wetlands[69]

The wetlands and rivers of Bihar are also home to a rich biodiversity. For example, Baghat Chaur said to be the largest wetland in Madhubani (area 2202 ha) attracts large number of migratory birds[70]. A study documented the presence of Gangetic river dolphins (*Platanista gangetica gangetica)* and several other species such as the Indian smooth-coated otter *Lutrogale perspicillata*, gharial *Gavialis gangeticus*, a variety of freshwater turtles, 135 water bird species, and 76 fish species in the Vikramshila Gangetic Dolphin Sanctuary, in the middle Ganges River in Bihar.

Plants
Cyperus spp. are the dominant emergents, besides *Eleocharis* spp. A few sites have only submerged and floating plants with open water. The common submerged plants found in almost all water bodies are *Hydrilla verticillata*, *Vallisneria spiralis* and floating plants *Eichhornia crassipes* and *Azolla pinnata*. Five endemic aquatic plants, each belonging to a separate family, occur in the undivided Bihar.

Table 15: Endemic aquatic plants recorded from undivided Bihar		
S. No.	*Species*	*Family*
1	*Hoppea dichotoma*	Gentianaceae
2	*Cryptocoryne spiralis*	Araceae
3	*Ischaemum nilagiricum*	Poaceae
4	*Lindernia estaminodiosa*	Scrophulariaceae
5	*Rotala illecebroides*	Lythraceae

Fishes
Nineteen species of Threatened fishes including five Endangered and 14 Vulnerable species were recorded from Bihar. There is no record of any Critically Endangered species in Bihar (Menon, 1999).

[69] ENVIS Centre, Salim Ali Centre for Ornithology, www.wetlandsofindia.org
[70] Bazmi, S.H.; Shahabuddin, Md. *Biodiversity and wise-use of wetlands of Madhubani in Bihar*, Nature, Environment and Pollution Technology. Vol. 4, no. 4, pp. 507-514. Dec. 2005 www.csa.com assessed in January 2007.

Table 16: Threatened freshwater fishes of Bihar		
S. No.	*Species*	*Status*
1	*Eutropiichthys vacha*	EN
2	*Chitala chitala*	EN
3	*Anguilla bengalensis*	EN
4	*Ompok bimaculatus*	EN
5	*Pseudeutropius atherinoides*	EN
6	*Rhinomugil corsula*	VU
7	*Puntius chola*	VU
8	*Puntius conchonius*	VU
9	*Osteobrama cotio*	VU
10	*Mystus vittatus*	VU
11	*Labeo dero*	VU
12	*Heteropneustes fossilis*	VU
13	*Cirrhinus reba*	VU
14	*Clarias batrachus*	VU
15	*Anabas testudineus*	VU
16	*Bagarius bagarius*	VU
17	*Barbodes sarana*	VU
18	*Barilius barila*	VU
19	*Catla catla*	VU
EN=Endangered; VU=Vulnerable		

Turtles

Fourteen species of turtles have been recorded from Bihar, out of which one is Critically Endangered, two are Endangered, six Vulnerable, three Near Threatened, and two Least Concerned.

Table 17 : Threatened freshwater turtles of Bihar				
S. No.	*Species*	*Status category*		
	IUCN listing	*CITES*	*Indian*	*WPA*
1	*Aspideretes gangeticus*	VU	-	I
2	*Aspideretes hurum*	VU	I	I
3	*Chitra indica*	EN	-	IV
4	*Geoclemys hamiltonii*	VU	I	I
5	*Hardella thurjii*	VU	I	I
6	*Kachuga dhongoka*	EN	-	-
7	*Kachuga kachuga*	CR	-	I
8	*Kachuga smithii*	LC	-	-

9	*Kachuga tecta*	NT	I	I
10	*Kachuga tentoria*	NT	-	-
11	*Lissemys punctata*	NT	II	I
12	*Morenia petersi*	VU	-	-
13	*Melanochelys tricarinata*	VU	I	IV
14	*Melanochelys trijufia*	LC	-	-
NT=Near Threatened; VU=Vulnerable; LC=Least concern; CR=Critical; EN=Endangered; WPA=Wildlife Protection Act				

Birds
Most of the wetland birds of Bihar are migratory. The widely distributed species are residents such as egrets and herons. The species important for conservation include: Three Threatened species, namely the Pallas's Fishing Eagle (at Goga heel), Lesser Kestrel (at Jagatpur lake) and Lesser Adjutant (in four wetlands) and, three Near Threatened species, namely the White Ibis (in four wetlands), Blacknecked Stork (at Baghar beel) and White-eyed Pochard (at Jagatpur lake)[71].

2.3.2 Issues

The wetlands of Bihar show the following trends[72]:

- Massive growth of aquatic macrophytes (submerged, floating, emergent) in most of the beels
- Inadequate population of plankton communities
- Dominance of mollusks at the benthic niche
- Greater dominance of forage fish and those of less economic value and relatively poor market acceptability (even to the tune of 70% at times)
- Sizeable presence of exotic species exerting pressure on the native species
- Water quality deterioration

These environmental stresses are the result of various activities that include[73]:

- Over-cultivation of marginal lands leading to excess silt load and turbidity
- Over- exploitation of resources
- Habitat degradation through change in fishing practices
- Introduction of exotic fishes
- Non compliance to environmental norms for short term gains
- Uncontrolled human settlement
- Dumping of wastes
- Pollutants

[71] ENVIS Centre, Salim Ali Centre for Ornithology, www.wetlandsofindia.org
[72] K.K.Vass, Sustainable Fisheries and Environmental Concerns of Floodplain Wetlands in India, National Research Centre on Coldwater Fisheries (ICAR)
[73] K.K.Vass, Sustainable Fisheries and Environmental Concerns of Floodplain Wetlands in India, National Research Centre on Coldwater Fisheries (ICAR)

Conservation of wetlands

The National Wetland Conservation Programme has identified the following wetlands in Bihar for conservation efforts:

- Kabar, Bihar
- Barilla, Bihar
- Kusheshwar Asthan, Bihar

Salim Ali Centre for Ornithology (SACON) has prioritized the wetlands in Bihar for conservation. The following table lists the wetlands and the rank given for indicating their status with respect to prioritizing them for conservation.

Table 18 : Prioritized list of wetlands for conservation in Bihar

S. No.	*Site*	*Rank*	*Use grade*
1	Goga beel	1	M
2	Jagatpur lake	1	L
3	Kharagpur jheel	1	H
4	Baghar beel	2	M
5	Cheriya Bariyarpur	DD	H
6	Barauni	DD	H
19	Fatua	DD	DD
20	Chandan	DD	DD
21	Hanumana	DD	DD
22	Indrapuri	DD	DD
23	Mora tal	DD	DD
24	Moti jheel	DD	DD
25	Mawda dam	DD	DD
26	Birpur-Sipaul- Kosi barrage	DD	DD
27	Kosi east & west	DD	DD
28	Kajra Ararja	DD	DD
29	Disha-Patha	DD	DD
30	Rajauli	DD	DD
31	Darong tal	DD	DD
32	Surya pokhar	DD	DD
33	Mehdar	DD	DD
34	Khemaith	DD	DD
35	Kesaria	DD	DD
36	Brahmaputra	DD	DD
37	Hardia	DD	DD
38	Bhimbandh	DD	DD
39	Kursela	DD	DD

40	Amarpur	DD	DD
L=Low; M=Medium; H=High; DD=Data deficient			

Fishing practices have an impact on the local biodiversity. For example, in wetlands the right of bird trapping is auctioned along with fish auction by the private land owners who own sizeable wetland areas[74]. Efforts are needed to control hunting, including by patrolling wetland protected areas and intercepting illegal hunters, and by monitoring and controlling the sale of water birds as food in markets, particularly in areas where large-scale hunting is a problem[75].

Overexploitation of fish is a common phenomenon and fishermen use a piscicidal plant extract, locally known as ziramai, for immobilization of fishes for easy catch[76]. Intensive uncontrolled fishing reduces future fish stocks and decreases food supply for piscivorous species (such as Pallas's Fish-eagle). Deliberate poisoning to kill fish destroys other aquatic fauna including birds. In the Vikramshila Gangetic Dolphin Sanctuary 43% of the fish species were caught exclusively in monofilament gill nets, a gear known to kill dolphins by entanglement[77].

[74] Bazmi, S.H.; Shahabuddin, Md. *Biodiversity and wise-use of wetlands of Madhubani in Bihar*, Nature, Environment and Pollution Technology. Vol. 4, no. 4, pp. 507-514. Dec. 2005 www.csa.com assessed in January 2007.

[75] North Indian Wetlands, Saving Asia's Threatened Birds, BirdLife International, www.birdlifeinternational.org accessed in February 2007

[76] Bazmi, S.H.; Shahabuddin, Md. *Biodiversity and wise-use of wetlands of Madhubani in Bihar*, Nature, Environment and Pollution Technology. Vol. 4, no. 4, pp. 507-514. Dec. 2005 www.csa.com assessed in January 2007.

[77] Choudhary S.K., Smith B.D., Dey S., Dey S. and Prakash S., 2005, *Conservation and biomonitoring in the Vikramshila Gangetic Dolphin Sanctuary, Bihar, India*, Vikramshila Biodiversity Research and Education Centre, T.M. Bhagalpur, University, Bhagalpur and Marine Program, Wildlife Conservation Society, New York

Implications for EMF: Fisheries

- Support for fishery activities in BRLP must include implementation of conservation measures such as preventing fishing in selected parts of wetlands, banning of fishing with chemicals and dynamite, fishing only during the permitted season, etc[78].
- In wetlands that have been identified as important for conservation (see above) extension support to ensure adoption of sustainable fishing practices by SHG members is necessary.
- Support for activities such as bird trapping or fishing by destructive means must not be provided.

2.3.3 Aquatic cultivation

The wetlands of North Bihar are ideal sites for cultivating gorgon nut, water chestnut and fodder plants[79].

2.3.3.1 Water chestnut (*singhara*) cultivation

A local water chestnut, called *singhara phal* (*Trapa natans* var. *bispinosa*), is one of the traditional water-crops of India. It is commercially cultivated for its edible fruits in ponds. It can be grown well in wastewater-fed water bodies and the plant is able to reduce organic load of the wastewater (*in-vitro*)[80].

Cultivation of singhara has an impact on the aquatic biodiversity. The plant forms extensive surface mats that reduce wetland productivity and inhibit feeding by water birds. It is planted during the Sarus Crane breeding season, causing disturbance and egg loss, and is harvested in winter, preventing non-breeding water birds from using the wetlands. In addition, large amounts of pesticide are sprayed directly into the wetlands to protect the crop. The cultivation of water chestnut should be strictly regulated, particularly at key wetlands for threatened birds, e.g. by establishing zones in large wetlands where its cultivation is prohibited[81].

[78] North Indian Wetlands, Saving Asia's Threatened Birds, BirdLife International, www.birdlifeinternational.org accessed in February 2007
[79] Vidyanath Jha, Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India Department of Botany C.M.Science College, Darbhanga.
[80] Ghosh S. K., *Traditional Commercial Practices in Sustainable Development and Conservation of Man and Wetlands,* Knowledge Marketplace Reports, The 3rd IUCN World Conservation Congress, Bangkok, 2004
[81] North Indian Wetlands, Saving Asia's Threatened Birds, BirdLife International, www.birdlifeinternational.org accessed in February 2007

2.3.3.2 Makhana cultivation

Euryale ferox (Makhana) is the foremost aquatic macrophyte grown as cash crop in the non-calcareous Kosi-Kamala belt[82]. This plant has become extinct in the temperate lakes of Kashmir and has become rare in Eurasia. It is also reportedly being lost from many parts of North Bihar as a result of siltation of water bodies following floods[83].

According to a report of State Fishery Department, Government of Bihar (1990–1991), *makhana* cultivation is being done in more than 96,000 ha of wetlands. *Makhana* supports a fully-fledged cottage industry, which provides subsistence to a great number of fishing communities (locally called *mallah*) in North Bihar[84]. Fish farmers of the *banpar* sub-caste are skilled in harvesting Makhana seeds from the pond bottom[85].

Makhana cultivation is preferred in shallower water bodies. Makhana ponds as well as weed infested chaur waters harbour a rich growth of air-breathing fishes like Singhi (*Heteropneustes fossilis*), Mangur (*Clarias batrachus*), Kawai (*Anabas testudineus*), Gainchi, etc. Deep ponds are either utilized exclusively for fish cultivation or at the most the outer peripheral portions with shallow water are put under Makhana cultivation. Such ponds could be put under integrated aquaculture with Makhana-cum-Fish cultivation. The fish varieties in this case need not be confined to the air-breathing Mangur, Singhi, Kawai, etc. only as applicable in the case of shallower ponds completely covered with the thick and leathery Makhana leaves. These leaves obstruct the water almost completely from coming in contact with the atmosphere[86]. By leaving sufficient open spaces in the middle of the ponds to will enable integrated aquaculture, Makhana ponds could also be used for rearing fishes as well as for nursery ponds during September to January, which is the intervening period between the two successive Makhana crops[87].

Makhana is also being grown under rotational cropping with arable lands like wheat and potato. This practice is getting popular in the flood ravaged Saharsa district which has a high water table and bamboo borings have made it possible to procure irrigation water at a relatively low cost[88].

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[82] Vidyanath Jha, Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India Department of Botany C.M.Science College, Darbhanga.

[83] Jha, V., Kargupta, A.N., Dutta, R.N., Jha, U.N., Mishra, R.K., *Utilization and Conservation of* Euryale ferox *in Mithila (North Bihar), India* Aquatic Botany AQBODS, Vol. 39, No. 3/4, p 295-314, March 1991. www.csa.com assessed in January 2007.

[84] Ghosh S. K., *Traditional Commercial Practices in Sustainable Development and Conservation of Man and Wetlands,* Knowledge Marketplace Reports, The 3rd IUCN World Conservation Congress, Bangkok, 2004

[85] Vidyanath Jha, Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India Department of Botany C.M.Science College, Darbhanga.

[86] www.makhanawet.com accessed in January 2007.

[87] Vidyanath Jha**,** 2002, *Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India*, Integrated Management of Water Quality and Quantity with Ecosystem Approach**,** accessed at http://wgbis.ces.iisc.ernet.in accessed in January 2007

[88] Vidyanath Jha, Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India Department of Botany C.M.Science College, Darbhanga.

Cultivation of Makhana is largely done using traditional methods. Some of the eco-friendly practices in Makhana cultivation are:

- There are no improved (hybrid) seed varieties of Makhana. Traditional varieties are used.
- There is no application of chemical fertilizer. *Makhana* ponds are said to have an indigenous fertility status as nothing except seed is taken out of the system. The organic matter remaining at the pond bottom mineralizes during next summer and is made available to the succeeding crop as good manure[89].
- Replanting of Makhana seed for even distribution in case the growth of plant is sparse or dense.
- Use of natural pest control methods such as application of ash, use of roping/ netting techniques so that the pests fall down from the Makhana leaves[90].

The productivity of the *Makhana* crop is affected by at least three major insect and two fungal diseases. Weeds and falling water levels are the other factors affecting the plant growth:

Factors adversely affecting the growth of Makhana Crop[91]			
(A) Infestation by insects & fungi			
Duration	Group	Scientific name	References
January - March	Aphid (Insect)	*Rhopalosiphum nymphaeae*	Mishra *et al.* (1992) Saraswati *et al.* (1990)
	Blight organism (Fungus)	*Alternaria alternata*	Haidar & Nath(1987) Dwivedi *et al.* (1995)
March-May	Leaf caseworm (Insect larvae)	*Nymphula* spp . *(=Elophila)*	Banerji (1972) Mishra *et al.* (1992)
	Root borers (Insect larvae)	*Donacia delesserti*	Mishra *et al.* (1992)
June-August	Leaf, petiole and fruit galls (Fungus)	*Doassansiopsis euryaleae*	Verma & Jha (1999)

[89] Vidyanath Jha**,** 2002, *Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India*, Integrated Management of Water Quality and Quantity with Ecosystem Approach**,** accessed at http://wgbis.ces.iisc.ernet.in accessed in January 2007

[90] Jha, T.N., 2005, Rigidities and Inefficiencies in Commodity Production: a Case of Makhana viewed at www.maithili.net in January 2007

[91] Vidyanath Jha**,** 2002, *Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India*, Integrated Management of Water Quality and Quantity with Ecosystem Approach**,** accessed at http://wgbis.ces.iisc.ernet.in accessed in January 2007

(B) Obstacle to crop growth by weeds / blooms at water surface			
	February - April	Lemnids	
	February - April	Algal blooms	
	Throughout the crop duration	Water hyacinth	
	Throughout the crop duration	*Monocharia* sp	
(C) Maintenance of water table			
	April - June	It becomes a limiting factor causing drying up of crops on periphery.	

High contents of residual pesticides have been found in seeds and other parts of Makhana and other aquatic plants. This is because of pesticidal inflows from nearby arable fields along with the rainwater. Their amounts are often higher then the FAO/WHO standards and may prove a deterrent to the export feasibility of these products (Rai et al. 2002)[92].

Processing of Makhana seeds is labour-intensive, time consuming and manual. Processing of it requires the following steps:

Sun drying and storage: Cleaned seeds are sun dried and stored for easy transportation and storage. It is necessary to sprinkle water at regular intervals during storage of seeds in order to keep them fresh. Popping of seeds and the quality of Makhana is very much dependent on its initial moisture content[93].

Drying and size grading: Seeds are spread on cemented or paved yard in sun to remove the free moisture. The moisture content of the seeds after sun drying is reduced to an extent of 25%. The dried nuts are hit by a wooden hammer. Easy separation of the kernel fragments confirms proper drying of the seeds. The sun dried seeds are then graded into 5 to 7 grades according to their sizes by means of a set of sieves. Grading of seeds facilitates the uniform heating of each seed during roasting[94].

Preheating and tempering: Sun dried seeds are generally heated in an earthen pitcher or cast iron pan and stirred continuously. The preheated seeds are then kept for tempering in basket at ambient conditions for 45-72 hours. Tempering of seeds facilitates the loosening of kernels within the hard seed coats[95].

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[92] Vidyanath Jha**,** 2002, *Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India*, Integrated Management of Water Quality and Quantity with Ecosystem Approach**,** accessed at http://wgbis.ces.iisc.ernet.in accessed in January 2007

[93] Export-Import Bank of India, 2005, *Export Potential of Makhana (Fox Nut)*, Agri-export Advantage, Vol IV, Issue I, www.eximbankagro.com accessed in January 2007.

[94] Export-Import Bank of India, 2005, *Export Potential of Makhana (Fox Nut)*, Agri-export Advantage, Vol IV, Issue I, www.eximbankagro.com accessed in January 2007.

[95] Export-Import Bank of India, 2005, *Export Potential of Makhana (Fox Nut)*, Agri-export Advantage, Vol IV, Issue I, www.eximbankagro.com accessed in January 2007.

Roasting and popping: Roasting and popping are the most important but laborious and painstaking operations. It involves working constantly before fire. Popping is the process of creating superheated vapour within the conditioned nut by heating the contained moisture and suddenly releasing the pressure to cause a volume expansion of the kernel. The roasted nuts, 5 to 7 in number, are scooped quickly by hand from the pan and kept on a hard surface and sudden impact force is applied on them by means of a wooden hammer. As the hard shell breaks, the kernel pops out in expanded form, which is called Makhana. The yield of Makhana is approximately one-third of the weight of its seeds[96]. The process of hammering the heated Guri is also hazardous and at the same time it leads to wastage/loss of Makhana pop, as seeds, if fallen out of the flat wooden platform become thurri or low quality *lawa/*pop[97]. A popping machine designed by the Central Food Technology Research Institute, Mysore reportedly could not find acceptability with the farmers. Another one designed at the post-harvest technology centre of the Indian Institute of Technology, Kharagpur is reportedly yet to be fabricated and tested at field level for its suitability[98].

Polishing, grading and packaging: Immediately after the popping, polishing is done by rubbing of Makhana in a basket made of bamboo splits to remove the red coloured layer. This rubbing operation provides more whiteness and luster to the pops. After polishing, Makhana is graded into 2-3 grades, depending on shape and size of pops. The graded Makhana is finally packed in polythene lined gunny bags[99].

Organizations that have technical expertise in Makhana cultivation are:

National Research Centre for Makhana
Darbhanga, Bihar

Mithila Samajik Evam Arthik Vikas Sansthan (MSEAVS)
Shekhar Sadan Balbhadrapur, Laheriasarai - 846001
Darbhanga, Bihar
Contact Tel.: 91 + 6272 + 220633

Implications for EMF: Aquatic cultivation

- In wetlands that have been prioritized for conservation, the cultivation of aquatic plants must be restricted to allow for some area to be undisturbed.
- Non-chemical pest and nutrient management and other practices that allow for the conservation value of the wetlands to be retained must be promoted.

[96] Export-Import Bank of India, 2005, *Export Potential of Makhana (Fox Nut)*, Agri-export Advantage, Vol IV, Issue I, www.eximbankagro.com accessed in January 2007.
[97] Jha, T.N., 2005, Rigidities and Inefficiencies in Commodity Production: a Case of Makhana viewed at www.maithili.net in January 2007
[98] Vidyanath Jha**,** 2002, *Sustainable Management of Biotic Resources in the Wetlands of North Bihar, India*, Integrated Management of Water Quality and Quantity with Ecosystem Approach**,** accessed at http://wgbis.ces.iisc.ernet.in accessed in January 2007
[99] Export-Import Bank of India, 2005, *Export Potential of Makhana (Fox Nut)*, Agri-export Advantage, Vol IV, Issue I, www.eximbankagro.com accessed in January 2007.

- Occupational hazards associated with Makhana harvesting and seed roasting and popping must be addressed by provision of appropriate safety gear.
- Extension support from available Government and non-governmental organizations must be made available to SHG members involved in aquatic cultivation.

2.4 Agarbatti

Agarbatti rolling is a popular cottage industry in South Bihar. The issues in agarbatti making relevant to the EMF are presented below:

2.4.1 Occupational Health

A study on women Muslim and Dalit agarbatti workers in select villages of Bodhgaya district found that almost in every household, girls below the age of 14 were making agarbattis. The study also reported that health examination of the agarbatti workers found incidence of Upper Respiratory Tract Infections, musculo-skeletal and lower abdomen pain. Among Muslims, prevailing norms of Purdah entail rolling agarbatti inside the house, thus also adding to their health problems[100].

A report[101] on the women agarbatti workers of Gujarat published by the Self Employed Women's Association (SEWA) says that agarbatti workers suffer from:

- Spinal pain, abdominal pain, pain in the hands and legs due to bending and rolling for 8-10 hours
- Damage the respiratory system and eyes due to fine dust
- Bruises on palms and skin damage due to the constant friction occurring during the rolling process

The report also states that in a survey of 825 agarbatti workers undertaken by SEWA in 1996, it was found that:

- 92% women complained of backache, pain in their hands and legs and abdominal pain, due to this work, 8% women also suffered from headache and throat problems.
- 47% women had to spend Rs. 50 to Rs. 100 per month on their health/medicines.

The report recommends that the agarbatti workers should be provided with better working tools including gloves, aprons and masks.

2.4.2 Over-exploitation of NTFP

Agarbatti manufacture involves the NTFP – bamboo and jigat. Jigat is the binding material that is derived from the glutinous bark of the trees *Machilus macrantha, Litsea glutinosa* and *Litsea monopetala*. All these three species are under stress of over exploitation in many parts of India. Other substitutes (like the Indian Gum Arabic

[100] Sabiha Hussain, *Work, Health and Family life: a Study of Muslim and Dalit Agarbatti Workers*, Centre for Women's Development Studies, accessed at http://www.cwds.org in January 2007
[101] Self Employed Women's Association (SEWA), 2000, *The Fragrance of Hard Work: Women Stick Incense Rollers of Gujarat*, access at http://www.seva.org in January 2007

produced from trees like *Acacia nilotica*) and boiled rice are also in use for inferior grade agarbattis[102].
The National Research Development Corporation reports that the Forest Research Institute has been able to find an agro-based biopolymer substitute for Jigat[103].

The Institute of Wood Science and Technology recommends scientific removal of bark for the conservation of *Machilus macrantha*. Scientific debarking involves leaving one or two strips of bark intact along the trunk of the tree and spraying the trees with insecticide/ fungicide mixture soon after debarking. This helps in the survival of the tree. This method is least damaging to living trees and leads to good regeneration of bark[104].

Implications for EMF: Agarbatti making

- Social forestry may be supported as a social infrastructure activity and can include species that are valuable for agarbatti making – bamboo, *Persea macrantha, Litsea glutinosa* and *Litsea monopetala.*
- As BRLP focuses on creation of livelihood opportunities for women involved in agarbatti rolling by going up the value chain – occupational health issues will need a thorough examination. For example, any common facility created for rolling Agarbattis must ensure provision of adequate space and ventilation, proper safety gear such as use of masks while rolling, use of gloves while sticking adhesive on wrapping paper, etc., need consideration.

[102] Rath B., *The Endangered Bark* in Donoghue, E. M.; Benson, G. L.; Chamberlain, J.L., tech. coords. 2004. Sustainable production of wood and non-wood forest products: Proceedings of IUFRO Division 5 Research Groups 5.11 and 5.12, Rotorua, New Zealand, March 11–15, 2003. General Technical Report PNW-GTR-604. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 120 p.
[103] National Research Development Corporation, www.ndrcindia.com, accessed in January 2007
[104] Institute of Wood Science and Technology, www.iwst.res.in, accessed in January 2007

2.5 Bee Keeping

About 85% crop plants are cross pollinated. One of the most important such external agent for pollination is the honey bees. When the crop is in flowering stage, these pollinators help in early setting of seeds resulting in early and more uniform crop yield. For certain crops of economic importance such as mango, mustard, sunflower, cotton, etc. honey bee pollination is especially beneficial. The increase in yield of various crops due to pollination by honey bees ranges from 20% to 10%[105].

Two species of honey bees, viz. Asian hive bee (*Apis cerana* F.) and European honey bee (*Apis mellifera* L.) are utilized for pollination of crops due to two main reasons: (1) these honey bees can be kept and managed in artificial wooden boxes (hives), that can easily be transported from one place to the other; and (2) their population can easily be manipulated depending upon the pollination requirements of the given crop area. However, bee-keeping as an input in agriculture has not yet been fully recognized[106].

2.5.1 Biodiversity concerns

Beekeeping is often involved in environmental concerns. The bee is an introduced insect and can compete with and adversely influence wild insect populations that eat nectar and pollen. In addition, the honey bee also is undoubtedly involved with the health and propagation of introduced weeds[107].

Apis cerana is a species naturally occurring in India. However this bee is not always welcomed by commercial beekeepers and farmers, because of its lower honey yield and more difficult behaviour. Survival of this native species is threatened by *Apis mellifera*, which is being introduced on a large scale. But *Apis cerana* offers potential benefits that are still not always recognized by farmers and development workers[108].

The introduction of exotic *Apis mellifera* has led to the native bee populations being affected by the Thai Sac Brood Virus (TSBV), European Foul Brood (EFB) and Acarine diseases. Beekeeping is generally understood by development workers in the perspective of honey production. This results in more focus on *Apis mellifera* promotion. The role of honey bees in conserving biodiversity and increasing farm productivity also needs to be recognized. *Apis cerana* and other indigenous honeybees are important in view of these considerations.

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[105] Madhya Pradesh State Agroindustries Development Corporation**,** Development of Beekeeping - A Proven Technique To Improve Crop Productivity, http://mpstateagro.nic.in , accessed in January 2007

[106] Sihag, R.C. *Why should bee-keeping be utilized as an input in agriculture?* Current Science, Vol. 81, No. 12, 25 December 2001

[107] http://apis.ifas.ufl.edu/index.htm access in January 2007

[108] *ICIMOD,* Indigenous Honeybees of the Himalayas – A Community-based Approach to Conserving Biodiversity and Increasing Farm Productivity, *http://bees4livelihood.icimod.org accessed in January 2007*

Table 19 : Comparative advantages of *Apis cerana* beekeeping over *Apis mellifera*		
Parameters	*Apis cerana* (Native bee)	*Apis mellifera* (Exotic bee)
Initial investment	Very low	High
Colony management costs	Negligible	High
Risk involved	Low	High
Potential of stationary beekeeping	Highly suitable	Not suitable
Scale of beekeeping	Profitable even when operated at a small scale. It is most suitable for poor beekeepers operating in remote areas	Profitable only when operated at commercial scale. It is most appropriate for commercial farmers from accessible areas
Pollination of early flowering crops	More efficient	Less suitable, colony strength is low during early in the season
Indigenous knowledge	Exists	Nil
Susceptibility to mites and predators	Resistant	Susceptible
Eco-services	High	Low

Note: In its original context, this table focused on the context of mountain areas[109].

Implications for EMF: Bee keeping

- Livelihood interventions in BRLP focusing on agriculture may consider promoting bee keeping as an complementary activity.
- Where feasible, *Apis cerena* may be promoted.
- Training support for SHG members involved in bee keeping may be taken from the following training centres accredited by the Commissioner for Khadi and Village Industries Commission: Bee Keeping Extension Centre, Zilla K. G. Sangh, Sarvodayagram, Muzaffarpur-842002 (Bihar); Bee Keeping Extension Centre, Khadi & Village Industries Commission, Mehsi, Maruabad, Mehsi, East Champaran-845426 (Bihar)

[109] *Ahmad, F. Partap, U. Joshi, S. R. Gurung, B. M. ICIMOD,* Retreating Native Bee, *Apis cerana* Populations and Livelihoods of Himalayan Farmers, *http://bees4livelihood.icimod.org accessed in January 2007*

3. Legal and regulatory framework relevant to the BRLP

This section presents a brief listing of the various Acts, Rules and Policies of the Government of India, Bihar as well as the safe guard Policies of the World Bank. The alignment of the proposed BRLP livelihood interventions with respect to these is examined.

Table 20 : Legal and regulatory framework

Act, Policy or Government Order	*Relevant to BRLP*	*Status (Applicability of regulation to project activity; Triggering of policy by project activity; Consistency of project activity with policy)*
Regulations of the Government of India		
Environment (Protection) Act, 1986 and EIA notification, 2006	Emission or discharge of pollutants beyond the specified standards is not permissible. Environmental impact assessment (EIA) is required for specified categories of industry.	Emission standards applicable for stone crushing units, brick kilns, dairy units and any such activities that may be supported through the BRLP. EIA notification not applicable due to the scale (e.g. mining on land ≥ 5 ha) and nature (e.g. thermal power plants) of activities to be supported through the BRLP.
Wildlife (Protection) Act, 1972	Destruction, exploitation or removal of any wild life including forest produce from a sanctuary or the destruction or diversification of habitat of any wild animal, or the diversion, stoppage or enhancement of the flow of water into or outside the sanctuary is prohibited without a permit granted by the Chief Wildlife Warden. Two of the BRLP districts – Gaya and Nalanda have protected areas. The Gautam Buddha Wild Life Sanctuary is spread over about 259 sq. km in Gaya while the Rajgir Wild Life Sanctuary is spread over about 35 sq. km. in Nalanda.	Applicable

Forest (Conservation) Act, 1980	The BRLP is unlikely to involve diversion of forest land for non-forest purposes. However, while supporting activities related to mining (stone quarrying) or brick making, it is necessary to ensure that the land is not forest land.	Applicable
Insecticides Act, 1968	A licence is required for the sale, stock or exhibition for sale or distribution of any insecticide. The use of certain insecticides are prohibited or restricted under this Act[110].	Applicable (SHG federations could take up collective procurement of agricultural inputs for distribution to members)
The Fertilizer (Control) Order, 1985	Registration is required for selling fertilizer at any place as wholesale dealer or retail dealer.	Applicable (SHG federations could take up collective procurement of agricultural inputs for distribution to members)
The Seed Act, 1966	Selling, bartering or otherwise supplying any seed of any notified kind or variety, requires that - a) such seed is identifiable as to its kind or variety; b) such seed conforms to the minimum limits of germination and purity specified c) the container of such seed bears in the prescribed manner, the mark or label containing the correct particulars	Applicable (SHG federations could take up collective procurement of agricultural inputs for distribution to members)
Indian Forest (Bihar Amendment) Act, 1989	Forest land is any area recorded as forest in the Government records, irrespective of ownership. Forest produce includes the following whether found in, or brought from a forest: timber, charcoal, caouthouc, catechu, wood-oil, resin, natural varnish, bark, lac, mahua flowers, mahua seeds, kuthi and myrabolams. It also includes all trees and leaves, flowers and fruits, and all other parts or produce of trees; plants that are not trees (including grass, creepers, reeds and moss)	Applicable

[110] See Annexure 4

	and all parts or produce of such plants; palms, bamboos, stumps, brush-wood and canes; wild animals and all parts and produce of animals; peat, surface soil, rock and minerals (including limestone, laterite, mineral oils, and all products of mines or quarries). Articles prepared from bamboo chips are not forest produce. Veneer is a forest produce. Quicklime is a forest produce. Cane baskets prepared from cane trees growing in forests is also forest produce. The following acts are prohibited in reserved and protected forests: Clearing, kindling fire, trespassing cattle, damaging trees (feeling, girdling, lopping, topping, burning, stripping bark and leaves), quarrying stone, burning lime or charcoal, collecting any forest produce, clearing or breaking land for cultivation, hunting, shooting, fishing, poisoning water, setting traps or snares, etc.	
Safe Guard Policies of the World Bank		
Environmental Assessment (OP 4.01)	The Bank requires environmental assessment (EA) of projects proposed for Bank financing to ensure that they are environmentally sound and sustainable, and thus to improve decision making.	Triggered
Natural Habitats (OP 4.04)	The Bank does not support projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats. The districts of Gaya and Nalanda (that are in the BRLP project area) include Wild Life Sanctuaries may be considered critical natural habitats.	Triggered (as Gaya and Nalanda districts have Wild Life Sanctuaries that are important areas for biodiversity conservation and future expansion of BRLP in these districts may involve areas that have close proximity to the sanctuaries)

Pest Management (OP 4.09)	In Bank-financed agriculture operations, pest populations are normally controlled through integrated pest management approaches, such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest. The Bank does not finance formulated products that fall in WHO classes IA and IB, or formulations of products in Class II[111], if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.	Triggered (as the agriculture related sub-sector interventions supported through the project will involve input support for pesticides)
Cultural Property (OP 4.11)	The Bank does not finance projects that will significantly damage non-replicable cultural property, and will assist only those projects that are sited or designed so as to prevent such damage. The project areas do not involve sites having archeological (prehistoric), paleontological, historical, religious, and unique natural values.	Not triggered (considering the nature of the activities presently foreseen to be undertaken in the BRLP – none involve excavation or construction activities at culturally significant sites)

[111] See Annexure 5

Indigenous Peoples (OD 4.20)	The objective at the centre of this directive is to ensure that indigenous peoples do not suffer adverse effects during the development process, particularly from Bank-financed projects, and that they receive culturally compatible social and economic benefits. For an investment project that affects indigenous peoples, the borrower should prepare an indigenous peoples development plan that is consistent with the Bank's policy. Any project that affects indigenous peoples is expected to include components or provisions that incorporate such a plan.	Not Triggered (as the project does not affect indigenous peoples)
Involuntary Resettlement (OD 4.30)	The objective of the Bank's resettlement policy is to ensure that the population displaced by a project receives benefits from it. There is no likelihood of any displacement happening as part of the project activities.	Not Triggered (as the project is not likely to cause any displacement)
Forestry (OP 4.36)	The Bank distinguishes investment projects that are exclusively environmentally protective (e.g., management of protected areas or reforestation of degraded watersheds) or supportive of small farmers (e.g., farm and community forestry) from all other forestry operations. Projects in this limited group may be appraised on the basis of their own social, economic, and environmental merits. The Bank finances plantations only on non forested areas (including previously planted areas) or on heavily degraded forestland.	Not Triggered (the project districts have very small area of land under forest and the EMF is designed to preclude activities on forest lands)
Safety of Dams (OP 4.37)	Construction of any dams may not be part of the project. Small dams are normally less than 15 meters in height. This category includes farm ponds, local silt	Not Triggered (as no dam construction is planned to be taken up as part of the BRLP activities, any construction of small embankments will include

	retention dams, and low embankment tanks. For small dams, generic dam safety measures designed by qualified engineers are adequate.	technical inputs of qualified engineers)
Projects on International Waterways (OP 7.50)	International waterways are not part of the project area.	Not Triggered (as no international waterways are part of the project area)
Projects in Disputed Areas (OP 7.60)	Disputed areas are not part of the project area.	Not Triggered (as no disputed areas are part of the porject area)
Regulations of the Government of Bihar		
Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Any user of ground water desiring to sink a well either on personal or community basis in the notified area (not specified so far), needs to apply to the Ground Water Authority for grant of a permit. This is not applicable in the case of wells that are fitted with hand operated pumps or water is proposed to be withdrawn by manual devices. Existing users of ground water are also required to register themselves with the Ground Water Authority.	Applicable to all credit support given to digging of tube wells. Not applicable in the case of hand pumps and treadle pumps.
The Bihar Fish Jalkar Management Bill, 2006	Fishing in rivers is prohibited from 15th June to 15th August Fishing net or Gill net with less than 4 cm mesh size shall be prohibited in rivers Fishing of fingerlings of culturable fishes of any species shall be prohibited in rivers and reservoirs Use of dynamite or explosives, poison and poisonous chemicals for fishing shall be prohibited. Drawing of water from tanks, reservoirs and mauns for irrigation shall be prohibited. The District Fisheries Officer may order for drawing of water for irrigation when the water level is averages a minimum of five feet in these Jalkars. Intentional water pollution, encroachment in Jalkars	Applicable to all credit support given to fishery activities.

	and disfiguration of the structure of Jalkars is prohibited.	
Bihar Irrigation Act, 1997	No well exclusively for domestic use, either on personal or community basis can be excavated within the distance specified by the State Government from time to time from the boundaries of an irrigation work without previous sanction by the State Government. No person has the right to fish or ply any vessel in a reservoir, pond or tank or along a canal or channel maintained or controlled by the Government without written permission of the State Government. No person can extract water for any purpose by the installation of pump sets or any other electrical or mechanical devices for pumping water from an irrigation work except with the permission of the Divisional Canal Officer. No person shall deposit any produce of mines or earth or any other material in or near any channel or field drain or other work, whether natural or artificial through which rain or other water flows into any irrigation work. No person shall pollute, or discharge sewage effluent or trade effluent in the water of any irrigation work which may cause injury to the irrigation work or may deteriorate the quality of water of the irrigation work or may give rise to any growth of weeds in the irrigation work.	Applicable to all credit support provided to agricultural activities and others such as stone cutting, brick making, jute processing, etc.
The Bihar Restoration and Improvement of Degraded Forest Land Taxation Act, 1992	The State Government has the power to levy, assess and collect a tax called the Bihar Restoration and Improvement of Degraded Forest Land Tax for reclamation and rehabilitation of forest land from the	

	user using forest land for non-forest purpose or indulging in developmental activities including mining.	
The Bihar Forest Produce (Regulation of Trade) Act, 1984	The purchase, transport, import or export of specified forest produce in a notified area can only be done by the Government or by an appointed agent. The primary collector of a specified produce may transport his specified forest produce[112] within the unit. Retail sale of a specified forest produce is permitted only under a license. Eucalyptus trees grown on land owned by farmers is not considered forest produce.	Applicable to all activities involving forest produce supported by the BRLP.
Bihar Rules for the Establishment of Saw Pits and Establishment and Regulation of Depots, 1983	Permission from the Divisional Forest Officer is required for establishing, maintaining or running a saw pit or depot. These rules are applicable in the BRLP districts of Gaya, Nalanda, Purnea. Saw pit means machine operated saws meant to cut, fashion or saw timber or poles. Depot is a place where timber more than 100 cft in quantity and poles more than 50 in number are stored.	Applicable to all saw mills and saw pits supported under the BRLP.
Bihar Saw Mills (Regulation) Act, 1990 Bihar Saw Mill (Regulation) (Amendment) Act, 2002	No person shall establish, operate a saw mill or saw pit except under license. Saw mill refers to sawing with the aid of electrical mechanical power. It also includes veneer plywood manufacturing units. Saw pit refers to the use of manually operated saws. No saw mill can exist within 15 km from a notified forest area.	Applicable to all saw mills and saw pits supported under the BRLP including plywood manufacturing units.
Bihar Kendu Leaves	No person other than the Government or an appointed	Applicable to all activities involving collection,

[112] See Annexure 6

(Control of Trade) Act, 1973	agent can purchase or transport kendu leaves.	storage and sale of kendu leaves supported by the BRLP.

4. Technical Environmental Guidelines

The Technical Environmental Guidelines (TEGs) are developed based on the environmental issues outlined in Chapter 3 and the regulatory requirements outlined in Chapter 4.

As per the Terms of Reference given for this assignement, the TEGs were to be developed for the following activities:

Dairy
Psiciculture
Vegetable cultivation, Sugarcane cultivation, Banana cultivation, Litchi cultivation
Makhana cultivation
Agriculture
Leather works
Weaving
Jute production
Incense stick making
Brick kilns
Madhubani paintings
Poultry
Medicinal plants cultivation
Use of chemicals in tiny and house hold industries

During discussion with the BRLPS team and the World Bank representatives during the assignment, it was suggested that TEGs be developed for the key livelihood interventions identified in the 'Livelihoods Study and Value Chain Analysis' document provided by the BRLPS. These are (district-wise):

Gaya	*Nalanda*	*Purnea*	*Madhubani*	*Muzaffarpur*	*Khagaria*
Paddy Cultivation Dairy Incense stick making	Paddy cultivation Vegetable cultivation Dairying	Banana cultivation Jute cultivation Winter paddy cultivation Cultivation and processing of aromatic plants (mentha, lemon grass)	Dairying Fisheries Vegetable cultivation Fruits cultivation (Makhana, Mango) Paddy cultivation	Dairying Fisheries Vegetable cultivation Fruits cultivation (Litchis, Mango) Maize Bee Keeping	Maize cultivation Dairy Fisheries

The TEGs are of three types:

Screening TEG: This consists of two sections: Section A – Non-permissible activities and Section B – Screening for deciding the level of environmental assessment

Generic TEG: These are generic in nature and are to be used for conducting the environmental assessment of any activity that does not have a Specific TEG

Specific TEGs: These are specific to the nature of the activity being undertaken and have been developed for all the activities listed above
Each Specific TEG is presented in two parts:

- Backend Reference Document: This is for the use by the BRLP functionaries and community institution federation members and provides an outline of the issues, technical and management guidelines for action.
- Frontend Document: This is for use with the SHG members, Commodity or Producer Groups during the discussions that precede an application for credit support. It is to be annexed to any such application form (sub-project proposal, micro-credit plan or livelihood enhancement plan) for further action.

4.1 Screening TEG – Section A – Non-permissible Activities

Assessment

Any activity that does not go through environmental assessment is not permissible.

Pesticides

Activity involving use of pesticides of classes Ia, Ib and II (as per the WHO classification) is not permissible.

Activity involving procurement and/or distribution of pesticides and chemical fertilizers for which the requisite permission has not been taken.

Irrigation

Any embankment that exceeds 5 mts in height is not permissible. Any embankment that is not designed by a qualified engineer is not permissible.

Any irirgation tube well dug without permission from the designated authority is not permissible.

Do not support any irrigation tubewell that is within a distance of 250 metres from the nearest tubewell.

Forest produce

Do not support the setting up of saw mills or any other timber processing mills without the permission of the Forest Department.

Brick-making activity involving extraction of soil from productive agricultural lands and extraction of soil and/or fuel wood from protected forests (wild life sanctuaries, protected wetlands, etc.).

Except for plantations raised for the purpose of providing timber and fuelwood, do not support any sub-project that involves felling of trees.

Any activity that involves extraction of non-timber forest produce (bark, gum, seeds, etc.) and making of charcoal, lime, etc., without permission from the forest department.

Do not support any activities that involves destruction, exploitation of wildlife (including wild birds at wetland sites).

Do not support grazing in a wild life sanctuary.

4.2 Screening TEG – Section B – Screening for deciding the level of environmental assessment

Name of the level	**E1**	**E2**	**E3**
Type of sub-projects requiring this level of assessment	One kind of sub-projects fall in the E1 category: All sub-projects that are likely to have only short term negative or positive environmental impact and that are taken up at the SHG level (by individual SHGs or Producers' Groups): Agriculture Horticulture Animal husbandry Makhana Bee Keeping Agarbatti making Non-farm sector interventions	Two kinds of sub-projects fall in the E2 category: All sub-projects that are likely to have long term negative environmental impacts and that are taken up at the SHG level (by individual SHGs or Producers' Groups): Brick kiln Tube well All E1 sub-projects operating at the level of a cluster or block (for checking the cumulative impacts)	Two kinds of sub-projects fall in the E3 category: All sub-projects that are likely to have significant negative environmental impacts that require specific technical inputs for mitigation: Bulk milk cooling centre All E2 sub-projects operating at the level of a district (for checking cumulative impacts)
Assessment to be done by whom?	Community Coordinator	Cluster Level Support Unit / Cluster Resource Team / Block Resource Team	External Agency identified in consultation with the State Level Environment Resource Agency

4.3 Generic TEG

(To be used only if a Specific TEG is not available for the activity)

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

	Information required on	*Record observations here*
1. Natural resources to be used in the activity	What natural resources will be used for the activity (e.g., soil, tree products, ground water, fuel wood, etc.)?	
2. What natural resources will be impacted by the activity?	What natural resources will be impacted (e.g., soil, water, fodder, etc.)? Will the available natural resources be able to support the porposed activity?	
3. What is the type of impact on the natural resources?	Is the impact on natural resources positive (e.g., any protection, conservation, or enhancement of the natural resource)? Is the impact on natural resources negative (e.g., any degradation, overexploitation or pollution of the natural resource)? Is the impact long-term or short-term?	
4. If the impact is positive, what can be done to	What activities or practices should be stressed to ensure	

enhance it?	positive impacts?	
5. If the impact is negative, what can be done to remove or reduce it?	What environment friendly alternatives exisit to the proposed activity? What activities or practices should be stressed to remove or reduce negative impacts?	
6. Is there a need for training to help manage the impacts?	What is the training required on? Where is it available? By when is the training needed?	
7. Is any other support needed to help manage the impacts?		

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.4 Specific TEGs - Gaya

Key features of the district relevant to the EMF

- Annual average rainfall is 944 mm (less than state average)
- Seasonal rivers and flash floods
- Land with significant slope
- Predominantly agricultural with 70% households owning less than 1 ha of land
- Low agricultural productivity (less than state average)
- Low use of chemical fertilizers (less than state average)
- Irrigation mostly through tube wells, followed by open wells, rivers, and canals
- 75% gross irrigated area (more than twice state average)
- Stage of ground water development is more than 40%

Key livelihoods selected through the Livelihoods Study and Value Chain Analysis study:

- Paddy Cultivation
- Dairy
- Incense stick making

4.4.1 SPECIFIC TEG: GAYA: PADDY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA to identify suitable irrigation schedule and provide training on farm-level water conservation measures
		Gaya is one of eight South Bihar districts selected for Watershed Development under which rainfed areas are to be treated. Coordination for utilization of this scheme is necessary.
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application	Training of CRPs in recommending efficient fertilizer scheduling and application based on results of soil testing
Use of hazardous chemical pesticides (impact on human and environmental health) such as Folidol (Class Ia), Methyl Parathion (Class Ia), Quinolphos (Class II), Endosulphan (Class II), Monocrotophos (Class IB), Thimate (Class Ia)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable IPM package using non-hazardous pesticides Training of CRPs in identifying common pests and IPM package required
	Use of recommended safety	Training of CRPs in

	measures and gear while using pesticides	building awareness on safety issues in pesticide use
	Use of efficient spraying equipment to prevent wastage and contamination	Procurement and provision of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: GAYA: PADDY: FRONTEND DOCUMENT

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Paddy Cultivation

I/We are planning to do paddy cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in paddy cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plan to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in paddy cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.4.2 SPECIFIC TEG: GAYA: DAIRY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Fodder scarcity (poor animal nutrition and productivity, over extraction of local fodder resources)	Adoption for fodder cutting through use of chaff cutter	Procurement and provision of chaff cutting equipment through the village level SHG federation for hiring to SHG members at subsidized rates
	Cultivation of green fodder crops and trees	Training on fodder cultivation in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Urea treatment of cereal straws for improving nutrient content	Training on urea treatment of cereal straws in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra
	Practice of rotational grazing	Sensitization to village federation members on need to devise and monitor adoption of norms for rotational grazing
	Harvesting of available green fodder from field bunds, harvesting weeds, etc. to augment green fodder availability to animals	Coordination with Department of Animal Husbandry for any technical guidelines in harvesting and use of weed species as fodder
Use of dung as fuel (loss of valuable crop nutrients)	Adoption of efficient method of composting (preferably pit method with moisture maintenance, turning over, etc. or more sophisticated methods such as vermicomposting)	Training on efficient compost preparation (including vermicomposting) in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Promotion of fuel wood plantations, fuel efficient cooking devices	Coordination with Bihar Renewable Energy Development Agency (BREDA) for implementation of relevant schemes
Poor arrangements for shelter for the animal (poor	Shelter with adequate space and ventilation, with	Training on urea treatment of fodder in coordination

ventilation, poor sanitation and impact on both animal and human health)	adequate distance from living quarters	with the Department of Animal Husbandry and Krishi Vignan Kendra

SPECIFIC TEG: GAYA: DAIRY: FRONTEND DOCUMENT

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Dairy

I/We are planning to procure _____ number of animals of _____ breed

For management of fodder for the animals:

- ☐ I/We have access to green fodder resources in the form of _____ in the seasons _____
- ☐ _____ has provided us with information on fodder crops and trees that can be cultivated as I/we plan to cultivate _____ fodder varieties on _____ amount of land
- ☐ _____ has provided us with information on the benefits of fodder chopping and I/we plan to use _____ for cutting fodder
- ☐ _____ has provided us with information on the procedure of treating cereal straw with urea on _____
- ☐ During the summer and in the event of any flooding during the monsoon I propose to meet fodder requirement by _____
- ☐ I/We wish to receive further information on fodder management from _____ and request the federation to arrange for the same by the date _____

For management of animal shelter and compost:

- ☐ I/We have already got an animal shelter with the dimensions of _____ that will house a total of ____ animals including the one/s that are to be procured now
- ☐ _____ has provided us with information on management of the livestock shed (ventilation, space requirement per animal, provision of food and water troughs, collection of dung and urine, efficient composting methods, etc.)
- ☐ The animal dung will be used for the following purposes:
  _____

☐ I/We wish to receive further information on vermi-composting from _____ and request the federation to arrange for the same by the date _____

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.4.3 SPECIFIC TEG: GAYA: AGARBATTI: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Health hazards (due to poor ventilation and crowding especially in case common facilities are created; and due to adhesives involved in packing agarbattis in case such activities are taken up as value addition)	Current practice of rolling in the open in small groups of 2-5 individuals allows for adequate ventilation	Sensitization of SHGs, village federation and Commodity Groups or Producer Groups on occupational health requirements
	In case common facilities are created, adequate space and ventilation must be provided	Coordination with Department of Health for regular (at least once every quarter) health check ups for SHG members involved in Agarbatti rolling
	Occupational safety measures such as use of gloves for handling any chemicals including adhesives and use of masks must be adopted	Procurement and subsidized distribution of safety equipment through the village federation and Commodity Groups or Producer Groups
Over-extraction of forest produce that is raw material for agarbatti production	Social forestry that focuses on improving the raw material availability for the agarbatti industry will ease pressure on natural sources	Coordination with Department of Forestry and programmes such as the Drought Prone Area Programme for taking up social forestry initiatives at the federation level
	Social forestry may focus on all the species utilized currently in agarbatti making – bamboo, *Persea macrantha, Litsea glutinosa* and *Litsea monopetala*	

SPECIFIC TEG: GAYA: AGARBATTI: FRONTEND DOCUMENT

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Agarbatti

I/We are planning to take support for an Agarbatti enterprise.

For the safety of our health:

- ☐ I/We will only work on the Agarbattis in a spacious, well ventilated area
- ☐ I/We wish to use gloves on our hands for handling any chemicals such as adhesives while packing Agarbattis
- ☐ I/We wish to use masks to cover the nose while rolling Agarbattis to protect our lungs
- ☐ _____ has provided us with information on the measures I/we need to take to protect our health while working on the Agarbattis

For ensuring sustainable supply of raw materials:

- ☐ I/We request that the village/block federation take up social forestry involving all the species utilized currently in agarbatti making – bamboo, *Persea macrantha, Litsea glutinosa* and *Litsea monopetala*

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.5 Specific TEGs - Nalanda

Key features of the district relevant to the EMF

- Annual normal rainfall is 904.84 mm (less than state average)
- Flat topography with some areas having undulating topography
- Alluvial soils capable of sustaining wide range of vegetation
- Forest area of 4462 ha
- Seasonal streams
- More than 80% of land holdings are below 1 ha in area
- Productivity of paddy, sugarcane and fruits lower than state average
- Productivity of vegetable crops higher than state average
- High use of chemical fertilizers (more than twice state average)
- Irrigation mostly through tube wells, followed by open wells, rivers, and canals
- Percentage of irrigated area is 75% (more than state average of 48%), mostly by private bore wells
- Stage of ground water development is more than 40%

Key livelihoods selected through the Livelihoods Study and Value Chain Analysis study:

- Paddy cultivation
- Vegetable cultivation
- Dairying

4.5.1 SPECIFIC TEG: NALANDA: PADDY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable irrigation schedule and provide training on farm-level water conservation measures
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application	Training of CRPs in recommending efficient fertilizer scheduling and application based on results of soil testing
Use of hazardous chemical pesticides (impact on human and environmental health) such as Folidol (Class Ia), Methyl Parathion (Class Ia), Quinolphos (Class II), Endosulphan (Class II), Monocrotophos (Class IB), Thimate (Class Ia)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable IPM package using non-hazardous pesticides Training of CRPs in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
	Use of efficient spraying equipment to prevent wastage and contamination	Procurement and provision of safety equipment (gloves, mask) and efficient spraying equipment through

		the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: NALANDA: PADDY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Paddy Cultivation

I/We are planning to do paddy cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in paddy cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plant to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in paddy cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.5.2 SPECIFIC TEG: NALANDA: VEGETABLE CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable irrigation schedule and provide training on farm-level water conservation measures Under the Creation of Water Resources scheme of the National Horticulture Mission, assistance is provided for creating water sources through construction of community tanks, farm ponds with plastic lining. The assistance is limited to Rs. 10 lakh per unit for a group of more than five farmers for an area of 10 ha to be taken up on community basis.
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application	Training of CRPs in recommending efficient fertilizer scheduling and application based on results of soil testing
	Adoption of integrated	Under the Integrated

	nutrient management	Nutrient Management scheme of the National Horticulture Mission assistance @ 50% of the estimated cost, maximum up to Rs. 1000 subject to a limit of 4 hectare per farmer will be given.
Use of hazardous chemical pesticides (impact on human and environmental health)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable IPM package using non-hazardous pesticides Training of CRPs in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
	Use of efficient spraying equipment to prevent wastage and contamination	Procurement and provision of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates
		Under the National Horticulture Mission financial assistance is provided to the agencies (in Government or in private sectors and in the NGO sector) involved in training programme.

SPECIFIC TEG: NALANDA: VEGETABLE CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Vegetable Cultivation

I/We are planning to do vegetable cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in vegetable cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in vegetable cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plant to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in vegetable cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in vegetable cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.5.3 SPECIFIC TEG: NALANDA: DAIRY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Fodder scarcity (poor animal nutrition and productivity, over extraction of local fodder resources)	Adoption for fodder cutting through use of chaff cutter	Procurement and provision of chaff cutting equipment through the village level SHG federation for hiring to SHG members at subsidized rates
	Cultivation of green fodder crops and trees	Training on fodder cultivation in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Urea treatment of cereal straws for improving nutrient content	Training on urea treatment of cereal straws in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra
	Practice of rotational grazing	Sensitization to village federation members on need to devise and monitor adoption of norms for rotational grazing
	Harvesting of available green fodder from field bunds, harvesting weeds, etc. to augment green fodder availability to animals	Coordination with Department of Animal Husbandry for any technical guidelines in harvesting and use of weed species as fodder
Use of dung as fuel (loss of valuable crop nutrients)	Adoption of efficient method of composting (preferably pit method with moisture maintenance, turning over, etc. or more sophisticated methods such as vermicomposting)	Training on efficient compost preparation (including vermicomposting) in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Promotion of fuel wood plantations, fuel efficient cooking devices	Coordination with Bihar Renewable Energy Development Agency (BREDA) for implementation of relevant schemes
Poor arrangements for shelter for the animal (poor	Shelter with adequate space and ventilation, with	Training on urea treatment of fodder in coordination

ventilation, poor sanitation and impact on both animal and human health)	adequate distance from living quarters	with the Department of Animal Husbandry and Krishi Vignan Kendra

SPECIFIC TEG: NALANDA: DAIRY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Dairy

I/We are planning to procure _____ number of animals of _____ breed

For management of fodder for the animals:

- ☐ I/We have access to green fodder resources in the form of _____ in the seasons _____
- ☐ _____ has provided us with information on fodder crops and trees that can be cultivated as I/we plan to cultivate _____ fodder varieties on _____ amount of land
- ☐ _____ has provided us with information on the benefits of fodder chopping and I/we plan to use _____ for cutting fodder
- ☐ _____ has provided us with information on the procedure of treating cereal straw with urea on _____
- ☐ During the summer and in the event of any flooding during the monsoon I propose to meet fodder requirement by _____
- ☐ I/We wish to receive further information on fodder management from _____ and request the federation to arrange for the same by the date _____

For management of animal shelter and compost:

- ☐ I/We have already got an animal shelter with the dimensions of _____ that will house a total of ____ animals including the one/s that are to be procured now
- ☐ _____ has provided us with information on management of the livestock shed (ventilation, space requirement per animal, provision of food and water troughs, collection of dung and urine, efficient composting methods, etc.)
- ☐ The animal dung will be used for the following purposes:
  _____

☐ I/We wish to receive further information on vermi-composting from _____ and request the federation to arrange for the same by the date _____

Any other significant information: _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Name/s of SHG member/s: SHG name: Date:

4.6 Specific TEGs - Purnea

Key features of the district relevant to the EMF

- Average annual rainfall is 1411.5 mm (highest in the state)
- Land is relatively plain
- Soils are alluvial or sandy loam
- Rivers Kosi and Mahananda (with their tributaries) pass through the district
- More than 60% of land holdings are below 1 ha in area
- Very little land is under wastelands and forests
- Productivity of food grains is high (more than twice the state average)
- Use of chemical fertilizers is little higher than state average
- Percentage of irrigated area is 18% (less than state average of 36%)
- Very little area is under canal irrigation
- Irrigation mostly through private tube wells tapping the high water table
- Stage of ground water development is more than 30%

Key livelihoods selected through the Livelihoods Study and Value Chain Analysis study:

- Banana cultivation
- Jute cultivation
- Winter paddy cultivation
- Cultivation and processing of aromatic plants (mentha, lemon grass)

4.6.1 SPECIFIC TEG: PURNEA: BANANA CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well Use of bamboo borings in bore well Use of treadle pumps
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[113] to identify suitable irrigation schedule and provide training on farm-level water conservation measures (for e.g., furrow and basin methods)
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies) as banana is a 'heavy feeder' and requires heavy fertilization	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application	Training of CRPs in recommending efficient fertilizer and manure scheduling and application based on results of soil testing (for e.g., application of urea in split doses)
	Use of organic manures (well rotted farm yard manure), neem cake, growing of green manure crops	
	Control of weeds through intercropping and soil mulching	
Use of hazardous chemical pesticides (impact on human and environmental health) such as Thimate (which is Phorate – a Class	Integrated pest management without the use of pesticides in classes Ia, Ib, and II	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[114] to identify suitable IPM package using

[113] Agriculture Technology Mission Agency
[114] Agriculture Technology Mission Agency

Ia pesticide)		non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
		Procurement and provision of safety equipment (gloves, mask) through the village level SHG federation for hiring to SHG farmers at subsidized rates
		Purnea is one of the districts identified under the National Horticulture Mission for promotion of Banana cultivation. Coordination with the Mission is essential to tap its schemes: support for establishment of community tanks, farm ponds, etc.; support for mulching; support for IPM and INM; support for organic farming; support for establishment of vermicompost units; support for training of farmers; etc.

SPECIFIC TEG: PURNEA: BANANA CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Banana Cultivation

I/We are planning to do banana cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in banana cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in banana cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plan to dig a new borewell
- ☐ I/we plan to use bamboo boring

- ☐ I/we plan to use a treadle pump and request the federation to arrange for more information on this by _____
- ☐ I will apply for and take a permit from the Groundwater Authority by myself
- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in banana cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in banana cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.6.2 SPECIFIC TEG: PURNEA: JUTE CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Poor water management practices	Adoption of water conservation measures	Coordination with Department of Agriculture, Krishi Vignan Kendra, ATMA[115] and with technical institutions such as the CRIJAF[116] and NIRJAFT[117] for technical support and training on farm-level water conservation measures
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application	Coordination with Department of Agriculture, Krishi Vignan Kendra, ATMA[118] and with technical institutions such as the CRIJAF and NIRJAFT for technical support and training in integrated nutrient management
	Integrated nutrient management including recommending efficient fertilizer scheduling and application based on results of soil testing; use of bio-fertilizers (e.g., use of *Azoto chroococcum*; use of green manures (e.g., use of *Glyricidia*, Water Hyacinth, Dhaincha); crop rotation; mixed cropping; etc. Details of crop rotation options: Under adequate and assured irrigation: Jute-Paddy-Wheat Jute-Paddy-Maize Jute-Paddy-Groundnut	

[115] Agriculture Technology Mission Agency
[116] Central Research Institute for Jute and Allied Fibres (CRIJAF)
[117] National Institute of Research on Jute and Allied Fibre Technology (NIRJAFT)
[118] Agriculture Technology Mission Agency

	Jute-Paddy-Paddy Jute-Paddy-Mustard Jute-Paddy-Cabbage Under limited and un-assured irrigation: Jute-Paddy-Mustard, Jute-Paddy-Pea, Jute-Paddy-Tomato Jute-Paddy-Lentil, Jute-Blackgram-Seasamum Jute-Mustard-Greengram Under rainfed conditions: Jute-Paddy, Jute-Mustard, Jute-Pea, Jute-Greengram, Jute-Lentil, Jute-Mustard+ Lentil	
Use of hazardous chemical pesticides (impact on human and environmental health) such as Parathion-methyl (Class Ia), Endosulphan (Class II), Carbosulfan (Class II), Cypermethrin (Class II), Copper oxychloride (Class III)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II and through a combination of different cultural, physical and other methods (for example, split application of nitrogenous fertilizers, thinning of affected plants, hand picking caterpillars and immersion in Kerosene water, application of raw garlic paste 12.50% i.e. 125 gram garlic paste mixed with 1 kg jute seed for seed purification and to prevent seedling mortality, neem leaf extracts and water @ 1:20 for control of white mite, etc.[119])	Coordination with Department of Agriculture, Krishi Vignan Kendra, ATMA[120] and with technical institutions such as the CRIJAF and NIRJAFT for technical support and training to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
	Use of efficient spraying	Procurement and provision

[119] Khatun A., Recent Agricultural Developments in Jute, Kenaf and Mesta through Traditional and Biotechnological Approaches, Bangladesh Jute Research Institute
[120] Agriculture Technology Mission Agency

	equipment to prevent wastage and contamination	of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates
Pollution of water bodies during retting	Use of artificial water tanks for retting at the community level	Commissioning and provision of water tanks for retting through the village level SHG federation for hiring to SHG farmers at subsidized rates (a subsidy of Rs. 20,000 is available for construction of Jute retting tanks from the Department of Agriculture)
	Adoption of alternative retting technology (for example, NIRJAFT technology where retting is effected in just water soaked conditions by the application of a specific fungus belonging to *Sclerotium* group, thus reducing substantially water requirement as well as achieve retting in a shorter time than traditional retting)	Coordination with technical institutions such as the CRIJAF and NIRJAFT for technical support and training

SPECIFIC TEG: PURNEA: JUTE CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Jute Cultivation

I/We are planning to do jute cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used. These include the pesticides _____ _____ that we have used before in Jute cultivation
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____. These include the pesticides _____ that we have used before in Jute cultivation
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in jute cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in jute cultivation from _____ and request the federation to arrange for the same by the date _____

For management of water resources:

- ☐ _____ has provided us with information on efficient methods of water use in jute cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in jute cultivation from _____ and request the federation to arrange for the same by the date _____
- ☐ I/We plan to undertake retting of jute in _____
- ☐ I/We are interested in a community facility (artificial tank) for retting of jute and request the federation to facilitate the same

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.6.3 SPECIFIC TEG: PURNEA: WINTER PADDY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Risk of floods and water logging	*Dapog* method for raising nursery	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[121] to identify suitable nursery raising and transplantation techniques to take advantage of water logged conditions and mitigate effect of floods
	Cultivation of *Boro* paddy for increasing productivity of Chaur areas	
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application Regular weeding to reduce nutrient loss to weeds	Training of CRPs in recommending efficient fertilizer scheduling and application based on results of soil testing
Use of hazardous chemical pesticides (impact on human and environmental health) such as Folidol (Class Ia), Methyl Parathion (Class Ia), Quinolphos (Class II), Endosulphan (Class II), Monocrotophos (Class IB), Thimate (Class Ia)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II and use of cultural, physical and other chemical methods (such as use of disease resistant varieties Gautam, Riccharia, Dhanlakshmi; control of case worm by providing alternate wetting and drying of the field, dislodging the insect by moving kerosene soaked rope across the field; use of pheromone traps for control of stem borer; etc.)	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use

[121] Agriculture Technology Mission Agency

	Use of efficient spraying equipment to prevent wastage and contamination	Procurement and provision of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: PURNEA: WINTER PADDY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Winter Paddy Cultivation

I/We are planning to do paddy cultivation in _____ extent of land

For management of water logged conditions:

- ☐ The method for nursery raising that I/We will be using is _____
- ☐ I/We will be transplanting paddy at _____
- ☐ I/We wish to obtain further information on Boro paddy from _____ and request the federation to arrange for the same by the date _____

For management of any pests that may attack the crop:

- ☐ The pest resistant varieties that we plan to sow are _____
- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in paddy cultivation on _____

☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.7 Specific TEGs - Madhubani

Key features of the district relevant to the EMF

- Annual rainfall is >1300 mm
- Soil is alluvial with medium-high water holding capacity
- 18 rivers traverse the district
- Floods are a common feature affecting 45% of the land
- Water logging affects 16% of the land
- About 84% of land holdings are below 1 ha in area
- Only about 25% of the gross cropped area is irrigated
- Tube well irrigation accounts for about 50% of the irrigated area
- Fertilizer consumption is less than the state average
- Productivity of food grains is less than the state average
- Stage of ground water development is about 33%

Key livelihoods selected through the Livelihoods Study and Value Chain Analysis study:

- Dairying
- Fisheries
- Vegetable cultivation
- Fruits cultivation (Makhana, Mango)
- Paddy cultivation

4.7.1 SPECIFIC TEG: MADHUBANI: DAIRY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Fodder scarcity (poor animal nutrition and productivity, over extraction of local fodder resources) especially during floods	Adoption for fodder cutting through use of chaff cutter	Procurement and provision of chaff cutting equipment through the village level SHG federation for hiring to SHG members at subsidized rates
	Cultivation of green fodder crops and trees	Training on fodder cultivation in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Urea treatment of cereal straws for improving nutrient content	Training on urea treatment of cereal straws in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra
	Practice of rotational grazing	Sensitization to village federation members on need to devise and monitor adoption of norms for rotational grazing
	Harvesting of available green fodder from field bunds, harvesting weeds, etc. to augment green fodder availability to animals	Coordination with Department of Animal Husbandry for any technical guidelines in harvesting and use of weed species as fodder
Floods (poor access to fodder and negative impact on animal health)	Establishment of fodder storage banks to meet fodder requirement during floods	Coordination with village level federations to establish fodder banks with support from the Department of Animal Husbandry
	Precautions for animal safety during floods: Prevent animals from drinking stagnated water Prevent animals from feeding on green or wetted dry fodder from water logged areas or mould-infested fodder	
Use of dung as fuel (loss of valuable crop nutrients)	Adoption of efficient method of composting	Training on efficient compost preparation

	(preferably pit method with moisture maintenance, turning over, etc. or more sophisticated methods such as vermicomposting)	(including vermi-composting) in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Promotion of fuel wood plantations, fuel efficient cooking devices	Coordination with Bihar Renewable Energy Development Agency (BREDA) for implementation of relevant schemes
Poor arrangements for shelter for the animal (poor ventilation, poor sanitation and impact on both animal and human health)	Shelter with adequate space and ventilation, with adequate distance from living quarters	Training on urea treatment of fodder in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra

SPECIFIC TEG: MADHUBANI: DAIRY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Dairy

I/We are planning to procure _____ number of animals of _____ breed

For management of fodder for the animals:

- ☐ I/We have access to green fodder resources in the form of _____ in the seasons _____
- ☐ _____ has provided us with information on fodder crops and trees that can be cultivated as I/we plan to cultivate _____ fodder varieties on _____ amount of land
- ☐ _____ has provided us with information on the benefits of fodder chopping and I/we plan to use _____ for cutting fodder
- ☐ _____ has provided us with information on the procedure of treating cereal straw with urea on _____
- ☐ In the event of any flooding during the monsoon I/We propose to meet fodder requirement by _____
- ☐ I/We wish to receive further information on fodder management from _____ and request the federation to arrange for the same by the date _____

For management of animal shelter and compost:

- ☐ I/We have already got an animal shelter with the dimensions of _____ that will house a total of ____ animals including the one/s that are to be procured now
- ☐ _____ has provided us with information on management of the livestock shed (ventilation, space requirement per animal, provision of food and water troughs, collection of dung and urine, efficient composting methods, etc.)
- ☐ The animal dung will be used for the following purposes:
  _____

☐ I/We wish to receive further information on vermi-composting from _____ and request the federation to arrange for the same by the date _____

Any other significant information: _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Name/s of SHG member/s: SHG name: Date:

4.7.2 SPECIFIC TEG: MADHUBANI: FISHERIES (Capture Fisheries): BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Loss of biodiversity	No harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals No support for activities such as bird-trapping, turtle/terrapin trapping, etc. No drawing of water from tanks, reservoirs and mauns for irrigation without permission No pollution or encroachment of water bodies (Jalkars) by any means	Coordination with District Fisheries Officer and Forest Department
Overexploitation of fish	No fishing in rivers from 15th June to 15th August No use of fishing net or Gill net with less than 4 cm mesh size in rivers No fishing of fingerlings of culturable fishes of any species in rivers and reservoirs	

SPECIFIC TEG: MADHUBANI: FISHERIES: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Fisheries (Capture Fisheries)

I/We are planning to do fishing in _____ extent of area in _____ water body, out of a total area of _____

We understand the importance of and agree to abide to the following:

- ☐ I/We will not take up activities such as bird-trapping, turtle/terrapin trapping, etc.
- ☐ I/We will not take up any harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals
- ☐ I/We will not take up fishing in rivers from 15th June to 15th August
- ☐ I/We will not use fishing net or Gill net with less than 4 cm mesh size in rivers
- ☐ I/We will not take up fishing of fingerlings of culturable fishes of any species in rivers and reservoirs
- ☐ I/We will not draw water from tanks, reservoirs and mauns for irrigation without permission
- ☐ I/We will not cause any pollution or encroachment of water bodies (Jalkars) by any means

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.7.3 SPECIFIC TEG: MADHUBANI: MANGO CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[122] to identify suitable water management methods including irrigation schedule, farm-level water conservation and management of flooding
Seasonal flooding	Proper plan for drainage of water from the field	
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application including application of farm yard manure in pits before planting of saplings, maintenance of adequate spacing between saplings (10-12 m.), application of 60-80 kg well rotted farm yard manure for each grown tree every year, etc.	Training of CRPs in recommending efficient fertilizer and manure scheduling and application based on results of soil testing (for e.g., application of urea in split doses)
	Control of weeds through intercropping and soil mulching	
Use of hazardous chemical pesticides (impact on	Integrated pest management without the use of pesticides	Coordination with Department of Agriculture,

[122] Agriculture Technology Mission Agency

human and environmental health) such as Carbaryl (Class II), Dimethoate (Class II), Methyl Parathion (Class Ia), Endosulphan (Class II), DDVP (Class II), etc.	in classes Ia, Ib, and II by incorporating a combination of cultural, physical and chemical methods such as summer ploughing, removal of affected branches, insertion of petrol swabs and blocking with mud plaster, application of tar/grease, etc.	Krishi Vignan Kendra and ATMA[123] to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
		Procurement and provision of safety equipment (gloves, mask) through the village level SHG federation for hiring to SHG farmers at subsidized rates

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SPECIFIC TEG: MADHUBANI: MANGO CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Mango Cultivation

I/We are planning to do Mango cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used and these include _____ --- _____ that we have been using so far
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on integrated pest management methods from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in mango cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in mango cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plan to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in mango cultivation including management of water drainage from the field on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in mango cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.7.4 SPECIFIC TEG: MADHUBANI: MAKHANA CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Loss of biodiversity	Set aside cultivation-free patches within wetlands identified as important for conservation Use of traditional varieties of Makhana	Coordination with Wildlife Department and Department of Fisheries
Poor productivity	Integrated Makhana-Fish cultivation with air-breathing fish species being grown in Makhana ponds, rotational cropping with wheat and potato, etc.	Coordination with Krishi Vignan Kendra, ATMA[124] and with institutions such as the National Research Centre for Makhana (NRCM) and Mithila Samajik Evam Arthik Vikas Sansthan (MSEAVS) for technical support and training of CRPs and farmers
Use of chemical fertilizers leading to pollution	No application of chemical fertilizer (which is the current practice), allowing crop residues to decompose in the pond to recycle nutrients, even distribution of Makhana plants in the pond, etc.	
Use of hazardous chemical pesticides (impact on human and environmental health)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II and through a combination of different cultural, physical and other methods (for example, application of ash, use of roping/ netting techniques so that the pests fall down from the Makhana leaves)	
	Use of recommended safety measures and gear while using pesticides	
Hazard of heat injuries during roasting and popping of Makhana seeds	Use of safety gear such as gloves Availability of first-aid kit for treating burn injuries Safe working conditions (child-proof, well ventilated, access to water, etc.)	Coordination with the National Research Centre for Makhana (NRCM) for technical support on occupational health

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SPECIFIC TEG: MADHUBANI: MAKHANA CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Makhana Cultivation

I/We are planning to do Makhana cultivation in _____ extent of area in _____ pond, out of a total pond area of _____ in which _____ area is totally under aquatic cultivation

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used. These include the pesticides _____ _____ that we have used before in makhana cultivation
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____.
- ☐ I/We wish to receive further information on integrated non-chemical pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ _____ has provided us with information on ways to manage fertility in makhana cultivation on _____ including leaving behind crop residues to decompose in the pond

For safe processing:

- ☐ _____ has provided us with information on safety measures and precautions during roasting and popping of makhana on _____ including use of safety gear for protection from burns, need for a first-aid kit, etc.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.7.5 SPECIFIC TEG: MADHUBANI: PADDY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Risk of floods and water logging	*Dapog* method for raising nursery	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[125] to identify suitable nursery raising and transplantation techniques to take advantage of water logged conditions and mitigate effect of floods
	Cultivation of *Boro* paddy for increasing productivity of Chaur areas	
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application Regular weeding to reduce nutrient loss to weeds	Training of CRPs in recommending efficient fertilizer scheduling and application based on results of soil testing
Use of hazardous chemical pesticides (impact on human and environmental health) such as Folidol (Class Ia), Methyl Parathion (Class Ia), Quinolphos (Class II), Endosulphan (Class II), Monocrotophos (Class IB), Thimate (Class Ia)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II and use of cultural, physical and other chemical methods (such as use of disease resistant varieties Gautam, Riccharia, Dhanlakshmi; control of case worm by providing alternate wetting and drying of the field, dislodging the insect by moving kerosene soaked rope across the field; use of pheromone traps for control of stem borer; etc.)	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
	Use of efficient spraying	Procurement and provision

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	equipment to prevent wastage and contamination	of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: MADHUBANI: PADDY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Paddy Cultivation

I/We are planning to do paddy cultivation in _____ extent of land

For management of water logged conditions:

- ☐ The method for nursery raising that I/We will be using is _____
- ☐ I/We will be transplanting paddy at _____
- ☐ I/We wish to obtain further information on Boro paddy from _____ and request the federation to arrange for the same by the date _____

For management of any pests that may attack the crop:

- ☐ The pest resistant varieties that we plan to sow are _____
- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in paddy cultivation on _____

☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.7.6 SPECIFIC TEG: MADHUBANI: VEGETABLE CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Floods	Sowing in time	Coordination with Department of Agriculture to ensure prepositioning of all inputs for sowing in time
Extraction of ground water (impact on local ground water aquifers)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable irrigation schedule and provide training on farm-level water conservation measures
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with Department of Agriculture for accessing services of soil testing labs, for accessing the vermicompost units scheme (Rs.2000 per unit is provided for construction of vermicompost units to farmers)
	Proper fertilizer scheduling and efficient application	Training of CRPs in soil testing using mobile soil testing kits, efficient fertilizer scheduling and application based on results of soil testing and INM
	Adoption of integrated nutrient management (INM) including: Application of biofertilizers: seed treatment for peas, lady's finger, rajma; treatment of nursery plants for tomato, chillies, onion, cauliflower, cabbage; direct application	

	to soil along with compost Application of green manure, farm yard manure, etc.	
Use of hazardous chemical pesticides (impact on human and environmental health) including: Brinjal: Furadon (Class Ib), Endosulphan (Class II), Quinolphos (Class II), Carboryl (Class II), Sulphur dust (Calss III), Dicofol (Class III) Cauliflower: Endosulphan (Class II), Malalthion (Class III), Carboryl (Class II), Monocrotophos (Class Ib), Dimethoate (Class II) Lady's finger: Malathion (Class III), Carboryl (Class II), Dimethoate (Class II), Endosulphan (Class II) Tomato: Endosulphan (Class II), Carboryl (Class II), Metacystox (Class Ib), Malathion (Class III) Chillies: Chloropyrifos (Class II) Onion: Endosulphan (Class II), Dimethoate (Class II), Malathion (Class III) Peas: Thimmet (Class Ia), Malathion (Class III), Carboryl (Class II), Endosulphan (Class II), Dimethoate (Class II), Monocrotophos (Class Ib)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II including use of methods such as: Brinjal: Pruning and burning of drooping shoots, destruction of damaged parts, application of neem cake while planting around plant base, application of neem seed kernel extract Cabbage and Cauliflower: Grow mustard as trap crop; apply neem seed kernel extract; hand-picking of larvae; destruction of egg masses of pests Lady's finger: Hand picking of pest insects; destruction of affected parts Tomato: Apply neem cake to soil while planting; plant yellow flowered marigold as trap crop; spray neem seed kernel extract; hand picking of large larvae; Use of NPV Chillies: Collect and destroy egg and young larvae masses; apply neem seed kernel extract; apply neem cake Onion: Apply neem cake to soil while sowing	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable IPM package using non-hazardous pesticides, implementation of Farmer's Field Schools in villages where BRLP is currently being implemented Training of CRPs in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides including maintenance of safe period between the last spray and the first harvest	Training of CRPs in building awareness on safety issues in pesticide use
	Use of efficient spraying	Procurement and provision

	equipment to prevent wastage and contamination	of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: MADHUBANI: VEGETABLE CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Vegetable Cultivation

I/We are planning to do vegetable cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used, these include the pesticides _____ _____ which we have used before
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in vegetable cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in vegetable cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plant to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in vegetable cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in vegetable cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.8 Specific TEGs - Muzaffarpur

Key features of the district relevant to the EMF

- Average rainfall of the district is 1200 mm
- Topography of the land is plain
- A large part of the district is flood prone
- Soil is calcareous and deposits of silt during floods increase its productivity
- More than 65% of the operational land holdings are less than 1 ha in area
- Percentage of gross irrigated area is less than the state avergae
- About 50% of the irrigated area is irrigated through tube wells
- Horticulture crops are the main source of income
- Fertilizer consumption is less than the state average
- Productivity of food grains is less than the state average
- Stage of ground water development is about 57% - the highest in the BRLP districts

Key livelihoods selected through the Livelihoods Study and Value Chain Analysis study:

- Dairying
- Fisheries
- Vegetable cultivation
- Fruits cultivation (Litchis, Mango)
- Maize
- Bee Keeping

4.8.1 SPECIFIC TEG: MUZAFFARPUR: DAIRY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Fodder scarcity (poor animal nutrition and productivity, over extraction of local fodder resources) especially during floods	Adoption for fodder cutting through use of chaff cutter	Procurement and provision of chaff cutting equipment through the village level SHG federation for hiring to SHG members at subsidized rates
	Cultivation of green fodder crops and trees	Training on fodder cultivation in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Urea treatment of cereal straws for improving nutrient content	Training on urea treatment of cereal straws in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra
	Practice of rotational grazing	Sensitization to village federation members on need to devise and monitor adoption of norms for rotational grazing
	Harvesting of available green fodder from field bunds, harvesting weeds, etc. to augment green fodder availability to animals	Coordination with Department of Animal Husbandry for any technical guidelines in harvesting and use of weed species as fodder
Floods (poor access to fodder and negative impact on animal health)	Establishment of fodder storage banks to meet fodder requirement during floods	Coordination with village level federations to establish fodder banks with support from the Department of Animal Husbandry
	Precautions for animal safety during floods: Prevent animals from drinking stagnated water Prevent animals from feeding on green or wetted dry fodder from water logged areas or mould-infested fodder	
Use of dung as fuel (loss of valuable crop nutrients)	Adoption of efficient method of composting	Training on efficient compost preparation

	(preferably pit method with moisture maintenance, turning over, etc. or more sophisticated methods such as vermicomposting)	(including vermi-composting) in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Promotion of fuel wood plantations, fuel efficient cooking devices	Coordination with Bihar Renewable Energy Development Agency (BREDA) for implementation of relevant schemes
Poor arrangements for shelter for the animal (poor ventilation, poor sanitation and impact on both animal and human health)	Shelter with adequate space and ventilation, with adequate distance from living quarters	Training on urea treatment of fodder in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra

SPECIFIC TEG: MUZAFFARPUR: DAIRY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Dairy

I/We are planning to procure _____ number of animals of _____ breed

For management of fodder for the animals:

- ☐ I/We have access to green fodder resources in the form of _____ in the seasons _____
- ☐ _____ has provided us with information on fodder crops and trees that can be cultivated as I/we plan to cultivate _____ fodder varieties on _____ amount of land
- ☐ _____ has provided us with information on the benefits of fodder chopping and I/we plan to use _____ for cutting fodder
- ☐ _____ has provided us with information on the procedure of treating cereal straw with urea on _____
- ☐ In the event of any flooding during the monsoon I/We propose to meet fodder requirement by _____
- ☐ I/We wish to receive further information on fodder management from _____ and request the federation to arrange for the same by the date _____

For management of animal shelter and compost:

- ☐ I/We have already got an animal shelter with the dimensions of _____ that will house a total of ____ animals including the one/s that are to be procured now
- ☐ _____ has provided us with information on management of the livestock shed (ventilation, space requirement per animal, provision of food and water troughs, collection of dung and urine, efficient composting methods, etc.)
- ☐ The animal dung will be used for the following purposes:
  _____

☐ I/We wish to receive further information on vermi-composting from _____ and request the federation to arrange for the same by the date _____

Any other significant information: _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Name/s of SHG member/s: SHG name: Date:

4.8.2 SPECIFIC TEG: MUZAFFARPUR: FISHERIES (Capture Fisheries[126]): BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Loss of biodiversity	No harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals No support for activities such as bird-trapping, turtle/terrapin trapping, etc. No drawing of water from tanks, reservoirs and mauns for irrigation without permission No pollution or encroachment of water bodies (Jalkars) by any means	Coordination with District Fisheries Officer and Forest Department
Overexploitation of fish	Protection measures to avoid overexploitation of fish. These include: • identification and protection of breeding grounds • allowing free migration of brooders and juveniles from *beel* to river and *vice versa* • protection of brood stock and juveniles Specific measures that need to be taken include: No fishing in rivers from 15th June to 15th August No use of fishing net or Gill net with less than 4 cm mesh size in rivers No fishing of fingerlings of culturable fishes of any species in rivers and reservoirs	

[126] Generally undertaken in open chaurs (wetlands there is link to the river)

SPECIFIC TEG: MUZAFFARPUR: FISHERIES (CAPTURE): FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Fisheries (Capture Fisheries)

I/We are planning to do fishing in _____ extent of area in _____ water body, out of a total area of _____

We understand the importance of and agree to abide to the following:

- ☐ I/We will not take up activities such as bird-trapping, turtle/terrapin trapping, etc.
- ☐ I/We will not take up any harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals
- ☐ I/We will not take up fishing in rivers from 15th June to 15th August
- ☐ I/We will not use fishing net or Gill net with less than 4 cm mesh size in rivers
- ☐ I/We will not take up fishing of fingerlings of culturable fishes of any species in rivers and reservoirs
- ☐ I/We will not draw water from tanks, reservoirs and mauns for irrigation without permission
- ☐ I/We will not cause any pollution or encroachment of water bodies (Jalkars) by any means

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.8.3 SPECIFIC TEG: MUZAFFARPUR: FISHERIES (Culture Fisheries[127]): BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Weed infestation	Control of Water Hyacinth by periodic harvesting Alternative uses of Water Hyacinth as cattle feed, for bio-gas generation, basket weaving, etc.	Coordination with District Fisheries Officer and other relevant departments (for example BREDA[128] for bio-gas generation)
Overuse of fertilizers (leads to pollution of the water body, algal blooms and loss of fish)	Use of fertilizers (cow dung, lime, etc.) as per recommended quantities: Cow dung – 2000 kg/ha first dose Cow dung – 1000 kg/ha monthly Urea – 25 kg/ha monthly Single super phosphate – 20 kg/ha monthly	Coordination with District Fisheries Officer and Krishi Vignan Kendra for technical support
Loss of biodiversity	In addition to stocking with Indian major carps which are fast growing species, indigenous species such as *Anabas testudineus, Clarias batrachus, Ompok* spp. murrels, *Amblypharyngodon mola*, *Gudusia chapra*, *Puntius* sps may also be used for stocking. The low yield rates of these species can be compensated with the high price they fetch. No support for activities such as bird-trapping, turtle/terrapin trapping, etc. No drawing of water from tanks, reservoirs and mauns for irrigation without permission No pollution or encroachment of water bodies (Jalkars) by any means	Coordination with District Fisheries Officer and Forest Department
Low productivity	Appropriate stocking of fish species (species ratio and density) to be determined based on the availability of food (plankton, benthos, detritus etc.). Indigenous ornamental species like Gold Barb (*Puntius sophore),* Rosy Barb (*P. conchonius),* Labrynth or Banded Gourami (*Colisa fasciatus),* Honey dwarf Gourami *(C. sota)* can be reared for sale as aquarium species.	

[127] Generally undertaken in closed chaurs (wetlands there is no link to the river)
[128] Bihar Renewable Energy Development Agency

SPECIFIC TEG: MUZAFFARPUR: FISHERIES (CULTURE): FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Fisheries (Culture Fisheries)

I/We are planning to do fish culture in _____ extent of area in _____ water body, out of a total area of _____

We understand the importance of and agree to abide to the following:

- ☐ I/We will not take up activities such as bird-trapping, turtle/terrapin trapping, etc.
- ☐ I/We plan to stock fish as per the following details:

Species	Number of fingerlings stocked

- ☐ I/We plan to apply the following fertilisrs in the water body as per the following details:

Fertilizer	Quantity

- ☐ I/We will not draw water from tanks, reservoirs and mauns for irrigation without permission
- ☐ I/We will not cause any pollution or encroachment of water bodies (Jalkars) by any means

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.8.4 SPECIFIC TEG: MUZAFFARPUR: VEGETABLE CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Floods	Sowing in time	Coordination with Department of Agriculture to ensure prepositioning of all inputs for sowing in time
Extraction of ground water (impact on local ground water aquifers, especially as exploitation rate in the district is close to 60%)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable irrigation schedule and provide training on farm-level water conservation measures
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with Department of Agriculture for accessing services of soil testing labs, for accessing the vermicompost units scheme (Rs.2000 per unit is provided for construction of vermicompost units to farmers)
	Proper fertilizer scheduling and efficient application	Training of CRPs in soil testing using mobile soil testing kits, efficient fertilizer scheduling and application based on results of soil testing and INM
	Adoption of integrated nutrient management (INM) including: Application of biofertilizers: seed treatment for peas, lady's finger, rajma; treatment for nursery plants of tomato, chillies, onion, cauliflower, cabbage; direct application	

	to soil along with compost Application of green manure, farm yard manure, etc.	
Use of hazardous chemical pesticides (impact on human and environmental health) including: Brinjal: Furadon (Class Ib), Endosulphan (Class II), Quinolphos (Class II), Carbaryl (Class II), Sulphur dust (Calss III), Dicofol (Class III) Cauliflower: Endosulphan (Class II), Malalthion (Class III), Carboryl (Class II), Monocrotophos (Class Ib), Dimethoate (Class II) Lady's finger: Malathion (Class III), Carboryl (Class II), Dimethoate (Class II), Endosulphan (Class II) Tomato: Endosulphan (Class II), Carbaryl (Class II), Metasystox (Class Ib), Malathion (Class III) Chillies: Chloropyrifos (Class II) Onion: Endosulphan (Class II), Dimethoate (Class II), Malathion (Class III) Peas: Thimmet (Class Ia), Malathion (Class III), Carbaryl (Class II), Endosulphan (Class II), Dimethoate (Class II), Monocrotophos (Class Ib)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II including use of methods such as: Brinjal: Pruning and burning of drooping shoots, destruction of damaged parts, application of neem cake while planting around plant base, application of neem seed kernel extract Cabbage and Cauliflower: Grow mustard as trap crop; apply neem seed kernel extract; hand-picking of larvae; destruction of egg masses of pests Lady's finger: Hand picking of pest insects; destruction of affected parts Tomato: Apply neem cake to soil while planting; plant yellow flowered marigold as trap crop; spray neem seed kernel extract; hand picking of large larvae; Use of NPV Chillies: Collect and destroy egg and young larvae masses; apply neem seed kernel extract; apply neem cake Onion: Apply neem cake to soil while sowing	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable IPM package using non-hazardous pesticides, implementation of Farmer's Field Schools in villages where BRLP is currently being implemented Training of CRPs in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides including maintenance of safe period between the last spray and the first harvest	Training of CRPs in building awareness on safety issues in pesticide use
	Use of efficient spraying	Procurement and provision

	equipment to prevent wastage and contamination	of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: MUZAFFARPUR: VEGETABLE CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Vegetable Cultivation

I/We are planning to do vegetable cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used, these include the pesticides _____ _____ which we have used before
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in vegetable cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in vegetable cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plant to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in vegetable cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in vegetable cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.8.5 SPECIFIC TEG: MUZAFFARPUR: LITCHI CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers, especially as exploitation rate in the district is close to 60%)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[129] to identify suitable water management methods including irrigation schedule, farm-level water conservation and management of flooding
Seasonal flooding	Proper plan for drainage of water from the field	
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application including application of farm yard manure in pits before planting of saplings, maintenance of adequate spacing between saplings (9-10 m.), application of 60-80 kg well rotted farm yard manure for each grown tree every year, etc.	Training of CRPs in recommending efficient fertilizer and manure scheduling and application based on results of soil testing (for e.g., application of urea in split doses)
	Control of weeds through intercropping and soil mulching	
Use of hazardous chemical pesticides (impact on	Integrated pest management without the use of pesticides	Coordination with Department of Agriculture,

[129] Agriculture Technology Mission Agency

human and environmental health) such as Malathion (Class III), Endosulphan (Class II), Carbaryl (Class II), Sulphur dust (Calss III), Dicofol (Class III), etc.	in classes Ia, Ib, and II by incorporating a combination of cultural, physical and chemical methods including application of neem seed cake in pits, use of healthy saplings, removal of affected leaves and branches, etc.	Krishi Vignan Kendra and ATMA[130] to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
		Procurement and provision of safety equipment (gloves, mask) through the village level SHG federation for hiring to SHG farmers at subsidized rates

[130] Agriculture Technology Mission Agency

SPECIFIC TEG: MUZAFFARPUR: LITCHI CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Litchi Cultivation

I/We are planning to do Litchi cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used and these include _____ _____ that we have been using so far
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on integrated pest management methods from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in litchi cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in litchi cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plan to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in litchi cultivation including management of water drainage from the field on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in litchi cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.8.6 SPECIFIC TEG: MUZAFFARPUR: MANGO CULTIVATION: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers, especially as exploitation rate in the district is close to 60%)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[131] to identify suitable water management methods including irrigation schedule, farm-level water conservation and management of flooding
Seasonal flooding	Proper plan for drainage of water from the field	
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application including application of farm yard manure in pits before planting of saplings, maintenance of adequate spacing between saplings (10-12 m.), application of 60-80 kg well rotted farm yard manure for each grown tree every year, etc.	Training of CRPs in recommending efficient fertilizer and manure scheduling and application based on results of soil testing (for e.g., application of urea in split doses)
	Control of weeds through intercropping and soil mulching	
Use of hazardous chemical pesticides (impact on	Integrated pest management without the use of pesticides	Coordination with Department of Agriculture,

[131] Agriculture Technology Mission Agency

human and environmental health) such as Carbaryl (Class II), Dimethoate (Class II), Methyl Parathion (Class Ia), Endosulphan (Class II), DDVP (Class II), etc.	in classes Ia, Ib, and II by incorporating a combination of cultural, physical and chemical methods such as summer ploughing, removal of affected branches, insertion of petrol swabs and blocking with mud plaster, application of tar/grease, etc.	Krishi Vignan Kendra and ATMA[132] to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
		Procurement and provision of safety equipment (gloves, mask) through the village level SHG federation for hiring to SHG farmers at subsidized rates

[132] Agriculture Technology Mission Agency

SPECIFIC TEG: MUZAFFARPUR: MANGO CULTIVATION: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Mango Cultivation

I/We are planning to do Mango cultivation in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used and these include _____ _____ that we have been using so far
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on integrated pest management methods from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in mango cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in mango cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plan to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in mango cultivation including management of water drainage from the field on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in mango cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.8.7 SPECIFIC TEG: MUZAFFARPUR: MAIZE: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Risk of floods and water logging (young maize plants are highly sensitive to water logging)	In Kharif season Shallow surface drains 40-50 m apart are to be provided across the slope, connected to a main outlet, to drain out water from the field	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[133] to identify suitable agronomy practices to control water logging
	Use of Quality Protein Maize cultivars such as Shaktiman that also provides green fodder for livestock	
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application Regular weeding to reduce nutrient loss to weeds	Training of CRPs in integrated nutrient management including recommending efficient fertilizer scheduling and application based on results of soil testing
	Intercropping with pulses such as black gram, and rajma, with vegetables such as potato, peas, radish, etc.	
Use of hazardous chemical pesticides (impact on human and environmental health) such as Deltamethrin (Class II), Endosulphan (Class II), Phorate (Class Ia), Carbofuran (Class Ib)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II and use of cultural, physical and other chemical methods (such as crop rotation with mustard, legumes, etc;)	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety	Training of CRPs in

[133] Agriculture Technology Mission Agency

	measures and gear while using pesticides	building awareness on safety issues in pesticide use
	Use of efficient spraying equipment to prevent wastage and contamination	Procurement and provision of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: MUZAFFARPUR: MAIZE: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Maize Cultivation

I/We are planning to do maize cultivation in _____ extent of land

For management of water logged conditions:

- ☐ I/We will be using _____ drainage methods
- ☐ I/We wish to obtain further information on water management in maize cultivation from _____ and request the federation to arrange for the same by the date _____

For management of any pests that may attack the crop:

- ☐ The pest resistant varieties that we plan to sow are _____
- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ The crop rotation that I/We plan to follow is _____
- ☐ I/We plan to cultivate _____ as intercrops in maize
- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in maize cultivation on _____

☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in maize cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.9 Specific TEGs - Khagaria

Key features of the district relevant to the EMF

- Average rainfall of the district is 1225 mm
- Some areas are affected by water logging
- Soil is sandy loam to clay loam
- Availability of Nitrogen is high and that of Phosphorus and Potassium are medium
- Micro nutrients are deficient in the soil
- There is no significant forest area
- Grasslands are found in the northern part
- About 74% of the operational land holdings are less than 1 ha in area
- Three fourths of the irrigated area is by ground water, mostly through private bore well
- Ground water is available at shallow depths and bamboo borings are commonly used
- Fertilizer consumption is nearly four times the state average
- Productivity of food grains is equivalent to the state average
- Stage of ground water development is about 45%

Key livelihoods selected through the Livelihoods Study and Value Chain Analysis study:

- Fisheries
- Dairying
- Maize

4.9.1 SPECIFIC TEG: KHAGARIA: FISHERIES (Capture Fisheries[134]): BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Loss of biodiversity	No harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals No support for activities such as bird-trapping, turtle/terrapin trapping, etc. No drawing of water from tanks, reservoirs and mauns for irrigation without permission No pollution or encroachment of water bodies (Jalkars) by any means	Coordination with District Fisheries Officer and Forest Department
Overexploitation of fish	Protection measures to avoid overexploitation of fish. These include: • identification and protection of breeding grounds • allowing free migration of brooders and juveniles from *beel* to river and *vice versa* • protection of brood stock and juveniles Specific measures that need to be taken include: No fishing in rivers from 15th June to 15th August No use of fishing net or Gill net with less than 4 cm mesh size in rivers No fishing of fingerlings of culturable fishes of any species in rivers and reservoirs	

[134] Generally undertaken in open chaurs (wetlands there is link to the river)

SPECIFIC TEG: KHAGARIA: FISHERIES (CAPTURE): FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Fisheries (Capture Fisheries)

I/We are planning to do fishing in _____ extent of area in _____ water body, out of a total area of _____

We understand the importance of and agree to abide to the following:

- ☐ I/We will not take up activities such as bird-trapping, turtle/terrapin trapping, etc.
- ☐ I/We will not take up any harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals
- ☐ I/We will not take up fishing in rivers from 15th June to 15th August
- ☐ I/We will not use fishing net or Gill net with less than 4 cm mesh size in rivers
- ☐ I/We will not take up fishing of fingerlings of culturable fishes of any species in rivers and reservoirs
- ☐ I/We will not draw water from tanks, reservoirs and mauns for irrigation without permission
- ☐ I/We will not cause any pollution or encroachment of water bodies (Jalkars) by any means

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.9.2 SPECIFIC TEG: KHAGARIA: FISHERIES (Culture Fisheries[135]): BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Weed infestation	Control of Water Hyacinth by periodic harvesting Alternative uses of Water Hyacinth as cattle feed, for bio-gas generation, basket weaving, etc.	Coordination with District Fisheries Officer and other relevant departments (for example BREDA[136] for bio-gas generation)
Overuse of fertilizers (leads to pollution of the water body, algal blooms and loss of fish)	Use of fertilizers (cow dung, lime, etc.) as per recommended quantities: Cow dung – 2000 kg/ha first dose Cow dung – 1000 kg/ha monthly Urea – 25 kg/ha monthly Single super phosphate – 20 kg/ha monthly	Coordination with District Fisheries Officer and Krishi Vignan Kendra for technical support
Loss of biodiversity	In addition to stocking with Indian major carps which are fast growing species, indigenous species such as *Anabas testudineus, Clarias batrachus, Ompok* spp. murrels, *Amblypharyngodon mola*, *Gudusia chapra*, *Puntius* sps may also be used for stocking. The low yield rates of these species can be compensated with the high price they fetch. No support for activities such as bird-trapping, turtle/terrapin trapping, etc. No drawing of water from tanks, reservoirs and mauns for irrigation without permission No pollution or encroachment of water bodies (Jalkars) by any means	Coordination with District Fisheries Officer and Forest Department
Low productivity	Appropriate stocking of fish species (species ratio and density) to be determined based on the availability of food (plankton, benthos, detritus etc.). Indigenous ornamental species like Gold Barb (*Puntius sophore),* Rosy Barb (*P. conchonius),* Labrynth or Banded Gourami (*Colisa fasciatus),* Honey dwarf Gourami *(C. sota)* can be reared for sale as aquarium species.	

[135] Generally undertaken in closed chaurs (wetlands there is no link to the river)
[136] Bihar Renewable Energy Development Agency

SPECIFIC TEG: KHAGARIA: FISHERIES (CULTURE): FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Fisheries (Culture Fisheries)

I/We are planning to do fish culture in _____ extent of area in _____ water body, out of a total area of _____

We understand the importance of and agree to abide to the following:

- ☐ I/We will not take up activities such as bird-trapping, turtle/terrapin trapping, etc.
- ☐ I/We plan to stock fish as per the following details:

Species	Number of fingerlings stocked

- ☐ I/We plan to the following fertilisers in the water body as per the following details:

Fertilizer	Quantity

- ☐ I/We will not draw water from tanks, reservoirs and mauns for irrigation without permission
- ☐ I/We will not cause any pollution or encroachment of water bodies (Jalkars) by any means

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

4.9.3 SPECIFIC TEG: KHAGARIA: DAIRY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Fodder scarcity (poor animal nutrition and productivity, over extraction of local fodder resources) especially during floods	Adoption for fodder cutting through use of chaff cutter	Procurement and provision of chaff cutting equipment through the village level SHG federation for hiring to SHG members at subsidized rates
	Cultivation of green fodder crops and trees	Training on fodder cultivation in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Urea treatment of cereal straws for improving nutrient content	Training on urea treatment of cereal straws in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra
	Practice of rotational grazing for conservation of pastures and grazing lands	Sensitization to village federation members on need to devise and monitor adoption of norms for rotational grazing
	Harvesting of available green fodder from field bunds, harvesting weeds, etc. to augment green fodder availability to animals	Coordination with Department of Animal Husbandry for any technical guidelines in harvesting and use of weed species as fodder
Floods (poor access to fodder and negative impact on animal health)	Establishment of fodder storage banks to meet fodder requirement during floods	Coordination with village level federations to establish fodder banks with support from the Department of Animal Husbandry
	Precautions for animal safety during floods: Prevent animals from drinking stagnated water Prevent animals from feeding on green or wetted dry fodder from water logged areas or mould-infested fodder	
Use of dung as fuel (loss of valuable crop nutrients)	Adoption of efficient method of composting	Training on efficient compost preparation

	(preferably pit method with moisture maintenance, turning over, etc. or more sophisticated methods such as vermicomposting)	(including vermi-composting) in coordination with the Department of Agriculture and Krishi Vignan Kendra
	Promotion of fuel wood plantations, fuel efficient cooking devices	Coordination with Bihar Renewable Energy Development Agency (BREDA) for implementation of relevant schemes
Poor arrangements for shelter for the animal (poor ventilation, poor sanitation and impact on both animal and human health)	Shelter with adequate space and ventilation, with adequate distance from living quarters	Training on urea treatment of fodder in coordination with the Department of Animal Husbandry and Krishi Vignan Kendra

SPECIFIC TEG: KHAGARIA: DAIRY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Dairy

I/We are planning to procure _____ number of animals of _____ breed

For management of fodder for the animals:

- ☐ I/We have access to green fodder resources in the form of _____ in the seasons _____
- ☐ _____ has provided us with information on fodder crops and trees that can be cultivated as I/we plan to cultivate _____ fodder varieties on _____ amount of land
- ☐ _____ has provided us with information on the benefits of fodder chopping and I/we plan to use _____ for cutting fodder
- ☐ _____ has provided us with information on the procedure of treating cereal straw with urea on _____
- ☐ In the event of any flooding during the monsoon I/We propose to meet fodder requirement by _____
- ☐ I/We wish to receive further information on fodder management from _____ and request the federation to arrange for the same by the date _____

For management of animal shelter and compost:

- ☐ I/We have already got an animal shelter with the dimensions of _____ that will house a total of ____ animals including the one/s that are to be procured now
- ☐ _____ has provided us with information on management of the livestock shed (ventilation, space requirement per animal, provision of food and water troughs, collection of dung and urine, efficient composting methods, etc.)
- ☐ The animal dung will be used for the following purposes:
  _____

☐ I/We wish to receive further information on vermi-composting from _____ and request the federation to arrange for the same by the date _____

Any other significant information: _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Name/s of SHG member/s: SHG name: Date:

4.9.4 SPECIFIC TEG: KHAGARIA: MAIZE: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Risk of floods and water logging (young maize plants are highly sensitive to water logging)	In Kharif season Shallow surface drains 40-50 m apart are to be provided across the slope, connected to a main outlet, to drain out water from the field	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA[137] to identify suitable agronomy practices to control water logging
	Use of Quality Protein Maize cultivars such as Shaktiman that also provides green fodder for livestock	
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application Regular weeding to reduce nutrient loss to weeds	Training of CRPs in integrated nutrient management including recommending efficient fertilizer scheduling and application based on results of soil testing
	Intercropping with pulses such as black gram, and rajma, with vegetables such as potato, peas, radish, etc.	
Use of hazardous chemical pesticides (impact on human and environmental health) such as Deltamethrin (Class II), Endosulphan (Class II), Phorate (Class Ia), Carbofuran (Class Ib)	Integrated pest management without the use of pesticides in classes Ia, Ib, and II and use of cultural, physical and other chemical methods (such as crop rotation with mustard, legumes, etc;)	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA to identify suitable IPM package using non-hazardous pesticides Training of CRPs and farmers (for example, through the Farmer's Field School scheme) in identifying common pests and IPM package required
	Use of recommended safety	Training of CRPs in

[137] Agriculture Technology Mission Agency

	measures and gear while using pesticides	building awareness on safety issues in pesticide use
	Use of efficient spraying equipment to prevent wastage and contamination	Procurement and provision of safety equipment (gloves, mask) and efficient spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: KHAGARIA: MAIZE: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Maize Cultivation

I/We are planning to do maize cultivation in _____ extent of land

For management of water logged conditions:

- ☐ I/We will be using _____ drainage methods
- ☐ I/We wish to obtain further information on water management in maize cultivation from _____ and request the federation to arrange for the same by the date _____

For management of any pests that may attack the crop:

- ☐ The pest resistant varieties that we plan to sow are _____
- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ The crop rotation that I/We plan to follow is _____
- ☐ I/We plan to cultivate _____ as intercrops in maize
- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in maize cultivation on _____

☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in maize cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

5. Additional TEGs:

SPECIFIC TEG: WEAVING: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Pulmonary (lung) problems associated with the release of fine dust of cotton or wool during weaving.	Promoting the use of face masks to avoid inhalation of wool or cotton dust. Regular health check up for lung functioning and respiratory problems	Coordination with the cooperatives and the department of health for arranging the health camps
Back pain, neck pain and burning of eyes due to the posture of working and strain on eyes	Regular health checkups	Coordination with the cooperatives and the department of health for arranging the health camps
Use of chemical dyes with hand directly while dyeing clothes	Use of hand gloves for mixing the chemical dyes Proper disposal of waste dye water	
Lack of ventilation and air circulation in the work areas	Providing required ventilation through construction of windows	
Illegal extraction of fuel wood for use in dyeing operations	Fuel wood need to be purchased or extracted with permission from the concerned departments	
Health hazards due to smoke	Fuel efficient smokeless cooking devices need to be promoted	

SPECIFIC TEG: WEAVING: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Weaving

I/We are planning to take up the weaving activity. The weaving unit will be located at _____

For management of ventilation and air circulation in the work area:

- ☐ We will do the activity only in well ventilated spacious area
- ☐ We will construct windows/ventilators for improving the ventilation and air circulation in the work area

For avoiding health related problems:

- ☐ I/We have already got information on hazards associated with chemical dyeing and exposure to cloth dust on _____
- ☐ We wish to use facemasks for protecting our selves from the cloth dust. We request the help of _____ in helping us to purchase good face masks
- ☐ I/We wish to use gloves for protecting our hands from use of harmful chemicals
- ☐ We wish to go for regular checkups at an interval on once in every_____
- ☐ We request _____ to help us in arranging the medical check up camps at an interval of _____

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

SPECIFIC TEG: LEATHER TANNING: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Pollution of water bodies where the used lime water is discarded (hides are soaked in lime water for removal of fat, flesh and hair). Some times to get desired results sodium sulphide and old lime liquor are also added Pollution of water bodies by discarding the water where the leather is soaked in water containing bark of babul or fruits and seeds of terminalia Pollution of water bodies by discarding the water used for deliming along with chemicals like weak acids and salts	Encourage use of enzymes for dehairing process instead of chemicals Use paint, dip or spray method for application of enzymes so that amount of water required is reduced Digging up of pits for disposal of waste water generated instead of disposing them into the water bodies so that the organic waste is decomposed with out contaminating the water bodies	Coordination with leather research institutes for details and technical help of enzymatic tanning process
Blisters on hands and face due to use of chemicals with hand directly	Use of protective hand and face fear like gloves while using chemicals Keeping the first aid kits near work places Regular health checkups	Coordination with department of health for arranging the health camps

SPECIFIC TEG: LEATHER TANNING: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Leather tanning

I/We are planning to take up the leather tanning activity. I/We are planning to do process near _____

For avoiding the pollution of water bodies:

- ☐ I/We got information on enzymatic tanning from _____ on _____
- ☐ I/We wish to do enzymatic tanning and we request for support on _____ by _____
- ☐ I/We will construct pits for disposal of waste water. We will not dispose into water bodies or gutters
- ☐ We propose to undertake safe disposal of solid wastes in the following manner: _____

For avoiding health related problems:

- ☐ I/We wish to use gloves for protecting our hands from use of harmful chemicals
- ☐ We wish to go for regular checkups at an interval of once in every_____
- ☐ We request _____to help us in arranging the medical check up camps

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

SPECIFIC TEG: BRICK MAKING: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of fertile soil from the forest lands (reserve forest), agricultural and grazing lands Loss of agricultural land, and possibility of land becoming unfit for agriculture due to large pits	Use of soil from levelling of the lands or use of tank silt for making bricks	Passing guide lines on restriction on use of soil from forest areas, agricultural lands and grazing lands
Cutting of trees to be used as fuel wood	Use of fuel efficient brick kilns or use of non wood fuel like husk	Coordination with organisation working in the area of energy efficiency like Non Conventional Energy Department

SPECIFIC TEG: BRICK MAKING: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Brick making

I/We are planning to take up brick making activity. I/We are planning to do the activity near _____

For avoiding the loss of fertile soil:

- ☐ I/We will collect the required soil from _____

For avoiding use of trees for fuel wood:

- ☐ I/We wish to use _____ as fuel (to some extent/or in place of) instead of fuel wood
- ☐ We will meet the fuel wood requirement in the following manner: _____
- ☐ We wish to go for fuel efficient brick kilns
- ☐ We request _____ to help us in contacting the departments promoting fuel efficient brick kilns by _____

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

SPECIFIC TEG: CULTIVATION OF MEDICINAL PLANTS: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Extraction of ground water (impact on local ground water aquifers)	Permit for digging of bore well from Ground Water Authority as per the Bihar Ground Water (Regulation and Control of Development and Management) Bill, 2006	Coordination with district level representative of Ground Water Authority to secure permission for digging of bore well
	Proper irrigation scheduling for efficient water use and adoption of water conservation measures	Coordination with Department of Agriculture, Krishi Vignan Kendra and ATMA to identify suitable irrigation schedule and provide training on farm-level water conservation measures
Improper use of chemical fertilizers (impact on soil health, crop nutrition, contamination of local water bodies)	Soil testing	Coordination with soil testing labs of Department of Agriculture
		Training of CRPs in soil testing using mobile soil testing kits
	Proper fertilizer scheduling and efficient application	Training of CRPs in recommending efficient fertilizer scheduling and application based on results of soil testing
Use of hazardous chemical pesticides falling under Class Ia, Ib and II	Integrated pest management without the use of pesticides in classes Ia, Ib, and II	Coordination with Department of Agriculture and Krishi Vignan Kendra to identify suitable IPM package using non-hazardous pesticides Training of CRPs in identifying common pests and IPM package required
	Use of recommended safety measures and gear while using pesticides	Training of CRPs in building awareness on safety issues in pesticide use
	Use of efficient spraying equipment to prevent wastage and contamination	Procurement and provision of safety equipment (gloves, mask) and efficient

		spraying equipment through the village level SHG federation for hiring to SHG farmers at subsidized rates

SPECIFIC TEG: CULTIVATION OF MEDICINAL PLANTS: FRONTEND DOCUMENT

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Cultivation of Medicinal plants

I/We are planning to do Cultivation of medicinal plants in _____ extent of land

For management of any pests that may attack the crop:

- ☐ _____ has provided us with information on pesticides that are hazardous and must not to be used
- ☐ _____ has provided us with information on safety measures that are required while handling pesticides on _____
- ☐ I/We wish to receive further information on pest management from _____ and request the federation to arrange for the same by the date _____

For management of crop nutrition:

- ☐ I/We have already got soil in the field/s tested during the month of _____ at _____
- ☐ I/We wish to get soil in the field/s tested during the month of _____ at _____ and request the federation to arrange for the same
- ☐ _____ has provided us with information on systematic use of natural and chemical fertilizers in paddy cultivation on _____
- ☐ I/We wish to obtain further information on systematic use of natural and chemical fertilizers in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

For management of irrigation:

- ☐ The water resource I/we will be using is _____
- ☐ I/we plan to dig a new borewell
- ☐ I will apply for and take a permit from the Groundwater Authority by myself

- ☐ I request _____ to help me take the permit from the Groundwater Authority
- ☐ _____ has provided us with information on efficient methods of water use in paddy cultivation on _____
- ☐ I/We wish to obtain further information on efficient methods of water use in paddy cultivation from _____ and request the federation to arrange for the same by the date _____

I/We have been informed about the Kissan Call Centre (Toll free no. 1551) and have tested using this service on _____.

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

SPECIFIC TEG: USE OF CHEMICALS IN HOUSEHOLDS: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Skin related and respiratory problems due to handling of chemicals	Training the members on safe use of chemicals	Organising training with help of organisations working on occupational health hazards in small scale industries
	Promoting the use of safety gear like gloves and masks for avoiding contact with chemicals	
	Organising health camps for regular health check ups	Coordination with department of health for arranging health camps
	Provision of first aid kit near the work places	

SPECIFIC TEG: USE OF CHEMICALS IN HOUSEHOLDS: FRONTEND DOCUMENT

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Use of chemicals in households

I/We are planning to do _____activity which involves use of chemicals

For Health problems:

- ☐ I/We got information/training on Health problems associated with the handling of the following chemicals : _____ on _____ date
- ☐ I/We wish to do use safety gear like gloves/face masks while handling the chemicals
- ☐ I/We will keep a first aid kit near the work place
- ☐ We request _____ to help us in arranging the medical check up camps at an interval of _____
- ☐ We request for help of _____in arranging for first aid kit

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

SPECIFIC TEG: MADHUBANI PAINTINGS: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Skin related problems due to handling of fabric paintings frequently	Training the members on safe use of chemicals Washing hands thoroughly after using fabric paints Keeping the paints out of reach of children	Orientation on safety issues as part of any other training programmes
Eye strain due to continuous work	Regular eye check up is required	Organising eye check up camps with the help of department of health

SPECIFIC TEG: MADHUBANI PAINTINGS: FRONTEND DOCUMENT

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Madhubani paintings

I/We are planning to do _____activity which involves use of chemicals

For Health problems:

- ☐ I/We will wash hands using soap after handling the fabric colours
- ☐ I/We will keep the paints out of reach of children
- ☐ We need help of _____ in organising eye check up camps at every _____

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

SPECIFIC TEG: POULTRY: BACKEND REFERENCE SHEET

Possible Issue	*Technical Guidelines*	*Management Guidelines*
Possibility of spread of diseases due to lack of provision on enough space and ventilation	Provision of required space and ventilation to avoid spread of diseases. Required space per full grown bird for egg purpose is 2300-2800 cm^2 and for 2800-3700 cm^2 (for birds of meat purpose)	Orientation to the members with the help of poultry department on the possible diseases and required care to be taken
Housing the diseased birds along with the healthy birds Spread of diseases to other birds, animals and human beings by open disposal of dead birds, chicks and eggs	Separate the diseases birds from the shed and keep them separately Dispose the dead birds properly either by burning or burying	
Bad offensive smell due to litter and droppings	Locate the poultry unit at a safe distance from the residential areas	Provision of guidelines on the safe distance to be maintained from the residential areas
Disposal of litter in open places which may give bad smell and may also spread diseases	Poultry litter has high manure value which can be stored in pits for proper decomposition and can be applied in pits	

SPECIFIC TEG: POULTRY: FRONTEND

For use by Community Coordinator (E1), Cluster or Block Resource Team (E2)
For discussion with SHG members or Producers' Groups / Cooperatives / Associations
Discuss and get this form filled up by the SHG member/s.
Attach the filled in form to the micro-credit plan or sub-project proposal

Level of Assessment (tick): ___ E1; ___ E2
Assessment being done by (tick): ___ Community Coordinator; ___ Cluster Resource Team; ___ Block Resource Team
Level of implementation of proposed activity (tick): ___ SHG or Producers' Group; ___ Village; ___ Cluster; ___ Block; ____ District

Name of activity:
Name of Producer Group:
Name of village:

ENVIRONMENTAL MANAGEMENT PLAN: Poultry

I/We are planning to procure _____ number of birds of _____ breed and are planning to house them in _____of measurements _____

For management of fodder for the animals:

- ☐ I/We will house the diseased birds separately and will dispose the dead birds by _____
- ☐ We will locate the unit at a distance of _____ from the near by residential areas
- ☐ We will store the litter in a _____ and apply to _____or sell to _____ as manure _____
- ☐ I/We wish to receive further information on common diseases of poultry birds and care to be taken

Any other significant information: _____

Name/s of SHG member/s: SHG name: Date:

Environmental Management Implementation and Monitoring Manual

This section details the following aspects of the implementation of the Environmental Management Framework (EMF):

- Integration of the EMF in the project activity cycle
- Institutional Arrangements for Environmental Management
- Capacity building strategy
- Monitoring strategy
- Budget

5.1 Integration of the EMF in the Project Activity Cycle

The BRLP has undertaken value chain analysis of the key livelihood sectors/commodities in each of the six districts to identify the following sub-sector based interventions:

- SRI cultivation
- Participatory Varietal Selection and Promotion Programme
- Dairy initiative
- Fishery
- Apiculture
- Makhana
- Non-farm sector

A three tier structure of commodity based groups and technical service providers is envisaged involving the state, district/block and village levels for facilitating interventions in these areas.

Environmental assessment is viewed a part of the overall appraisal of the proposals. It checks both the individual and cumulative impacts of the proposed sub-sector interventions. The assessment process involves two steps: Screening and Assessment.

Screening helps to ensure that the legal and regulatory requirements of the project are met and that environmental assessment is done at the required level of detail and scale. The *Screening TEG – Section A – Non-permissible activities* has to be referred to first to ensure that the proposed project is not on the list. The *Screening TEG – Section B – Screening for deciding level of assessment* has to be used to determine the environmental categorization (E1, E2, or E3) of the proposed sub-sector intervention.

The E1 level of assessment is for activities that are taken up at the SHG / Producer Group level and have short term negative or positive environmental impact
The E2 level of assessment is for activities that are taken up at the SHG / Producer Group level and have long term negative environmental impact and for all activities taken up at the Cluster / Block level (for checking cumulative impacts)
The E3 level of assessment is for activities that are likely to have significant negative environmental impacts that require specific technical inputs for mitigation and for all E2 sub-projects operating at the level of a district (for checking cumulative impacts)

The assessment for the proposed sub-sector intervention has to be done by the individual/agency prescribed in the *Screening TEG – Section B – Screening for deciding level of assessment*.

The E1 level of assessment is done by the Community Coordinator.
The E2 level of assessment is done by the Cluster Level Support Unit / Cluster Resource Team / Block Resource Team.
The E3 level of assessment is done by an external agency with facilitation by the State Level Resource Agency.

Specific TEGs are available for various sub-sector interventions. In case a specific TEG is not available the *Generic TEG* needs to be used.

The environmental assessment process involves detailed interaction with the concerned Producers' Groups and/or the relevant Federations as well as field visits. The TEGs are to be used as guidelines to study the impacts and make suitable recommendations. Based on this, the TEG Front-End form is to be filled and attached to the proposal document of the sub-sector intervention.

The following table specifies in detail the specific steps to be taken for ensuring that the environmental safeguards are followed through all the stages of the sub-sector interventions, starting from sub-project proposal submission, through the implementation. The specific activities at each step are listed, along with the assignment of the responsibilities.

Responsible Agency	**EMF Activities**	**Outcomes**
PLANNING AND DESIGN STAGE		
Community Coordinator	Awareness programme to prospective Producer Group members on the environmental management aspects of the proposed sub-sector intervention Environmental assessment of Producers' Group proposals of E1 category	
Producers' Group / Cooperative Society / Association members with facilitation by Community Coordinator	Submission of individual / group proposals to Community Coordinator	Completed Front-End TEG form for each individual proposal
Rural Business Hub / Federation / Cooperative (with the assistance of the Cluster Resource Team / Cluster Level Support Unit as well as an external Environmental Appraiser sourced from the relevant line department)	Environmental assessment of Producers' Group proposals of E2 category	Specific TEGs relevant to the proposed sub-sector intervention are prescribed. Unless there are issues requiring revision in the individual / group proposals, environmental clearance is provided for E1 and E2 class sub-sector interventions. For E3 class sub-sector interventions, the

		requirement for EIA study is communicated to the Block Level Coordinator.
Block Level Federation / Cooperative with facilitation by Cluster Resource Team of Technical Support Provider	If the sub-sector intervention is classed E3, an EIA needs to be conducted and its report submitted with the proposal. The EIA report is submitted to the Block Level Coordinator for evaluation.	EIA report is submitted to the Block Level Coordinator, who forwards it to the SPM LI who forwards it to the State Level Environment Resource Agency.
State Level Environment Resource Agency	Commissioning of EIA study (for E3 class sub-sector interventions) Evaluation of the EIA report (for E3 sub-sector interventions) Sub-sector intervention proposal activity is rejected if the EIA report does not adequately address the anticipated environmental impacts. If the EIA report is acceptable, the sub-sector intervention proposal is given the final environmental clearance and forwarded.	Final decision for E3 class sub-sector intervention proposals.
IMPLEMENTATION		
State Level Environment Support Agency	Monitoring and Evaluation 5% of the E1 and E2 class sub-sector interventions in operation are randomly selected for environmental monitoring every year. All E3 class sub-sector interventions are monitored for the specified parameters at the monitoring frequency stipulated in the monitoring plan prepared as a part of the EIA.	Report of each sub-sector intervention selected for Audit. Yearly supervision reports

5.2 Institutional Arrangements for Environmental Management

The overall responsibility for implementation of the EMF will lie with BRLP. It will liaison closely with the community institution partners and ensure that all the provisions of the EMF are adequately met. It will also take on the responsibility of recruiting additional technical assistance for the implementation of the EMF from relevant government departments, NGOs, academic institutions in Bihar. The responsibility of reporting back to the World Bank periodically also lies with BRLP.

Table 21: Primary stakeholders in the BRLP for EMF

BRLP functionaries		*Community institution partners*
State level	*Block level*	
Project management: Chief Executive Officer Additional Chief Executive Officer State Project Managers (CB, SD, LI, MF, IL, M&E) State Level Environment Support Agency *Technical Service Providers for commodity-specific interventions:* State level Technical Service Provider	*Project management:* Block Program Manager Area Coordinator (CB, LI, MF) Community Coordinators Community Resource Persons *Technical Service Providers for commodity-specific interventions:* • SRI intervention o State Resource Team: State Coordinator, Training and Field Coordinator o District Resource Team: District Coordinator, Subject Matter Specialists o Cluster Support Units: Subject Matter Specialists, Skilled Extension Workers • PVSP intervention o State Resource Team: Project Coordinator,	*SHG institutions:* SHG Village/cluster level federation (Gram Sanghatan) Block level federation *Commodity Based Groups or Producers' Groups:* • SRI intervention o SHG level: SRI Producers' Group o VO level: Rural Buisiness Hub o Block level: Producer's company having Rural Livelihoods Support Centre • PVSP intervention o SHG level: PVSP Producers' Groups o VO level: Rural Buisiness Hub o Block level: Producer's company having Rural Livelihoods Support Centre • Dairy initiative

	Training Coordinator, pool of resource persons / experts of Technical Service Provider o District Resource Team: Coordinator, Subject Matter Specialist and MIS Specialist o Cluster Support Units: Cluster Coordinator, Subject Matter Specialists, Skilled Extension Workers • Dairy initiative o State Core Team: Technical Officer o Spear Head Team: Assistant in Procurement and Animal Husbandry o Secretary or Paravet from SHG • Apiculture o Senior Level Management Team o District Resource Team: Project Manager, Management Executives, Federation level CEO o Block Resource Team: Field executives • Makhana o Block Procurement Centre: Resource Persons o Makhana Mitra • Fishery o State Resource	o SHG level: Dairy Cooperative Societies o Block level: District Milk Union • Apiculture o SHG level: Beekeepers Association o VO level: Beekeepers Federation • Fishery o VO level: Fishery Producers' Group o Block level: Fishery Cooperative o District level: Fishery Federation • Makhana o VO level: Makhana Producer's Group o Block level: Makhana Procurement Centre • Non-farm sector o VO level: Producer's Group o Block level: Cluster Level Community Organization o State level: Trade and Finance Facilitation Centre Community Resource Persons and Para Professionals Panchayat-level Bookkeeper

	Team: Senior staff o District Resource Team: Assistant Project Coordinator o Cluster Resource Team: Field Executives • Non-farm sector o State Resource Team o District Resource Team: Assistant Project Coordinator o Cluster Resource Team: Field Coordinator, Shahayak	

The roles and responsibilities of BRLP and its community institution partners are presented in the following table. It must be noted here that in a project such as the BRLP there are bound to be several changes in the organizational structure at the state and block levels. Several new designations may evolve in the course of the project, while some existing designations may be redefined. The EMF responsibilities will thus have to be carried out in tune with the Roles mentioned in column 2. The allocation of roles to the various designated functionaries mentioned in column 1 is only indicative. (In other words, it is important at all times to have, for example, a person carrying on the role of 'Key functionary for overall EMF implementation' at the state level. This may or may not always be the State Project Manager LI). The same holds true for the community institution partners as well. Over time new institutional structures could emerge. However, the responsibilities of the EMF must be integrated with the new structures.

Table 22: Roles and responsibilities of BRLP functionaries in implementation of EMF		
Functionary	*Role*	*Responsibility in implementation of EMF*
State Level – Internal to BRLPS		
Chief Executive Officer	Overall manager for EMF implementation	• Overall responsibility of implementation of EMF in the project (including ensuring coordination among the BRLP functionaries at the state and district levels) • Liaison with government departments at the state level for securing support for EMF implementation (for example, utilize existing government schemes and programmes for training, supply of inputs, etc.) • Ensure that environmental assessment is an integral part of all strategy and planning

		for the sub-sector interventions
State Project Manager LI	Key functionary for overall EMF implementation	• Key functionary at the state level with overall responsibility of implementation of EMF in the project • Ensure that the State Environment Resource Agency is appointed and carries its functions as per its terms of reference • Ensure that all legal and regulatory provisions relevant to the EMF are satisfactorily met through the project processes (for example, non-use of pesticides classified in classes Ia, Ib and II) • Ensure that environmental assessment is an integral part of all strategy and planning for the sub-sector interventions • Ensure regular updating (once every 6 months) and availability of TEGs to all project functionaries and community institution partners • Ensure that all strategy and planning documents for the sub-sector intervention have a reference to the environmental assessment process as part of the overall sub-sector interventions • Ensure development/procurement[138] and availability of IEC materials supporting the TEGs to all project functionaries and community institution partners • Report to the World Bank on EMF progress as part of regular project reporting requirements of BRLP • Use the Bihar Innovations Forum as a vehicle to promote environmentally sustainable practices in the livelihoods activities supported by the BRLP
State Project Manager CB	Key functionary for integration of EMF into CB	• Ensure that all capacity building requirements of the EMF are integrated into the overall CB strategy on a continuing basis and are met efficiently
State Project Manager MF	Key functionary for integration of EMF into MF	• Ensure that all MF initiatives including all credit support provided through SHG savings, through bank linkages, etc., are consistent with the provisions of the EMF (for example, if a bank loan is being sought for collective procurement of agricultural inputs, ensure that the provisions of the TEGs for agricultural sub-projects are referred

[138] IEC materials available from line departments and other relevant institutions may be procured by BRLP

		to and followed)
State Project Manager M&E	Key functionary for ensuring integration of EMF in regular M&E activities of the BRLP	• Ensure that all M&E activities of the BRLP have consistent and accurate reporting on the EMF
		State Level – External to BRLPS
State Level Environmental Resource Agency	Key resource agency for strategy development and faciliatation of EMF implementation	• Responsible for providing state-level support to BRLPS • Advise SPMU on sub-sector inteventions that are not appropriate in view of the nature and severity of the threat they pose to the environment • Review the regulatory requirements periodically and update on a regular basis the Screening TEG – Section A – Non-Permissible Activities • Develop TEGs on a regular basis including for all forthcoming sub-sector interventions • Provide capacity building support including development and delivery of training modules relevant to the EMF • Develop IEC strategy and materials • Provide technical assistance in coordinating environmental assessment process for E3 class individual business plans • Evaluation of the EIA report (for E3 sub-sector interventions) • Monitoring of 5% of the randomly selected E1 and E2 class sub-sector interventions every year. • Monitoring of all E3 class sub-sector interventions for the specified parameters at the monitoring frequency stipulated in the monitoring plan prepared as a part of the EIA. • Facilitate external environmental audits (two for the duration of the project; in III and V years)
		Block Level – Internal to BRLPS
Block Program Manager	Block level functionary for EMF implementation	• Overall responsibility of implementation of EMF in the block (including ensuring coordination among the BRLP functionaries at the block and cluster/village levels) • Liaison with government departments at the district/block level for securing support for EMF implementation (for example, utilize existing government schemes and

		programmes for training, supply of inputs, etc.)
Area Coordinator CB	Key functionary for integration of EMF into CB in the block	• Ensure that all capacity building requirements of the EMF are met on a continuing basis for both the BRLP functionaries as well as for the community institution partners in the block • Ensure that all SHG members, Producers' Groups and federation representatives receive a detailed orientation on the provisions of the EMF on a continuing basis • Ensure identification and training of CRPs as paraprofessionals in sustainable agriculture, livestock management, fisheries, in coordination with relevant Government departments, NGOs, etc.
Area Coordinator LI	Key functionary for overall EMF implementation in the block	• Key functionary at the block level with overall responsibility of implementation of EMF in the block • Ensure that all legal and regulatory provisions relevant to the EMF are satisfactorily met through the project processes (for example, non-use of pesticides classified in classes Ia, Ib and II) • Ensure availability of TEGs to all BRLP functionaries and community institution partners in the block • Ensure that environmental assessment focussing on the *cumulative* impacts of the activities of Producer Groups is conducted for each of the sub-sector interventions • Report to the State Project Manager LI on EMF progress as part of regular reporting requirements
Area Coordinator MF	Key functionary for integration of EMF into MF in the block	• Ensure that all MF initiatives including all credit support provided through SHG savings, through bank linkages, etc., are consistent with the provisions of the EMF (for example, if a bank loan is being sought for collective procurement of agricultural inputs, ensure that the provisions of the TEGs for agricultural sub-projects are referred to and followed)
MIS Officer	Key functionary for ensuring integration of EMF in regular M&E activities at the block	• Ensure that the MIS includes consistent and accurate reporting on the EMF as per the monitoring parameters specified in the TEGs

Community Coordinators		• Organize awareness programmes in the village for prospective producer groups on environmental management specific to the sub-sector intervention being planned • Use the TEGs for conducting the environmental assessment for all activities taken up by the SHGs and Producers' Groups with support through the BRLP (Livelihood Fund, bank linkages). • Attach the TEG Back-End form to all the sub-project intervention porposals • Ensure that all SHG members, Producers' Groups and federation representatives receive a detailed orientation on the provisions of the EMF • Ensure that required technical support is provided for the SHG members for livelihood activities • Identify CRPs who can be trained as paraprofessionals to provide village level services in sustainable agriculture, livestock management, etc. • Ensure that a detailed orientation on the provisions of the EMF is provided to book keepers • Liaison with government departments at the district/block level for securing support for EMF implementation (for example, utilize existing government schemes and programmes for training, supply of inputs, etc.)

Table 23: Roles and responsibilities of Community Institution partners in implementation of EMF		
Functionary	*Role*	*Responsibility in implementation of EMF*
SHG	Key institution for integration of EMF in livelihoods	• Ensure that all members of the SHG integrate the technical recommendations made in the TEG into the relevant livelihood activities • Ensure that discussion on practices, issues and innovations in livelihood activities forms part of agenda for discussion in the SHG on a regular basis. Ensure that this discussion is recorded in the minutes of the SHG and forms basis for further action (for example, discussion on issues with respect to fodder availability in the monsoon months must lead to action such as demand for training on fodder storage, fodder bank, etc.)
Village/cluster	Key institution for	• Ensure that all SHG members in the village/cluster receive technical and necessary

level federation (Gram Sanghatan)	liaison with line departments and other relevant institutions	financial support (access to subsidy schemes, credit) to enable integration of TEG technical recommendations into livelihood activities • Take up village/cluster level initiatives that contribute to sustainability of livelihood activities taken up by the SHGs in the village/cluster (for example, procure and operate a community chaff cutter, undertake preparation and sale of botanical extracts for pest management, etc.) • Identify, ensure training and monitor service provision by Community Resource Persons and Skilled Extension Workers • Ensure that discussion on practices, issues and innovations in livelihood activities forms part of agenda for discussion in the federation on a regular basis. Ensure that this discussion is recorded in the minutes of the federation and forms basis for further action (for example, discussion on issues with respect to pest incidence must lead to action such as demand for technical support on its management) • Integrate information on EMF parameters (specified in the TEG) in the MIS maintained on the livelihood activities taken up by the federation (for example, number of farmers using chaff cutter, area and species composition of agro-forestry, details of permissions taken for activities that require the same, etc.)
Commodity Based Groups or Producers' Groups	Key institution for integration of EMF in the focus activity of the Group	• Ensure that all Commodity Based Group or Producers' Group members in the village/cluster receive technical and necessary financial support (access to subsidy schemes, credit) to enable integration of technical recommendations of TEG into livelihood activities • Integrate initiatives that contribute to sustainability of livelihood activities taken up by the Group in the village/cluster (for example, integrating measures to address occupational health concerns in Agarbatti making) • Identify, ensure training of and monitor service provision by Community Resource Persons and Skilled Extension Workers • Integrate information on EMF parameters (specified in the TEG) in the MIS maintained on the livelihood activity taken up by the Group (for example, number of farmers that received training on integrated nutrient management, number of farmers field where soil testing was done, etc.)

Community Resource Persons	Key functionary for capacity building of community institution partners in the block	• Ensure that in all capacity building programmes to SHGs an emphasis is placed on the role of sustainable livelihoods (including the dimension of environmental sustainability) • In the case of CRPs trained as paraprofessionals, ensure that technical support is provided to all relevant livelihood activities taken up by the SHGs (these may include services such as soil testing, recommendations on fertilizer scheduling, safety measures for use of chemical pesticides, etc.)
Panchayat-level Bookkeeper	Key functionary for ensuring recording of SHG level information on EMF	• Ensure that information on EMF parameters (specified in the TEG) that is discussed in the SHG meetings is recorded in the minutes maintained by the SHG (for example, number of members desiring training in integrated pest management, etc.)

Table 24: Roles and responsibilities of Technical Service Providers for commodity specific interventions in implementation of EMF		
Functionary	*Role*	*Responsibility in implementation of EMF*
SRI intervention		
State Coordinator in State Resource Team	Ensure that the provisions of the EMF are met with respect to SRI interventions	• Ensure that all SRI interventions (production, procurement, etc.) go through the process of environmental assessment at the design stage. Ensure that the TEG on paddy cultivation is referred to and its recommendations are integrated into the design of the SRI interventions. • Ensure that non-permissible pesticides (those in classes Ia, Ib and II of the WHO classification) are not procured, distributed, promoted through the SRI interventions at all levels.
District Coordinator in District Resource Team	Ensure that the provisions of the EMF are met with respect to SRI interventions in the district	• Ensure that all SRI interventions in the district (including input support and training to farmers) go through environmental assessment at the design stage. Ensure that the TEG on paddy cultivation is referred to for conducting the environmental assessment and its recommendations are implemented. • Undertake periodic monitoring to ensure that non-permissible pesticides (those in classes Ia, Ib and II of the WHO classification) are not procured, distributed, promoted

		through the SRI interventions • Through coordination with the line departments and other relevant technical institutions ensure that Producer Groups are trained in integrated nutrient and pest management as part of the training on SRI
Subject Matter Specialists in Cluster Support Units	Ensure that the provisions of the EMF are met with respect to SRI interventions in the cluster	• Conduct the environmental assessment at the design stage by referring to the TEG on paddy cultivation. • Ensure that the technical recommendations made in the environmental assessment are implemented. • Organize periodic training to Producer Groups and monitoring of their practices through the Skilled Extension Workers.
PVSP intervention		
State Resource Team: Project Coordinator	Ensure that the provisions of the EMF are met with respect to PVSP interventions	• Ensure that all PVSP interventions (production, procurement, etc.) go through the process of environmental assessment at the design stage. • Ensure that non-permissible pesticides (those in classes Ia, Ib and II of the WHO classification) are not procured, distributed, promoted through the PVSP interventions at all levels. • Ensure that the Training Coordinator liasions with the line departments and other relevant technical institutions to ensure that Producer Groups are trained in integrated nutrient and pest management
District Resource Team: Coordinator	Ensure that the provisions of the EMF are met with respect to PVSP interventions in the district	• Ensure that all PVSP interventions in the district (including input support and training to farmers) go through environmental assessment at the design stage (by referring to the appropriate TEGs) and that the mitigation measures recommended are implemented • Undertake periodic monitoring to ensure that non-permissible pesticides (those in classes Ia, Ib and II of the WHO classification) are not procured, distributed, promoted through the PVSP interventions • Through coordination with the line departments and other relevant technical institutions ensure that Producer Groups are trained in integrated nutrient and pest management
Cluster Support	Ensure that the	• Conduct the environmental assessment at the design stage by referring to the TEG on

Units: Cluster Coordinator	provisions of the EMF are met with respect to PVSP interventions in the cluster	paddy cultivation. • Ensure that the technical recommendations made in the environmental assessment are implemented. • Organize periodic training to Producer Groups and monitoring of their practices through the Skilled Extension Workers.
		Dairy initiative
State Core Team: Technical Officer	Ensure that the provisions of the EMF are met with respect to Diary initiative	• Ensure that all Dairy interventions (at all levels) go through the process of environmental assessment at the design stage. Ensure that the TEG on Dairy is referred to and its recommendations are integrated into the design of the Dairy interventions. • Coordinate with the state unit of BRLPS and the State Environment Resource Agency to ensure that Dairy interventions that involve construction or expansion of Bulk Cooling Units go through a detailed EIA.
Spear Head Team: Assistant in Procurement and Animal Husbandry	Ensure that the provisions of the EMF are met with respect to Dairy initiative	• Ensure that all Dairy interventions in the district (including input support and training to farmers) go through environmental assessment at the design stage. Ensure that the TEG on dairy is referred to for conducting the environmental assessment and its recommendations are implemented • Through coordination with the line departments and other relevant technical institutions ensure that Producer Groups are trained in good fodder and shelter management as part of the training on animal husbandry interventions
Secretary or Paravet from SHG	Ensure that the provisions of the EMF are met with respect to Dairy interventions in the village	• Conduct the environmental assessment at the design stage by referring to the TEG on Dairy. • Esnure that the technical recommendations made in the environmental assessment are implemented. For example, provide extension support to the Producer Groups in the village on fodder and shelter management
		Apiculture
Senior Level Management Team	Ensure that the provisions of the EMF are met with respect to Apiculture	• Ensure that all Apiculture interventions (including production and processing) go through the process of environmental assessment at the design stage. Ensure that the TEG on Bee Keeping is referred to and its recommendations are integrated into the design of the Apiculture interventions

District Resource Team: Project Manager	Ensure that the provisions of the EMF are met with respect to Apiculture	• Ensure that all Apiculture interventions in the district (including input support and training to farmers) go through environmental assessment at the design stage. Ensure that the TEG on Apiculture is referred to for conducting the environmental assessment and its recommendations are implemented
Block Resource Team: Field executives	Ensure that the provisions of the EMF are met with respect to Apiculture	• Conduct the environmental assessment at the design stage by referring to the TEG on Apiculture • Ensure that the technical recommendations made in the environmental assessment are implemented. For example, provide extension support to the Producer Groups in the village on Bee Keeping
Makhana		
Block Procurement Centre: Resource Persons	Ensure that the provisions of the EMF are met with respect to Makhana	• Conduct environmental assessment at the design stage by referring to the TEG on Makhana. Ensure that the TEG on Makhana cultivation is referred to and its recommendations are integrated into the design of the Makhana interventions (including production and processing) • Undertake periodic monitoring to ensure that non-permissible pesticides (those in classes Ia, Ib and II of the WHO classification) are not procured, distributed, promoted through the Makhana interventions
Makhana Mitra	Ensure that the provisions of the EMF are met with respect to Makhana	• Provide extension support to the Producer Groups in the village on the mitigation measures included in the Makhana TEG
Fishery		
State Resource Team: Senior staff	Ensure that the provisions of the EMF are met with respect to Fishery	• Ensure that all Fishery interventions (including production and processing) go through the process of environmental assessment at the design stage. Ensure that the TEG on Fishery is referred to and its recommendations are integrated into the design of the Fishery interventions
District Resource Team: Assistant Project Coordinator	Ensure that the provisions of the EMF are met with respect to Fishery	• Ensure that all Fishery interventions in the district (including input support and training to farmers) go through environmental assessment at the design stage. Ensure that the TEG on Fishery is referred to for conducting the environmental assessment and its recommendations are implemented

Cluster Resource Team: Field Executives	Ensure that the provisions of the EMF are met with respect to Fishery	• Conduct environmental assessment at the design stage by referring to the TEG on Fishery. Ensure that the TEG's technical recommendations are integrated into the design of the Fishery interventions (including production and processing) • Provide extension support to the Producer Groups in the village on the mitigation measures included in the Fishery TEG
Non-farm sector		
State Resource Team	Ensure that the provisions of the EMF are met with respect to the non-farm sector interventions	• Ensure that all non-farm sector interventions (including production and processing) go through the process of environmental assessment at the design stage. Ensure that the General TEG is referred to and its recommendations are integrated into the design of the interventions especially with regard to: use of chemicals, use of high speed machinery, occupational health concerns, energy use and waste management
District Resource Team: Assistant Project Coordinator	Ensure that the provisions of the EMF are met with respect to the non-farm sector interventions	• Ensure that all non-farm sector interventions in the district (including input support and training to farmers) go through environmental assessment at the design stage. Ensure that the General TEG is referred to for conducting the environmental assessment and its recommendations are implemented
Cluster Resource Team: Field Coordinator, Shahayak	Ensure that the provisions of the EMF are met with respect to the non-farm sector interventions	• Conduct environmental assessment at the design stage by referring to the General TEG. Ensure that the TEG's technical recommendations are integrated into the design of the Non-farm sector interventions • Provide extension support to the Producer Groups in the village on the mitigation measures included in the General TEG especially with regard to: use of chemicals, use of high speed machinery, occupational health and safety, energy use and waste management.

Capacity building strategy

The key tasks in the implementation of the EMF are:

- the implementation of the TEGs in all relevant livelihood activities
- the commissioning of development of TEGs for all emerging livelihood interventions including those related to the Commodity Groups or Producer Groups

The capacity building of the various stakeholders in the BRLP and the community institution partners is aimed at enabling them to execute the above mentioned tasks effectively on a continued basis.

In order to make the capacity building strategy resource efficient the following is recommended:

- The focus should be more on skill enhancement for environmental management of livelihood activities at the community level so that the expertise generated will be relevant and accessible to the SHGs
- Convergence with existing institutions such as the Departments of Agriculture, Fisheries, Animal Husbandry and Krishi Vignan Kendras (as well as with NGOs) will make the capacity building efforts sustainable

The capacity building needs and recommended means for the BRLP functionaries and the community institution partners are as follows:

Table 25 : Capacity building needs and recommended means for the BRLP functionaries					
State and Block levels	*Capacity building needs*	*Means*	*Block level*	*Capacity building needs*	*Means*
Chief Executive Officer Additional Chief Executive Officer State Project Managers (CB, SD, LI, MF, IL, M&E) Block Project Manager Area Coordinator (CB, LI, MF) State Resource Team District Resource Team	Appreciation on the need for EMF Understanding of the provisions of EMF (especially implementation of TEGs, capacity building and monitoring) Clarity on the roles and responsibilities of BRLP functionaries and community institution partners with respect to the EMF Appreciation on the need and mechanisms for convergence with government and academic institutions as well as NGOs for implementation of the TEGs	Initial orientation programme to the EMF conducted at the state level for one day duration	Cluster Resource Team / Cluster Level Support Unit Community Coordinators	Need for environmental management for livelihood sustainability EMF provisions in BRLP Convergence possibilities with government and academic institutions as well as NGOs Effective use of IEC materials to communicate the provisions of the TEGs	Orientation programme on the EMF conducted initially at the state level (during the pilot phase of the project) for one day
	Regular update on emerging livelihood interventions and need for TEGs Update on technical	Half-yearly refresher programmes on EMF conducted at the state level for half day duration (preferably as		Regular update on emerging environmental management issues in livelihood activities	Monthly refresher programmes on EMF conducted at the block level for half day duration (preferably as

	and financial support available from relevant line departments, NGOs, etc. (e.g., subsidy schemes, training opportunities, etc.)	part of any review meetings on livelihoods or on the whole of BRLP activities)		and need for TEGs Update on technical and financial support available from relevant line departments, NGOs, etc. (e.g., subsidy schemes, training opportunities, etc.)	part of any review meetings on livelihoods or on the whole of BRLP activities in the block)

The State Level Environment Resource Agency with the involvement of the Technical Support Providers at the State, District and Cluster levels will provide the capacity building inputs to the BRLP functionaries.

5.3.1 IEC materials to be developed as part of capacity building

Apart from actually developing and delivering the training modules, the State Level Environment Resource Agency will develop training, education and communication materials for the BRLP functionaries. The following table presents an indicative list of IEC materials that need to be developed by the State Level Environment Resource Agency in the local language.

Table 26 : IEC materials to be developed as part of EMF

Material for BRLP functionaries	*Material for Community Institution Partners*
Manual on EMF including TEGs (Back-End and Front-End)	Posters on TEGs: each poster depicting the technical guidelines for environmental management in each sub-sector intervention
Front-End TEG forms (to be integrated into the sub-sector intervention proposal forms)	Flip charts on environmental management in each sub-sector intervention, including: Flip chart on integrated nutrient management Flip chart on integrated pest management Flip chart on SRI Flip chart on livestock management

	Songs, playlets, etc., promoting awareness on environmental management as part of traditional media (such as Kala Jatha)
Documentation of case studies illustrating good environmental management from within the BRLP SHGs and Producers' Groups	Video documentation of case studies illustrating good environmental management from within the BRLP SHGs and Producers' Groups

Table 27 : Capacity building needs and recommended means for the community institution partners			
Community institution partners	*Capacity building needs*	*Means*	*Institutional (internal and external) resources that may be utilized*

SHGs, Producers' Groups / Associations / Cooperatives and their federations at the village, cluster and block levels including Community Resource Persons and Skilled Extension Workers (e.g. Para Veterinarian, Makhana Mitra)	<u>Community Resource Persons and Skilled Extension Workers:</u> Understanding of TEGs and how they relate to sustainable livelihoods Coping with floods including preparedness, monitoring, etc. Mechanisms for implementation of TEGs in livelihood interventions of BRLP Appreciation of existing technical and financial support available from relevant line departments, NGOs, etc. (e.g., subsidy schemes, training opportunities, etc.) and need of empowering community to access the same Effective use of IEC materials to communicate the provisions of the TEGs Use of the Kissan Call Centre (Toll free no. 1551) for accessing extension support <u>Skilled Extension Workers:</u> <u>Skilled Extension Workers in Agriculture:</u> *<u>Crops</u>*: Soil testing using mobile soil testing kit Integrated nutrient management Integrated pest management and pesticide safety Water conservation Flood mitigation (where applicable) Agronomic practices for various crops *Livestock*:	Orientation and refresher programmes on EMF as part of all training provided to SHG leaders and members on livelihood interventions, microcredit, etc. Incorporation of EMF as one of themes on which 'cultural performance teams[139]' will conduct outreach programmes in villages All CRPs and Skilled Extension Workers must receive inputs on EMF as part of their regular training inputs on a regular basis – half-day refresher session on the EMF every three months will be necessary after an initial 2 day orientation Skilled Extension Workers in Agriculture (one per village) will need to be trained intensively over a period of time as the training must be focused on skill acquisition. The detailed content training module will have to be worked out in consultation with the training providers.	Cluster Resource Team / Cluster Level Support Unit Community Resource Persons Community Coordinators Relevant line departments, Krishi Vignan Kendras and ATMA centres operating at the district level

Panchayat-level Bookkeeper	Understanding of TEGs and how they relate to sustainable livelihoods Systematic recording of information on EMF parameters (specified in the TEG) that is discussed in the SHG meetings in the minutes maintained by the SHG	Orientation and refresher programmes on EMF as part of all training provided to panchayat-level bookkeepers	Cluster Resource Team / Cluster Level Support Unit Community Coordinators
Village/cluster level federation (Gram Sanghatan)	Understanding of TEGs and how they relate to sustainable livelihoods Identification of environmental management issues at the village ecosystem scale for ensuring sustainability of positive livelihood outcomes (e.g. determining the number of livestock units that can be managed efficiently with the village fodder resources) Identification of environmental management interventions that can be taken up at the village ecosystem scale for ensuring positive livelihood outcomes (e.g. establishing norms for sustainable fishing practices) Awareness of existing technical and financial support available from relevant line departments, NGOs, etc. Norms for identification of individuals for relevant training programmes, subsidy schemes, demonstration plots, etc. and plan for	Orientation and refresher programmes on EMF as part of all training provided to federation leaders and members on livelihood interventions, microcredit, etc. Special days to be announced by the BRLP every year to focus the attention of the federation members on themes such as: • Fodder management • Organic farming • Sustainable use of wetlands For example, all village federation meetings held in the months of April-May could discuss 'organic farming' as part of the agenda. The block agriculture officer could be invited to the meeting to discuss possible convergence with existing schemes such as vermi-composting, training on IPM, etc. This will facilitate some farmers adopting these practices in the Kharif season. These days will serve to identify village level needs and required actions.	Cluster Resource Team / Cluster Level Support Unit Community Resource Persons Para-Sustainable Agriculture Workers Community Coordinators Area Coordinators (CB, LI, MF)

	subsequent scaling up of benefits to all SHG members Awareness of regulatory requirements (as per the requirements of the EMF) for certain livelihood interventions Use of the Kissan Call Centre (Toll free no. 1551) for accessing extension support		
Block level federation	Awareness of regulatory requirements (as per the requirements of the EMF) for certain livelihood interventions	-do-	District Resource Team Block Project Manager Area Coordinators (CB, LI, MF)

5.3.2 Supplementary Studies neccessary for strengthening the EMF

The following supplementary studies are recommended to be commissioned to further strengthen the EMF:

Coping with Floods: Floods are a critical factor influencing livelihoods in Bihar as a whole and North Bihar in particular. It is important to focus on ways in which the resources and skills of the poor can be enhanced to enable them to cope with the floods. A study is necessary to identify such resources and skills as well as the ways in which they can be built up. The study should include but not be limited to: Flood mitigation in agriculture (including crop and animal husbandry), sanitation and hygiene during floods, etc.

Non-Chemical Pest Management Options: Bihar is not a heavy consumer of chemical pesticides. However, the use of chemical pesticides that are not permissible in the World Bank supported projects (Classes Ia, Ib and II) is common in the state, especially as they are recommended by the Agriculture Department and University. A detailed study is thus required to identify proven safe alteratives (chemical pesticides in the permissible classes and more importantly non-chemical pest management options). The study

must focus on the compilation and analysis of available information and experinence in this area and make practical recommendations for the BRLP.

Coping with the Fuel Crisis: The fuel wood crisis in Bihar has resulted in use of cattle dung as fuel and the consequent loss of the option to replenish soil nutirents with farm yard manure. The twin issues of current fuel availability as well as the long term agricultural sustainability requires that alternative options for meeting fuel needs must be explored. These may include biogas, fuel efficient stoves, energy plantations, etc.

Detailed terms of reference for the above three studies have to be worked out in consultation with agencies such as the department of disaster management, the agriculture department and university, the renewable energy department, etc.

5.4 Monitoring and Audit Strategy

The monitoring of the EMF implementation is done at two levels: (i) monitoring by BRLP through its internal monitoring systems, and (ii) audit by BRLP by sourcing external assistance. The key parametres for the monitoring and the audit will however be the same.

It is proposed that this external audit be conducted twice during the duration of the project – once in the 3rd year and once in the 5th year of its implementation. An independent organization (preferably civil society organization or academic institution or extension institution) will be appointed for the purpose.

The principal objectives of the audit will be the following:

- Evaluate the effectiveness of the EMF implementation including the procedures and components through the process of stakeholder consultations.
- Assess the accuracy of application of the environmental screening process.
- Assess the degree of compliance with the legal and regulatory framework of the EMF.
- Assess the technical viability and user-friendliness of the TEGs.
- Assess the implementation and effectiveness of the mitigation measures suggested in the TEGs.
- Report qualitatively and quantitatively on the cumulative impact (positive and negative) of the sub-sector interventions on the environment
- Evaluate the implementation of capacity building programmes including awareness and skill building programmes.
- Assess the adequacy of staffing and environmental capacity in the project implementation structure at all levels (village, district and state) and recommend changes to address the identified weaknesses, if any.
- Understand the changing environmental conditions and emerging environmental concerns in the BRLP areas, and recommend revisions to the EMF in this regard

Depending on the results of the above evaluation, the audit must rate the environmental performance in accordance to World Bank criteria as described below:

1. Highly satisfactory: Projects where the environmental components are being implemented in a timely and satisfactory manner.
2. Satisfactory: Projects where there are some unpredicted impacts but they do not undermine the progress of execution of projects and are addressed by the responsible agency, fall in the satisfactory category.
3. Unsatisfactory: Projects where, there are major problems in execution due to unexpected environmental impacts fall in this category. The measures suggested through the TEGs are not being addressed properly.

The external audit will include a review of SHG livelihood activities in various sectors as well as the sub-sector interventions. A suitable sample size (around 2-3 subprojects in each type) covering all districts and all livelihood sectors will be drawn up for the purpose. Care should be taken that the sample includes activities falling under E1, E2 and E3.

The key environmental management monitoring indicators that will aid in the Monitoring (internal) and Audit (external) are as follows:

Table 28 : Environmental Management Monitoring Indicators			
Key aspects	*Indicators*	*Frequency of monitoring (for internal monitoring)*	*Responsibility of monitoring (for internal monitoring)*
Management Aspects (mostly to be monitored through desk reviews)			
Service delivery by State Level Environment Resource Agency	Reports indicating completion of tasks as per the terms of reference	Quarterly	State Project Manager LI reporting to Chief Executive Officer
Development and availability of TEGs to BRLP functionaries and community institution partners	Availability of Front-End and Back-End TEGs in the local language at all levels	Quarterly	State Level Environment Resource Agency reporting to State Project Manager LI
Capacity building to BRLP functionaries and community institution partners on the EMF	Number and content of awareness and training programmes provided as against the capacity building strategy specified in the EMF	Quarterly	State Level Environment Resource Agency reporting to State Project Manager LI
Environmental Assessment conducted for all sub-sector interventions and recommendations for mitigation made in the TEGs integrated into the sub-sector intervention proposals	Percentage of sub-sector intervention proposals that have the filled in Front-End TEGs attached	Quarterly	State Level Environment Resource Agency reporting to State Project Manager LI
Technical Aspects (mostly to be monitored through field work)			
Agriculture and Horticulture		Annual	State Level Environment Resource Agency reporting to State Project Manager LI
Permit for digging of bore well from Ground Water Authority	Availability of copy of the permit		
Maintenance of minimum distance of 250 mts between borewells	Distance from nearest borewell		
Proper irrigation scheduling	Evidence of technical extension support taken for irirgation scheduling		

Soil testing	Copy of soil test report		
Proper fertilizer scheduling and efficient application	Evidence of technical extension support taken for fertilizer scheduling		
Integrated pest management (IPM) without the use of pesticides in classes Ia, Ib, and II	Names of the pesticides used Evidence of technical extension support taken for IPM		
Use of recommended safety measures and gear while using pesticides	Evidence of technical extension support taken for pesticide safety		
Use of efficient spraying equipment to prevent wastage and contamination			
Adoption of flood preparedness measures	Evidence of technical extension support taken for flood preparedness		
Dairy		Annual	State Level Environment Resource Agency reporting to State Project Manager LI
Adoption of chaff cutter	Availability and use of chaff cutting equipment		
Cultivation of green fodder	Quality and quantity of green fodder cultivated		
Urea treatment of cereal straws	Practice of urea treatment		
Practice of rotational grazing and harvesting	Norms for rotational grazing and harvesting		
Method of composting	Evidence of pit method of composting		
Promotion of fuel wood plantations, fuel efficient cooking devices	Quantity of fueld wood generated		
Shelter with adequate space and ventilation	Space per animal		
Agarbatti		Annual	State Level Environment Resource Agency reporting to State Project Manager LI
Space and ventilation in work space	Space per person		
Occupational safety measures such as use of gloves and masks	Availability and use of safety equipment		

Social forestry for raw material availability	Area and species composition		
Fishery - Capture		Annual	State Level Environment Resource Agency reporting to State Project Manager LI
Incidence of harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals	Type of capture methods used		
Incidence of support for activities such as bird-trapping, turtle/terrapin trapping, etc.			
Incidence of pollution or encroachment of water bodies	Visual observation of pollution such as algal bloom, waste dumps, etc.		
Practice of no fishing period in rivers from 15th June to 15th August	Period of no fishing		
Use of fishing net or Gill net with less than 4 cm mesh size in rivers	Type and mesh size of net used		
Incidence of fishing of fingerlings	Size of fish captured		
Fishery - Culture		Annual	State Level Environment Resource Agency reporting to State Project Manager LI
Mechanisms for Control of Water Hyacinth Alternative uses of Water Hyacinth	Presence of Water Hyacinth		
Quantity and quality of fertilizers used	Evidence of technical extension support taken for fertilizer scheduling		
Species density and composition (layering, indigenous species)	Evidence of technical extension support taken		
Incidence of activities such as bird-trapping, turtle/terrapin trapping, etc.			
Makhana		Annual	State Level Environment Resource Agency reporting to State Project Manager LI
Reservation of cultivation-free patches within wetlands for conservation	Percentage of total water body under cultivation		
Use of traditional varieties of Makhana	Varieties of Makhana cultivated		
Quantity and quality of manures and fertilizers applied	Evidence of technical extension support taken for fertilizer		

	scheduling		
Integrated pest management (IPM) without the use of pesticides in classes Ia, Ib, and II	Names of the pesticides used Evidence of technical extension support taken for IPM		
Use of recommended safety measures and gear while using pesticides	Evidence of technical extension support taken for pesticide safety		
Use of safety gear during Makhana processing			

5.5 Budget

(Total for 4 years from the 2nd to the 5th year of the project)

S.No.	*Budget Head*	*Details*	*Amount in INR (in lakhs)*
1	Appointment of State Level Environmental Resource Agency	One time appointment costs including advertisement, procurement procedures, etc.	0.5
2	**Development and printing of IEC materials**	**Manual on EMF @ 0.5 lakh (1000 copies)** **Front-End TEG forms @ 0.5 lakh** **Documentation of case studies @ 1 lakh (1000 copies)** **Posters on TEGs @ 1.5 lakh (1000 copies)** **Flip charts on TEGs @ 1 lakh per flip chart of 4 flip charts (1000 copies each)** **Video documentation of case studies @ 2.5 lakh (100 copies)**	**0.5** **0.5** **1** **1.5** **4** **2.5**
		Sub-total of S.No.2	10
3	Training of BRLP functionaries and community institution partners at various levels	Training of BRLP functionaries: **Initial orientation programme at state level of 1 day duration @ Rs 0.5 lakh** **Initial orientation programme at state level for cluster and block level staff of 1 day duration @ Rs 1 lakh** **Half yearly refresher programmes at state level of ½ day duration @ Rs 0.25 lakh for 8** programmes Monthly refresher programmes at block	0.5 1 2

		level of ½ day duration @ Rs 0.25 lakh per district per year for 6 districts <u>Training of community institution partners:</u> **Initial orientation programmes of 2 day duration @ Rs 1 lakh per district** **Refresher programmes of ½ day duration @ Rs 0.25 lakh per district for 16 programmes** Cultural performances @ Rs 1 lakh per district for the whole project duration for 10 programmes per year **Skill based training of Skilled Extension Workers in EMF @ Rs 1 lakh per training for 3 sub-sector interventions (Agriculture, Animal Husbandry, Fishery)** Integration of EMF into trainings for book keepers, federation members, etc. @ Rs. 1 lakh per district	6 2 4 6 3 6
		Sub-Total of S.No.3	30.5
4	**Monitoring**	**3 monitoring visits @ Rs. 2 lakh each**	**6**
5	External audit	2 audits @ Rs. 2 lakh each	4
6	Supplementary studies	3 studies @ Rs. 1.5 lakh each	4.5
		Total	55.5

PS: The budget details marked out in bold are for the tasks that are to be outsourced to the State Level Environmental Resource Agency.

Annexure 1

Package of practices for rice cultivation in Bihar[140]

Varieties

(A) For Kharif Season

(a) Upland/Rainfed Condition: Pusa 2-21; Turanta (only 75 days crop); Prabhat (only 90 days crop); C.R.44-35 (Saket-4); Saroj; Birsa Dhan 105; Birsa Dhan 201; Birsa Dhan 202; Dhanlaxmi; Kanchan; Kalinga -III; Richharia; Aditya; Tulasi; Vandana.

(b) Medium Land: B.R.34; I.R.36; C.R.1002; Rajendra Dhan 201; Sita; Kanak; Mansuri; Sujata; Jai shree; Raj Shree; Pankaj; Swarna; Janaki; Radha; Savitri; Salivahana, MTU-7029, Sonam, BPT-5204, BPT-1001, Nata Mahsuri, Heera, Satyam, Punjab Parimal.

(c) Low Land: B.R.8; C.R.1002; Satyam; Kishori; Raj Shree; Pankaj; Swarnadhan; Mansuri; Shyamala; Kranti; Surekha; Vaidehi; Radha Shakuntala; Santosh; Mahamaya; T 141.

(d) Deep Water: Janaki; Vaidehi; Sudha; Jaladhi-I; Jaladhi-II; Jalmagna.

(B) For Winter Season: Gautam; Dhanlaxmi; Richharia; Saroj.

(C) For Summer Season: Gautam; Pusa-33; Pusa-2-21; C.R. 44-35 (Saket-4); Prabhat (only 90 days crop); Turanta (only 75 days crop).

(D) Scented Rice: Sugandha; B.R.-9; Kamini; Katarni, Basmati 370.

(E) Hybrid Rice: PA 6201, Hybrid-6204.

Time of Sowing/Harvesting

Seasons	Sowing	Harvesting
(A) In Kharif	June	October-November
(B) In Rabi/Winter	October-November	April-May
(C) Summer	1-15 March	June-July

Time of Transplanting
25~30 days after sowing.

Seed Rate
(a) Direct Sowing: 90~100 Kg/Ha.
(b) Transplanting: 30~50 Kg / Ha.

Seed Treatment
60 gm Ceresan 2.5% WP or other Organo Mercurial Fungicides (Seed should be dipped in the water).

Spacing
(a) 20 X 30 cm.
(b) 2-3 Seedlings/Hill.
Nursery Area: 1/20th parts for one hectare.

Manures and Fertilizers
FYM/Compost: 10~15 Cartload (Compost: N=0.5~0.5%; P=1.5%; K=2.3%)
Nitrogen: 100~150 Kg/Ha.
Phosphorous: 50~60 Kg P2O5/Ha. (P = P2O5 x 0.44 & P2O5 = P x 2.29)
Potash: 40~50 Kg K2O/Ha. (K = K2O x 0.83 & K2O = K x 1.20)
Zinc Sulphate: 25 Kg/Ha. (22~35% Zn)
Green Manuring Crops: Sanai; Dhaincha; Moong/Urd, etc.

Weed Management
(A) Hand Weeding: 2 Times
(B) Chemical Weeding
(i) Direct Sowing:
(a) As Post-Emergence
Spray Butachlor 50 E.C. or Thiobencarb 50 E.C. @ 2-3 litre/ha in 700-800 litre of water after 2-3 days of sowing to control all types of weeds.
(b) As Pre-Emergence
Spray Alachlor 50 E.C. or Butachlor 50 EC @ 4 lit./ha before sowing in upland condition to check the germination of all weed seeds.
(ii) Transplanted Rice Field : Spray Anilophos 30 E.C. 0.4 lit./ha or Oxyflorfen 200 g/ha or Butachlor 50 E.C. 2 lit./ha in 600-700 lit. of water after 5-7 days of sowing to control all types of weeds. Standing water in the field shouldn't be > 5 cm.
(iii) Deep Water Rice: Apply Butachlor 5% or Thiobencarb 5% or Anilophos 5% granules 20-25 Kg or Copper Sulphate Powder @ 15-20 Kg/ha mixed with 100 Kg sand and broadcast in the field after 2-3 days of transplanting to control aquatic weeds.

Insects/Pests and their Management
(a) Stem borer or leaf cutting insects: To control the insects like leaf roller, Case worm, Army insects etc. spray Chlorpyriphos 1 lit. or Endosulfan or Quinolphos 1.5 lit./ha and add Tipol 5 ml/10 lit.of water during at the time of spray. To control Babhani insects spray Phosphymidon @4-5 ml/10 lit.of water or Monocrotophos @ 1 ml/lit. of water.
(b) Juice sucking insects: To control the insects like Madhua , Dhahiya insects and Thrips apply granular insecticides like Carbofuron, phorate, Quinolphos etc. Beside these, farmers can spray Phosphymidon @ 4-5 ml/10 lit.of water or Monocrotophos @ 10 ml/10lit. of water or Methyl Dimeton (Metasystox) 1 ml/lit. of water. Grow resistant rice varieties like Kanak, Satyam, Kishori and Satyam to control the insects like Madhua or broadcast Thimmet 10 per cent granules @ 10 Kg + 5 Kg Neem cake in 2-5 cm standing water in the field.

(c) Rice Gandhi Bug: To control the Rice Gandhi Bug broadcast Endosulfan 4 per cent dust or Quinolphos 1.5 per cent dust @ 10 Kg/acre.
(d) Gallmidge Fly (Sarha insects): (1) To control Gallmidge Fly grow resistant rice varieties like I.R.36 and Rajendra Dhan 202.
(2) Dip the root of the seedling before transplanting in solution of Chlorpyriphos 20 E.C. @ 0.02 % + 4 % urea (0.5 lit. Chlorpyriphos in 25 lit. of water) for 3-4 hours.
(3) Where Gallmidge is a serious problem in every year, apply Carbofuron 3G @16 Kg or phorate 10G @ 5Kg or Quinolphos 5G @ 10 Kg per hectare after 15-20 days of transplanting. Repeat the same insecticide after 40 days of transplanting. During application of the insecticide 6-7 cm standing water for 3-4 days in the field is essential.
(4) Spray liquid insecticides like Monocrotophos 36 E.C. @ 1000 ml/ha or Fenthion 100 E.C. @ 500 ml/ha or phosalon 35 E.C. @ 1500 ml/ha.
(5) Apply 5 % Neem oil to control Gallmidge.
(e) Brown & Green Hopper: To control both types of hopper apply Furadon 3G granules @ 30 Kg per hectare or Thimmet 10 % @ 10 Kg/ha or Dimecron 100E.C. @ 0.5 ml in one litre of water or Rogor 30 E.C. @ 1.75 ml in one litre of water.
(f) Rice Hispa: Drain out the field. For chemical control apply Endosulfan 35 E.C. @ 1.25 lit./ha or Quinolphos 25 E.C. @ 1.25 lit./ha or Phosphomidon 85 E.C.@ 300 ml/ha.
Pest Management
(a) Snails: (1) Effective control of snails to collect their eggs and dip in 10% salt solution.
(2) To kill the snails apply Carbofuron 3G @ 25 Kg/ha.
(b) Rat: (1) Aluminium Phosphide – keep 3 gm peillets in each live burrow and close the hole with mud.
(2) Zinc Phosphoide – Mix 1 gm Zinc Phosphide with 40 parts edible flour + linseed oil and make 5 gm pillets as bait.
(3) Bromodiolon: Keep 15-20 gm poisonous bait in each burrow.

Diseases and their Management
(a) Blast: Casual Organism: *Pyricularia Grisera*
Symptoms: The leaves show spindle shaped spots with grey centre and dark brown margin. The lesions enlarge and cause drying of leaves. The nodes and neck regions turn black and cause rotting and breaking with complete/partial chaffiness of earhead. Intermittent drizzles, cloudy and overcast conditions, long dew periods, continuous low night temperature (below 20 degree celcious), high relative humidity and susceptible varieties spread disease.
Control: (a) Grow resistant varieties like IR 20 IR-8, Jaya, Pankaj Ratna etc. (b) Seed treatment with Agrosan G.N. or Seresan or Thiram or Carbendazim @ 2 g/Kg of seeds.
(c) Spray 0.1 % Hinosan 50 E.C. (4-5 times), Carbendazim 250 gm or Tricyclazole 75 wp @ 500 gm/ha.
(b) Brown Spot: Casual Organism: *Helminthosporium Oryzae*
Symptoms: The leaves show oval shaped foliar spots with yellow halo.Severely affected field presents a reddish appearance. Grain becomes discoloured.
Control: (a) Grow resistant varieties like IR-24, Bala, Krishana etc. (b) Seed treatment with Thiram or Carbendazim @ 2 g/Kg of seeds. (c) Spray Edifenphos @ 500 ml/ha or Mancozeb @ 1 Kg/ha. (d) Application of Neem coated urea.
(c) Sheath Blight: Casual Organism: *Rhizoctonia Solani*

Symptoms: The disease affects at tillering stage. The infection starts in the form elliptical or oval greenish grey spots appearing on the leaf sheaths near the water level. These enlarge as irregular, elongated spots with white centre brown margin and progressively spread upwards on stem and leaves. The entire plant is blighted and dries up.
A dry spell followed by shower, high relative humidity, closer planting, excess N application favors the spread of disease.
Control: (a) Grow resistant varieties like Rajendra Dhan 201, IR 36, IR 20, Saket, Prabhat, Turant Dhan, Raj Shree etc. (b) Seed treatment with Carbendazim @ 2 gm/Kg of seed. (c) Adequate drainage facilities to be provided. (d) Spray Streptocyclin 250 gm and Blitox 50 E.C. @ 2.5 Kg in 1000 lit. of water 3 times at 10-15 days interval, Endofil –M 45 @ 3 gm/ lit. of water.
(d) Sheath Rot: Casual Organism: *Saracladium Oryzae*
Symptoms: The Diseases affects at booting stage. The uppermost leaf sheath enclosing the young panicle shows oblong or irregular spots with grey centre and brown margin. The boot leaf becomes brownish black and rotten. The grains ill filled and discoloured. The disease spreads through airborne conidia. Closer planting high humidity and low temp. (25-30 C), injuries caused by earhead bug and mealy bugs, predispose the plants to infection.
Control: (a) Application of gypsum @ 500 Kg/ha basally or in two equal splits (basal and tillering stage). (b) Spray Bavistin @ 500 gm or Endofil –M 45 @ 2.5 Kg /ha, Dimecron or Metasystox along with Edifenphos @ 500 ml or Carbendazim @ 250 gm or Mancozeb @ 1 Kg/ha at boot leaf stage.
(e) Bacterial Leaf Blight: Causal organism: *Xanthomonas Oryzae*
Symptoms: It is also known as seedling blight in nursery. Death of young plants is observed 2-3 weeks after transplanting. Appear as yellowish or dull greenish water soaked spots or straw coloured lesions at the tip of the leaves which latter extend downwards and towards the centre with characteristic wavy margins. The leaf becomes blighted and turns straw coloured under cool and humid conditions, minute yellowish crusts or pearly, bead like bacterial exudates can be seen over the infected leaf tissue.
Control: (a) Grow resistant varieties like IR-20, IR-36, Saket-4, Rajendra Dhan 200, Pusa-2-21, Ratna etc. (b) Spray and 5 gm Agrimycin-100 and 500 gm Copper oxychloride e.g. phytolan, Blitox 50 in 500 lit. of water per hectare 3-4 times. (c) Spray Streptomycin sulphate + Tetracyclin combination 300g + Copper oxychloride @ 1.25 Kg/ha and repeat after 10 days. (d) Spray Nickel nitrate) @ 0.3 %.
(f) Rice Tungro Virus: RTV: The virus is transmitted by the Green leaf hopper *N. virescens and N. niggropictus.*
Symptoms: The diseased plants exibit orange yellow discolouration of leaves from the tip downwards. The young leaves show mosaic mottling. The plants are dwarfed with poor tillering and become sterile.
Control : (a) Grow resistant varieties like IR-20, Ratna etc. (b) Spray Diazinon a.i. @ 1.5 Kg/ha 5 times. First spray10 days after sowing and rest after transplanting at 15, 30, 45 and 60 days. (c) Use light trap to attract and control the leaf hopper vector.
(g) Grain Discolouration: The discoloured grains are found associated with fungi like *Helminthosporium* sp., *Curvularia lunata*, *Saracladium oryzae*, *Alternaria tenuis*, *Fusarium moniliforme*, *Cephalosporium* sp. and Phoma sp. The disease appears on the

grains during the maturity stage when there are incessant rains. The disease is more severe during 2nd season.
Control: (a) Seed treatment with Thiram or Captan @ 1gm/Kg of seed. (b) Spray Mancozeb @ 1 Kg or IBP 500 ml or Carbendazim @ 250 gm/ha at boot leaf stage.

Annexure 2

National Standards of Organic Farming

Ministry of Commerce under the National Programme for Organic Production has prescribed National Standards for Organic Production. These standards are grouped under following six categories:

1. Conversion
2. Crop production
3. Animal husbandry
4. Food processing and handling
5. Labeling
6. Storage and transport

1. Conversion Requirements

The time between the start of organic management and cultivation of crops or animal husbandry is known as the conversion period. The whole farm including the livestock should be converted to the standards over a period of time. All standard requirements should be met during conversion period. If the whole farm is not converted then the two must be separate and inspectible. Regular inspections during the conversion period should be carried out.

Simultaneous productions of conventional or in conversion and\or organic which can not be distinguished clearly are not allowed. To ensure clear separation the certification programme shall inspect the whole production system. Full conversion period is not required where organic farming practices are already in use. But this has to be verified by the inspection agency.

Maintenance of organic management

Organic certification is based on continuance. The certification programme should certify the production, which is likely to be maintained on a long term basis. The converted land and animals shall not get switched back and forth between organic and conventional management.

Landscape

Organic farming should contribute beneficially to the ecosystem. Areas which should be managed properly and linked to facilitate biodiversity are:

- Extensive grassland
- All areas which are not under rotation and are not heavily manured
- Pastures, meadows, orchards, hedges, hedgerows etc
- Ecologically rich fallow land or arable land
- Ecologically diversified field margins
- Waterways, pools, springs, ditches, wetland, swamps

The certification programme shall set standards for a minimum percentage of the farm area to facilitate biodiversity and nature conservation.

2. Crop Production

2.1 Choice of crops and varieties – All seeds and planting materials should be certified organic, well adapted to local climatic conditions and resistant to pests and diseases. If certified organic seed or planting material is not available then chemically untreated conventional material can be used. Uses of genetically engineered seeds, pollen, transgenic plants are not allowed.

2.2 Duration of conversion period – The minimum conversion period for plant products, produced annually is 12 months prior to the start of the production cycle. For perennial plants (excluding pastures and meadows) the conversion period is 18 months from the date of starting organic management. Depending upon the past use of the land and ecological situations, the certification agency can extend or reduce the minimum conversion period.

2.3 Diversity in crop production – Diversity in crop production is achieved by a combination of (a) versatile crop rotation with legumes and (b) by appropriate coverage of the soil with diverse plant species during the year of production that, taken into account pressure from insects, weeds, diseases and other pests, while maintaining or increasing soil health and fertility.

2.4 Fertilization policy – Biodegradable material of plant or animal origin produced on organic farms should form the basis of the fertilization policy. Fertilization management should minimize nutrient losses, avoid accumulation of heavy metals and maintain the soil pH. Emphasis should be given to generate and use own on-farm organic fertilizers. Brought in fertilizers of biological origin should be supplementary and not a replacement. Over manuring should be avoided. Manures containing human excreta should not be used on vegetation for human consumption.

In case of deficiency mineral fertilizers can be used as supplementary source and should be applied in their natural composition. Minerals containing high concentrations of heavy metals should be avoided.

Biofertilizers can be used safely under all ecosystems and in all the crops.

2.5 Pest disease and weed management including growth regulators – Weeds, pests and diseases should be controlled by a number of preventive cultural techniques, such as suitable rotations, green manures, a balanced fertilization programme, early and pre-drilling seed bed preparations, mulching, mechanical control and the disturbances of pest development cycles.

Botanical pesticides prepared at farm from local plants, animals and microorganisms are allowed. Thermic weed control and physical methods for pests, disease and weed

management are permitted. Use of synthetic chemicals such as fungicides, insecticides, herbicides, synthetic growth regulators and dyes are prohibited. Use of genetically engineered organisms or products is prohibited.

2.6 Contamination control - All attempts should be made to minimize contamination from outside and with in the farm.

2.7 Soil and Water conservation – Soil and water resources should be handled in a sustainable manner to avoid erosion, salination, excessive and improper use of water and the pollution of surface and ground water. Cleaning of land by burning (e.g. slash and burn and straw burning) should be restricted. Clearing of primary forest for agriculture (jhum or shifting cultivation) is strictly prohibited.

3. Collection of non-cultivated material of plant origin and honey – Wild harvested products shall only be certified organic, if derived from a stable and sustainable growth environment and the harvesting shall not exceed the sustainable yield of the ecosystem and should not threaten the existence of plant or animal species.

The collection area should not be exposed to prohibited substances and should be at an appropriate distance from conventional farming, human habitation, and places of pollution and contamination.

4. Animal Husbandry

4.1 Maintenance\rearing of animals
The certification programme shall ensure that the management of animal environment takes into account the behavioral needs of the animal and provides for:
a. Sufficient free movement
b. Sufficient fresh air and day light
c. Protection against excessive sunlight, temperature, rain, wind etc.
d. Enough lying and resting area
e. Ample access to fresh water and feed and
f. Proper environment for their biological and ethological needs

Poultry and rabbits should not be kept in cages. Land less animal husbandry system shall not be allowed.

4.2 Length of conversion period
The whole farm including livestock should be converted to organic according to the standards. Animal products may be certified organic only after the farm has been under conversion for at least 12 months and the required standards have been achieved. Length of the conversion period can be extended at the discretion of the certification agency. In case of dairy and egg production the conversion period shall be 30 days at minimum.

4.3 Brought-in animals

All organic animals should be born and raised on the organic holding. When organic livestock is not available the certification programme shall allow brought-in conventional animals according to the specified age limits e.g. 2 days old chicken for meat production, 18 weeks old hen for egg production, 2 weeks old for any other poultry, piglets up to 6 weeks old after weaning and calves up to 4 weeks old which have received colostrums and are fed a diet consisting mainly of full milk.

4.4 Breeds and breeding

Breed should be chosen which are adapted to the local conditions. Breeding goals should not be in opposition to animal's natural behavior and be directed towards good health.

Artificial insemination is allowed. Embryo transfer techniques are not allowed. Hormonal heat treatment and induced births are not allowed unless applied for medical reasons. Use of genetically engineered species or breeds is not allowed.

4.5 Mutilations

Mutilations of animals in any form are not allowed. Certification programme may allow following exceptions – Castration, tail docking of lambs, dehorning, ringing and mule sing etc.

4.6 Animal nutrition

The livestock should be fed 100% organically grown feed of good quality. All feed should come from the farm itself or be procured from the region. The certification programme shall draw up standards for feed and feed ingredients.

Where it proves impossible to obtain certain feeds from organic farming sources, the certification programme shall allow a percentage of feed consumed by farm animals to be sourced from conventional farms subject to a maximum prescribed limit.

Synthetic growth promoters or stimulants, synthetic appetizers, preservatives, artificial colouring agents, urea, farm animal by products to ruminants, droppings, dung or other manure, feed subjected to solvent extraction (soy and rapeseed meal), pure amino acids and genetically engineered organisms or their products are strictly prohibited in the feeds.

Vitamins, trace elements and supplements shall be used from natural origin. Certification programme can define conditions for use of vitamins and minerals from synthesized or unnatural sources. For fodder preservation bacteria, fungi and enzymes, by products of food industry (such as molasses) and plant based products can be used.

4.7 Veterinary medicines

Management practices should be directed to the well being of animals, achieving maximum disease resistance. Natural medicines and methods including homeopathy, ayurvedic, unani medicines and acupuncture shall be emphasized.

Conventional veterinary medicines are allowed when no other justifiable alternative is available, but in all such cases the withholding period should be double the legal period.

Use of synthetic growth promoters, substances of synthetic origin for production, stimulation or suppression of natural growth and hormones for heat induction is prohibited.

Vaccinations shall be used only when diseases are known and are expected to be a problem. Legally required vaccinations are allowed. Genetically engineered vaccines are not allowed.

4.8 Transport and slaughter
Transport and slaughter should minimize stress to the animal. Transport medium should be appropriate for each animal and the animals are fed and watered during transport. Each animal shall be stunned before being bled to death. The equipment used for stunning should be in good working order.

No chemical synthesized tranquilizers or stimulants shall be given prior to or during transport.

5. Bee keeping
Bee keeping is considered to be part of animal husbandry. The general principles therefore also apply to bee keeping.

Bee hives shall be situated in organically managed fields and/ or wild natural areas. Hives shall not be placed close to field or other areas where chemical pesticides and herbicides are used. Each bee hive shall primarily consist of natural materials. Wing clipping and veterinary medicines are not allowed. While working with bees no repellent consisting of prohibited substances shall be used. For pest and disease control and for hive disinfection following products are allowed: Caustic soda, lactic, oxalic, acetic and formic acids, sulphur, enteric oils and *Bacillus thuringensis*.

6. Food processing and handling

6.1 General principles – Organic products shall be protected from co-mingling with non-organic products, and shall be adequately identified through the whole process. Certification programme shall regulate the means and measures to be allowed or recommended for decontamination, clearing or disinfection of all facilities where organic products are kept, handled, processed or stored. Besides storage at ambient temperature the following special conditions of storage are permitted: Controlled atmosphere, cooling, freezing, drying and humidity regulation.

6.2 Pests and disease control – For pest management and control following measure shall be used in order of priority:

- Preventive methods such as disruption, and elimination of habitat and access to facilities.
- Mechanical, physical and biological methods
- Permitted pesticidal substances as per the standards and

- Other substances used in traps.
- Irradiation is prohibited. Direct or indirect contact between organic products and prohibited substances (such as pesticides) should not be there.

6.3 Ingredients, Additives and processing aids
100% of the ingredients of agricultural origin shall be certified organic. For the production of enzymes and other microbiological products, the medium shall be composed of organic ingredients.

In case where an ingredient of organic origin is not available, the certification programme may allow use of non-organic raw material subject to periodic re-evaluation. The same ingredient with in one product shall not be derived both from organic and inorganic origin. Minerals, vitamins and similar isolated ingredients shall not be used. The use of additives and processing aids shall be restricted.

Preparations of microorganisms and enzymes commonly used in food processing can be used. But no genetically engineered microorganisms and their products shall be used.

7. Processing methods - Processing methods should be based on mechanized, physical and biological processes, so that the quality of organic ingredients is maintained through the process. Some of the approved processes are: Mechanical and physical, biological, smoking, extraction, precipitation and filtration.

Extraction shall only takes place with water, ethanol, plant and animal oils, vinegar, carbon-di-oxide, nitrogen or carboxylic acids and all these shall be of food grade quality.

8. Packaging
Material used for packaging shall be ecofriendly. Unnecessary packaging material should be avoided. Recycling and reusable systems should be used. Packaging material should be biodegradable. Material used for packaging shall not contaminate the food.

9. Labeling
When the full standard requirements are met, the product can be sold as “Organic”. On proper certification by certification agency “India Organic” logo can also be used on the product.

10. Storage and transport
Products integrity should be maintained during storage and transportation of organic products. Organic products must be protected from co-mingling with non-organic products and must be protected at all times from contact with the materials and substances not permitted for use in organic farming.

Products for use in fertilization and soil conditioning in organic farming

Items	Conditions for use
Material from plant and animal origin	
Matter produced on an organic farm unit	
Farmyard and poultry manure, slurry, urine	Permitted
Crop residues and green manure	Permitted
Straw and other mulches	Permitted
Composts and Vermicompost	Permitted
Matter produced outside the organic farm unit	
Blood meal, meat meal, bone meal and feather meal without preservatives	Restricted
Compost made from plant residues and animal excrement	Restricted
Farmyard manure, slurry, urine	Restricted
Fish and fish products without preservatives	Restricted
Guano	Restricted
Human excrement	Prohibited
Wood, bark, sawdust, wood shavings, wood ash, wood charcoal	Restricted
Straw, animal charcoal, compost and spent mushroom and vermiculate substances	Restricted
Compost from organic household	Restricted
Compost from plant residues	Restricted
Sea weed and sea weed products	Restricted
By products from the industries	
By-products from the food and textile industries of biodegradable material of microbial, plant or animal origin without any synthetic additives	Restricted
By products from oil palm, coconut and cocoa (including fruit bunch, palm oil mill effluent, cocoa peat and empty cocoa pods).	Restricted
By-products of industries processing ingredients from organic agriculture	Restricted
Extracts from mushroom, Chlorella, Fermented product from *Aspergillus*, natural acids (vinegar)	Restricted
Items	Conditions for use
Mineral Origin	
Basic slag	Restricted
Calcareous and magnesium rock	Restricted
Lime, limestone, gypsum	Permitted
Calcified sea weed	Permitted
Calcium chloride	Permitted
Mineral potassium with low chlorine content (e.g. sulphate of potash, kaonite, sylvinite, patenkali)	Restricted
Natural phosphates (rock phosphate)	Restricted
Trace elements	Permitted
Sulphur	Permitted

Clay (bentonite, perlite, zeolite)	Permitted
Microbiological origin	
Bacterial preparations (biofertilizers) Biodynamic preparations Plant preparations and botanical extracts	Permitted Permitted Permitted

Products for Plant pest and disease control

Items	Conditions for use
Material from plant and animal origin	
Plant based repellents (Neem preparations from *Azadirachta indica*) Algal preparations (gelatin) Casein Extracts from mushroom, chlorella, fermented products from *Aspergillus* Propolis Beeswax, Natural acids (vinegar), plant oils, Quassia Rotenone from *Derris elliptica*, *Lonchocarpus*, *Thephrosia* spp. Tobacco tea (pure nicotine is prohibited) Preparation from *Ryania* species	Permitted Permitted Permitted Permitted Restricted Permitted Restricted Restricted Restricted
Mineral origin	
Chlorides of lime/soda Burgundy mixture Clay (bentonite, perlite, vermiculite, zeolite) Copper salts/ inorganic salts (Bordeaux mix, copper hydroxide, copper oxychloride) Quick lime	Restricted Restricted Permitted Not allowed Restricted
Items	Conditions for use
Mineral origin	
Diatomaceous earth Light mineral oils Permangnate of potash	Permitted Restricted Restricted
Insects origin	
Release of parasites, predators of insect pests Sterilized insects Sterilized insect males	Restricted Restricted Not allowed
Microorganisms used for biological pest control	
Viral, fungal and bacterial preparations (biopesticides)	Restricted
Others	
Carbon dioxide and nitrogen gas Soft soap, soda, sulphur dioxide Homeopathic and ayurvedic preparations Herbal and biodynamic preparations	Permitted Permitted Permitted Permitted

Sea salt and salty water Ethyl alcohol	Permitted Not allowed
Traps, barriers and repellants	
Physical methods (e.g. chromatic traps, mechanical traps) Mulches, nets Pheromones – in traps and dispensers only	Permitted Permitted Permitted

Annexure 3

Table ____: Appropriate Crop Cultivars: Key Input for Rabi[141]			
Crops	Acreage, Mha	Farmer's Yields* t/ha	Appropriate cultivars
Winter Maize	0.2- 0.38	2 – 4.0 6 - 6.5 7 - 8.5	Dhawal, Laxmi, Hemant, Devaki, ICI705 Hy: Ganga-11,Deccan-103, Makka1, MMH-3824 Pro-8644, Cargil-566, QPM-Shaktiman-1&2
Spring Maize	0.10	6 – 8.5	Devki Composite Pro-8644, Cargil-566,
Wheat	2.12	3.0-5.4	HP 1731, HUW 234, HUW 468, HD2733;HD 2239, HD2643, PBW226,PBW343; K 8804, UP-262
Boro Rice	0.10	5 – 8.0	Gautam, Prabhat, IR64, IR36, Krishana Hansa, Jayamati, Vishnu Prasad, Jyoti Prasad, Saroj
Potato	-	22.0	Kufri Ashoka

Table ____: Production Technique for rabi crops[142]			
Name of the Crop	Sowing time	Variety	Remarks
Sweet Potato	Sept. (North Bihar) Oct. to Nov. (Diara)	Rajendra Sakarkand-5,35,43,47 Sreebhadra RS- 92	Spacing 30 x 30 cm (Plain areas). 45 x 45 cm in Diara land N, P_2O_5, K_2O @ 80.60.40 kg/ha.
Sugarcane	Second week Oct. to mid Nov. (Autumn planting)	Early BO-120, BO-130 Mid-Early BO-109, COP-9206,BO-128, COP 9301 Main Season BO-91, BO-110 COP-9302 BO-136, 137	Seed rate 50-60 q ha(3 eyed Setts 40,000) spacing (row to row = 90 cm) For unirrigated condition: North Bihar – N, P_2O_5, K_2O @ 90.50.60 kg/ha South Bihar – N, P_2O_5, K_2O @105.50.60 kg/ha For irrigated condition North Bihar – N, P_2O_5, K_2O @ 150.85.60 kg/ha South Bihar – N, P_2O_5, K_2O @ 140.70.60 kg/ha For ratoon crop N, P_2O_5, K_2O @ 150.50.60 kg/ha Mixed Cropping Sugarcane + Potato Sugarcane + Coriander Sugarcane + Garlic Sugarcane + Lentil Sugarcane + Maize Sugarcane + Tobacco
Maize (Rabi / Winter)	15 Oct. to 20 Nov.	Ganga- 11 Lakshmi Deoki Rajendra Hybrid Maize-1 Shaktiman-1 Shaktiman-2 Deccan- 105	Seed rate –20 kg /ha Spacing 60 x 25 cm N, P_2O_5, K_2O @ 120.75.50 kg/ha Mixed Cropping Maize – Potato Maize – Pea Maize – Radish Maize – Tobacco

Gram	15 Oct. to15 Nov.	Tal-Diara areas Rajendra gram 1, RAU 52, SG 2. North and South Bihar C 235, Pant G 114, Pusa 240, Pusa 256	Seed rate 80 kg/ha (small sized seed), 100 kg/ha (large sized seed Pusa 256). Spacing 30 x 10 cm. DAP @ 100 kg/ha.
Lentil	15 Oct. to 15 Nov.	BR 25, PL 406, L 9-12 Arun, (PC 77-12), PC. 77-2	Seed rate 25-30 kg/ha spacing 22.5 x 5 cm and DAP @ 100 kg/ha.
Rajmash	1 Nov. to 20 Nov.	PDR 14	Seed rate 80 kg/ha. Spacing 30 x 6 cm N, P_2O_5, K_2O @ 80.50.30 kg/ha
Toria	Last week of Sept. to 10 Oct.	RAUTS-17 Panchali PT 303, Bhawani	Seed rate 5 kg/ha. spacing 30 x 110 cm N, P_2O_5, K_2O @ 60.40.40 kg/ha
Yellow Mustard	10 Oct. to 20 Oct.	66-197-3, Rajendra Sarson 1. Swarna . Rajendra Sarson 2	Seed rate 5 kg /ha. Spacing 30 x 10 cm N, P_2O_5, K_2O @ 60.40.40 kg/ha.
Mustard (Rai)	15 Oct. to 25 Oct.	Varuna, PusaBold, Kranti	Seed rate 3 kg /ha. Spacing 30 x 15 cm N, P_2O_5, K_2O @ 80.40.40 kg/ha.
Linseed	10 Oct. to 15 Nov.	T 397, Subhra. Garima, Sweta	Seed rate 15-20 kg /ha. Spacing 30 x 15 cm. N, P_2O_5, K_2O @ 60.20 kg /ha.
Sunflower	15 Oct. to 10 Nov.	Morden. Surya, CO 1. Peredovic (composite) BSH 1.MSFH 1,8,17,(hybrid)	Seed rate 8 kg for composite and 5 kg for hybrid spacing 45 x 20 cm (composite) 60 x 30 cm (hybrid) N, P_2O_5, K_2O @ 60.80.40 kg/ha (composite) and 80.90.40 kg/ha (hybrid).

<table>
<tr><td rowspan="3">Wheat</td><td>Irrigated Timely sown: 20 Nov. to 10 Dec.</td><td>HUW 206, RW 346 K,HD 2733,9107 K 8804, HP 1761 HUJW 468 NW 1024. PBW 443, 343,</td><td>
<table>
<tr><td></td><td colspan="2">Irrigated</td><td>Unirrigated</td></tr>
<tr><td></td><td>Timely sown</td><td>Late sown</td><td></td></tr>
<tr><td>Seed rate (kg/ha)</td><td>125</td><td>150</td><td>125</td></tr>
<tr><td>Spacing(cm)</td><td>20</td><td>18</td><td>20</td></tr>
<tr><td>N,P_2O_5,K_2O</td><td>120.60.40</td><td>80.40.20</td><td>40.30.20</td></tr>
</table>
</td></tr>
<tr><td>Irrigated late sown: 11 Dec. to 31 Dec.</td><td>HP 1744 HUW 234, HD 2307, HD 2285, HD 2329, HD 2643, PBW 373,</td><td></td></tr>
<tr><td>Unirrigated condition 1 Nov. to 15 Nov.</td><td>C 306, K 8027, RW 3016, HP 1493.</td><td></td></tr>
<tr><td>Fodder</td><td>Oct. to Nov. Berseem Oat</td><td>Mescavi Bardan Kent ,UP-212 OS-6, JHO-851</td><td>Seed rate- 15 kg/ha Berseem culture N-20, P_2O_5 -80</td></tr>
<tr><td>Boro rice</td><td>Oct. to Nov.</td><td>Gautam Richaria Prabhat</td><td>Transplanting –1st week of Feb.
N, P_2O_5, K_2O @ 100.60.40 kg/ha</td></tr>
</table>

Annexure 4

Pesticides banned in India

Pesticides Banned for manufacture, import and use (25 No.s)	
1.	Aldrin
2.	Benzene Hexachloride
3.	Calcium Cyanide
4.	Chlordane
5.	Copper Acetoarsenite
6.	Cibromochloropropane
7.	Endrin
8.	Ethyl Mercury Chloride
9.	Ethyl Parathion
10.	Heptachlor
11.	Menazone
12.	Nitrofen
13.	Paraquat Dimethyl Sulphate
14.	Pentachloro Nitrobenzene
15.	Pentachlorophenol
16.	Phenyl Mercury Acetate
17.	Sodium Methane Arsonate
18.	Tetradifon
19.	Toxafen
20.	Aldicarb
21.	Chlorobenzilate
22.	Dieldrine
23.	Maleic Hydrazide
24.	Ethylene Dibromide
25.	TCA (Trichloro acetic acid)
Pesticide Withdrawn (7 No.s)	
1.	Dalapon
2.	Ferbam
3.	Formothion
4.	Nickel Chloride
5.	Paradichlorobenzene (PDCB)
6.	Simazine
7.	Warfarin
Pesticides restricted for use in India	
1.	Aluminium Phosphide
2.	DDT
3.	Lindane
4.	Methyl Bromide
5.	Methyl Parathion
6.	Sodium Cyanide

7.	Methoxy Ethyl Merciru Chloride (MEMC)
8.	Monocrotophos(ban for use on vegetables)

Annexure 5

WHO classification of chemical pesticides

List 1. Extremely hazardous (Class IA) technical grade active ingredients in pesticides

Aldicarb
Brodifacoum
Bromadiolone
Bromethalin
Calcium cyanide
Captafol
Chlorethoxyfos
Chlormephos
Chlorophacinone
Difenacoum
Difethialone
Diphacinone
Disulfoton
EPN
Ethoprophos
Flocoumafen
Hexachlorobenzene
Mercuric chloride
Mevinphos
Parathion
Parathion-methyl
Phenyl mercury acetate
Phorate
Phosphamidon
Sodium fluoroacetate
Sulfotep
Tebupirimfos
Terbufos

List 2. Highly hazardous (Class IB) technical grade active ingredients in pesticides

Acrolein
Allyl alcohol
Azinphos-ethyl
Azinphos-methyl
Blasticidin-S
Butocarboxim
Butoxycarboxim
Cadusafos
Calcium arsenate
Carbofuran
Chlorfenvinphos
3-Chloro-1, 2-propanediol
Coumaphos
Coumatetralyl
Zeta-cypermethrin
Demeton-S-methyl
Dichlorvos
Dicrotophos
Dinoterb
DNOC
Edifenphos
Ethiofencarb
Famphur
Fenamiphos
Flucythrinate
Fluoroacetamide
Formetanate
Furathiocarb
Heptenophos
Isoxathion
Lead arsenate
Mecarbam
Mercuric oxide
Methamidophos
Methidathion
Methiocarb
Methomyl
Monocrotophos
Nicotine
Omethoate
Oxamyl
Oxydemeton-methyl
Paris green
Pentachlorophenol

Propetamphos
Sodium arsenite
Sodium cyanide
Strychnine
Tefluthrin
Thallium sulfate
Thiofanox
Thiometon
Triazophos
Vamidothion
Warfarin
Zinc phosphide

List 3. Moderately hazardous (Class II) technical grade active ingredients in pesticides

Alanycarb
Anilofos
Azaconazole
Azocyclotin
Bendiocarb
Benfuracarb
Bensulide
Bifenthrin
Bilanafos
Bioallethrin
Bromoxynil
Bromuconazole
Bronopol
Butamifos
Butylamine
Carbaryl
Carbosulfan
Cartap
Chloralose
Chlordane
Chlorfenapyr
Chlorphonium chloride
Chlorpyrifos
Clomazone
Copper sulfate
Cuprous oxide
Cyanazine
Cyanophos
Cyfluthrin
Beta-cyfluthrin
Cyhalothrin
Cypermethrin
Alpha-cypermethrin
Cyphenothrin [(1R)-isomers]
2,4-D
DDT
Deltamethrin
Diazinon
Difenzoquat
Dimethoate
Dinobuton
Diquat
Endosulfan
Endothal-sodium

EPTC
Esfenvalerate
Ethion
Fenazaquin
Fenitrothion
Fenobucarb
Fenpropidin
Fenpropathrin
Fenthion
Fentin acetate
Fentin hydroxide
Fenvalerate
Fipronil
Fluxofenim
Fuberidazole
Gamma-HCH
Guazatine
Haloxyfop
HCH
Imazalil
Imidacloprid
Iminoctadine
Ioxynil
Ioxynil octanoate
Isoprocarb
Lambda-cyhalothrin
Mercurous chloride
Metaldehyde
Metam-sodium
Methacrifos
Methasulfocarb
Methyl isothiocyanate
Metolcarb
Metribuzin
Molinate
Nabam
Naled
Paraquat
Pebulate
Permethrin
Phenthoate
Phosalone
Phosmet
Phoxim
Piperophos
Pirimicarb

Prallethrin
Profenofos
Propiconazole
Propoxur
Prosulfocarb
Prothiofos
Pyraclofos
Pyrazophos
Pyrethrins
Pyroquilon
Quinalphos
Quizalofop-p-tefuryl
Rotenone
Spiroxamine
TCA (acid)
Terbumeton
Tetraconazole
Thiacloprid
Thiobencarb
Thiocyclam
Thiodicarb
Tralomethrin
Triazamate
Trichlorfon
Tricyclazole
Tridemorph
Xylylcarb

List 4. Slightly hazardous (Class III) technical grade active ingredients in pesticides

Acephate
Acetochlor
Acifluorfen
Alachlor
Allethrin
Ametryn
Amitraz
Azamethiphos
Bensultap
Bentazone
Butralin
Butroxydim
Chinomethionat
Chlormequat (chloride)
Chloroacetic acid
Copper hydroxide
Copper oxychloride
4-CPA
Cycloate
Cyhexatin
Cymoxanil [
Cyproconazole
Dazomet
Dicamba
Dichlormid
Dichlorobenzene
Dichlorophen
Dichlorprop
Diclofop
Dicofol
Diethyltoluamide
Difenoconazole
Dimepiperate
Dimethachlor
Dimethametryn
Dimethipin
Dimethylarsinic acid
Diniconazole
Dinocap
Diphenamid
Dithianon
Dodine
Empenthrin [(1R) isomers]
Esprocarb

Etridiazole
Fenothiocarb
Ferimzone
Fluazifop-p-butyl
Fluchloralin
Flufenacet
Fluoroglycofen
Flurprimidol
Flusilazole
Flutriafol
Fomesafen
Furalaxyl
Glufosinate
Hexazinone
Hydramethylnon
Iprobenfos
Isoprothiolane
Isoproturon
Isouron
Malathion
MCPA
MCPA-thioethyl
MCPB
Mecoprop
Mecoprop-P
Mefluidide
Mepiquat
Metalaxyl
Metamitron
Metconazole
Methylarsonic acid
Metolachlor
Myclobutanil
2-Napthyloxyacetic acid
Nitrapyrin
Nuarimol
Octhilinone
N-octylbicycloheptene dicarboximide
Oxadixyl
Paclobutrazol
Pendimethalin
Pimaricin
Pirimiphos-methyl
Prochloraz
Propachlor
Propanil

Propargite
Pyrazoxyfen
Pyridaben
Pyridaphenthion
Pyridate
Pyrifenox
Quinoclamine
Quizalofop
Resmethrin
Sethoxydim
Simetryn
Sodium chlorate
Sulphur amide
2,3,6-TBA
Tebuconazole
Tebufenpyrad
Tebuthiuron
Thiram
Tralkoxydim
Triadimefon
Triadimenol
Tri-allate
Triclopyr
Triflumizole
Undecan-2-one
Uniconazole
XMC
Ziram

List 5. Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use

Aclonifen
Acrinathrin
Alloxydim
Amitrole
Ammonium sulphamate
Ancymidol
Anthraquinone
Asulam
Atrazine
Azimsulfuron
Azoxystrobine
Bacillus thuringiensis
Benalaxyl
Benazolin
Benfluralin
Benfuresate
Benomyl
Benoxacor
Bensulfuron-methy
Bifenox
Bioresmethrin
Bipheny
Bispyribac
Bitertanol
Borax
Bromacil
Bromobutide
Bromopropy
Bupirimate
Buprofezin
Butachlor
Butylate
Captan
Carbendazim
Carbetamide
Carboxin
Carpropamid
Chloransulam methy
Chlorfluazur
Chloridazon
Chlorimuron
Chlorothaloni
Chlorotoluron

Chlorpropham
Chlorpyrifos methyl
Chlorsulfuron
Chlorthal-dimethyl
Chlozolinate
Cinmethylin
Cinosulfuron
Clofentezine
Clomeprop
Clopyralid
Cloxyfonac
Cryolite
Cycloprothrin
Cyclosulfamuron
Cycloxydim
Cyhalofop
Cyromazine
Daimuron
Dalapon
Daminozide
Desmedipham
Diafenthiuron
Dichlobenil
Dichlofluanid
Diclomezine
Dicloran
Diclosulam
Diethofencarb
Diflubenzuron
Diflufenican
Dikegulac
Dimefuron
Dimethirimol
Dimethomorph
Dimethyl phthalate
Dinitramine
Dipropyl isocinchomerate
Dithiopyr
Diuron
Dodemorph
Ethalfluralin
Ethephon
Ethirimol
Ethofumesate
Ethyl

Etofenprox
Famoxadone
Fenarimo
Fenbuconazole
Fenbutatin oxide
Fenchlorazole
Fenclorim
Fenfuram
Fenhexamide
Fenoxycarb
Fenpiclonil
Fenpropimorph
Ferbam
Flamprop-M
Florasulam
Flucarbazone-sodium
Flucycloxuron
Flufenoxuron
Flumetralin
Flumetsulam
Fluometuron
Flupropanate
Flupyrsulfuron
Flurenol
Fluridone
Flurochloridone
Fluroxypy
Fluthiacet
Flutolanil
Tau-Fluvalinate
Folpet
Fosamine
Fosety
Gibberellic acid
Glyphosate
Halofenozide
Hexaconazole
Hexaflumuron
Hexythiazox
Hydroprene
2-Hydroxyethy
Hymexazo
Imazametha benzmethyl
Imazapyr
Imazaquin
Imazethapyr

Imibenconazole
Inabenfide
Iprodione
Iprovalicarb
Isoxaben
Kasugamycin
Lenacil
Linuron
Maleic hydrazide
Mancozeb
Maneb
Mefenacet
Mepanipyrim
Mepronil
Metazachlor
Methabenzthiazuron
Methoprene
Methoxychlor
Methozyfenozide
Methyldymron
Metiram
Metobromuron
Metosulam
Metoxuron
Metsulfuron methyl
Monolinuron
2-(1-Naphthyl) acetamide
1-Naphthylacetic acid
Napropamide
Naptalam
Neburon
Niclosamide
Nicosulfuron
Nitrothal-isopropyl
Norflurazon
Noviflumuron
Ofurace
Oryzalin
Oxabetrini
Oxadiazon
Oxine-copper
Oxycarboxin
Oxyfluorfen
Penconazole
Pencycuron
Penoxsulam

Pentanochlor
Phenmedipham
Phenothrin
2-Phenylpheno
Phosphorus acid
Phthalide
Picloram
Piperony
Pretilachlor
Primisulfuron
Probenazole
Procymidone
Prodiamine
Prometon
Prometryn
Propamocarb
Propaquizafop
Propazine
Propham
Propineb
Propyzamide
Pyrazolynate
Pyrazosulfuron
Pyrimethanil
Pyriminobac
Pyriproxyfen
Pyrithiobac sodium
Quinclorac
Quinmerac
Quinoxyfen
Quintozene
Rimsulfuron
Siduron
Simazine
Spinosad
Sulfometuron
Sulphur
See note
TCA
Tebufenozide
Tebutam
Tecnazene
Teflubenzuron
Temephos
Terbacil
Terbuthylazine

Terbutryn
Tetrachlorvinphos
Tetradifon
Tetramethrin
Thiabendazole
Thidiazuron
Thifensulfuron-methy
Thifluzamide
Thiophanate-
Tiocarbazil
Tolclofos
Tolylfluanid
Transfluthrin
Triasulfuron
Tribenuron
Trietazine
Triflumuron
Trifluralin
Triflusulfuron-methyl
Triforine
Triticonazole
Validamycin
Vinclozolin
Zineb

Annexure 6

Details of trade prohibitions on forest produce

1. Trade of any part of the following trees species in North Bihar is prohibited:

Sal	- *Shorea robusta*
Asan	- *Terminalia tomentosa*
Karam	- *Adina cordifolia*
Bija	- *Pterocarpus marsupium*
Sagwan	- *Tectona grandis*
Shisham	- *Dalbergia sissoo*
Sidha	- *Lagerstroemia parviflora*
Dhup	- *Pinus roxburghii*
Eucalyptus	- *Eucalyptus species*
Ghora Karanj	- *Ailanthus excelsa*
Harra	- *Terminalia chebula*
Bahera	- *Terminalia bellirica*
Satsal	- *Dalbergia latifolia*
Kekar	- *Garuga pinnata*
Karanj	- *Pongamia pinnata*
Kusum	- *Schlcichera oleosa*
Bhurkund	- *Hymenodictyon excelsum*
Salai	- *Boswellia serrata*
Champ	- *Michelia champaca*
Semali	- *Salmalia malabarica*
Arjun	- *Terminalia arjuna*
Dhaura	- *Anogeissus latifolia*
Siris	- *Albizia chinensis*
Kajh	- *Breynia retusa*
Gamhar	- *Gmelina arboria*
Toon	- *Cedrela toona*
Chatwan	- *Alstonia scholaris*
Palas	- *Butea monosperma*
White siris	- *Albizia procera*
Panjan	- *Ougeinia ongensis*
Phaldu	- *Mitragyna parvifolia*
Kendu	- *Diospyros melanoxylon*

2. Trade of timber of the following is prohibited in Bihar state:

Khair tree
Katha
Charcoal

3. Trade of Fruits and seed of the following tree species in Bihar state is prohibited:

Sal	- *Shorea robusta*
Mahua	- *Madhuca indica*
Harra	- *Terminalia chebula*

4. Trade of forest produce of the following trees species in South Bihar is prohibited:

Sal	- *Shorea robusta*
Asan	- *Terminalia tomentosa*
Gamhar	- *Melina arboria*
Bija	- *Pterocarpus marsupium*
Salai	- *Boswellia serrata*
Khair	- *Acacia catechu*
Sagwan	- *Tectona grandis*
Karam	- *Adina cordifolia*

5. Use of dead wood from the following tree species is prohibited in the Bihar state:

Sal	- *Shorea robusta*
Asan	- *Terminalia tomentosa*
Gamhar	- *Melina arboria*
Bija	- *Pterocarpus marsupium*
Salai	- *Boswellia serrata*
Khair	- *Acacia catechu*
Sagwan	- *Tectona grandis*
Karam	- *Adina cordifolia*

6. Trade of the produce of following tree species is allowed in Bihar:

Mango
Tamarind
Jamun
Kat haal
Mahua
Bamboo
Pepal
Banyan
Paakad
Badhara

Annexure 7

Field notes:

Note: These are field notes – they are annexed to the report only for the purpose of giving an insight into the field work. They have not been specifically edited into a report format.

As part of the assignment interactions were held with the Self Help Groups (SHGs), project staff and relevant line departments at district as well as state levels. The objective was to get the first hand information on issues associated with environment management in different livelihood activities as well the kind of support available for environmental management from various government line departments at district as well as state levels. The districts selected for field visits in consultation with the project functionaries are Gaya, Nalanda, Muzaffarpur and Madhubani. The detailed notes of the visit are hereunder.

Visit to Gaya (South Bihar): Date: 8th January

Interaction with women rolling Agarbathis: The traders come and give the raw materials like jigat (glue), sticks and dust. They roll the agarbathis and hand them back to the traders. Agarbathi rolling is usually done in outdoors, some times indoors as well. Hand washing with soap is in practice. Problems associated with this occupation are back pain and friction on hands due to continuous rolling.

Interaction with the farmers for general agricultural practices:
Major crops grown in this area are Rice, Wheat, Sesamum, Bengal gram, Peas, Sugarcane etc. In Kharif (south west monsoon) paddy is grown generally. In Rabi (winter) Wheat is grown. Green gram and Black gram are grown during March, April.

Major irrigation sources are tube wells. Water availability is good but no power and motor facilities with the farmers. Around 50 tube wells are present in the village and each tube well can irrigate 6-7 acres. Total land in the village is 500 bighas. In 200 acres cereals are grown where water facility is there. In other areas (with out irrigation facility) pulses are grown. Average land holdings of the farmers are 4-5 bighas.

Ground water level in this village is 50 ft. in summer it goes up to 80 ft. Farm ponds are present at a frequency of 1 per 3 bighas but no water is harvested during last three years due to lack of rain fall. Basin method of irrigation is followed for wheat, paddy and furrow method for potato.
Fertilizers applied are DAP, Potash, and Urea. Pesticides are applied based on the advice by the pesticide dealers.
Intercrops: Arhar is planted on rice bunds for household consumption.
Pesticides: Pesticides are sprayed only when pest attack is seen. Only the area affected in the field is sprayed. Around Rs. 100/- per bigha is spent on pesticides.
Fertilizers: Fertilizers are applied on guidance of large farmers. Urea and DAP are

generally applied.
Irrigation: Major source of irrigation are bore wells. Farmers with out bore well facility purchase water from the rich farmers at the rate of Rs. 100/- per one irrigation. *Aahars* are the traditional water conservation structures seen in the village. 30 acres can be irrigated using water conserved through one *Aahar.* Bihar Government is currently constructing check dams and renovating the *Aahars*.

Livestock management:
Total livestock population of the village is 200 buffaloes and 40 cow; and 2 bullocks per each farmer.
Fodder: Major fodder is paddy and wheat straw. No pasturelands are available in the village. Sesamum and mustard oil cake (*Khalli*) are used as concentrates. The dry fodder is cut in to pieces using chaff cutters. 30-40 chaff cutters are present in the village. These small bits of dry fodder is mixed with oil cake and fed to cattle in cement tubs. Cost of chaff cutter is 2,600. Semi open type of cattle sheds are constructed.
Milk Yield: Milk yield is 2-3 kilos per buffalo. Sold at a price of Rs. 12/- per kilo.
Dung: Dung is used as fuel. In rainy season it is applied in field.

Agarbathi making

Chaff cutter

Fodder trough

Controlled grazing of goat

Dung as fuel

Cattle shed

Interaction with farmers and staff

Interaction with KVK officials

Interaction with Mr. Rajan Gowtham, Block Project Manager (BPM)

Training to the Community Resource Persons (CRPs) on Environment Management would be a good idea.
Other methodologies for promoting better environment management could be flip charts with simple messages and field demonstrations.
Any intervention planed should finally succeed in market. For eg: *saathu* making initiated some time back has failed due to lack of market.

Interaction with Mr. A.K. Singh, Programme Coordinator, KVK, Gaya

KVK provides trainings to farmers and farm women.
Vocational trainings are given on apiculture (honey), mushroom, medicinal plant cultivation etc.
Demonstrations of High Yielding Varieties is done in villages.
Soil testing is done by KVK, and diagnostic services regarding pest and disease infestation are provided to the farmers.
KVK is implementing 'seed gram programme' in near by villages with an objective of making the villages self sufficient in seed production. In this programme technical support and foundation seed is provided to the interested farmers for producing the seed.
District Soil Conservation Officers are present in identified districts. Gaya is one among the districts. Director of Soil Conservation is in Secretariat (New).
Village level workers are appointed by Government at Block level. Qualification is B.Sc (Ag.).
One of the thrust areas of the KVK is to increase the production of sesamum as the consumption is more in the state and the state is importing sesamum from Rajasthan.
Training support to CRPs can be given by KVK.
Under Horticulture the thrust area of the KVK is promoting cultivation of medicinal plants.
A variety of Maize – Shakthimam Char is under trail in KVK, the leaves of which remain green for a longer period even after the harvest of the plant which can be used as green fodder.
Availability of seed and fertilizer to the farmers is a major problem in the district.
A copy of Annual Action Plan of the KVK is provided.

Soil nutrient constraints in the district:
N, P, K and sulpher deficiency is widely seen in Bihar.
Available calcium carbonate is high in soils of North Bihar but the intake is very less due to fixation.
Zinc deficiency is wide spread in Bihar and the recommended dosage is 25 kg Zinc Sulphate per hectare.
Boron deficiency is also seen in patches. Spray of 2 gm per liter of water is recommended for vegetables.
Providing soil testing facility is the future plan of KVK.

Field notes: (29th January – 2nd February))

Interaction with staff at Muzaffarpur: Date: 30th January
Vikrant Kumar Singh: AC – P.G. in Rural management
--------- : AC – P.G. in Political Sciences, earlier worked in pesticide marketing.
Uma Kumari: CC – P.G. Sanskrit, Worked in an NGO earlier in formation of SHGs
Usha Kumari: CC – Ph. D, Home science

Most of the beneficiaries are agricultural labor and work for daily wages. No traditional livelihoods are seen. Vegetable vending is another major business.
Swasakthi is one programme being under Women Development Corporation supported by World Bank. Under this programme support is given to PoP for activities like petty shops as they are land less and can not invest in agriculture.

Agriculture:
50% of agricultural lands are under paddy. Other crops are Maize, Potato, Cauliflower and Cabbage.
Water scarcity is the major problem due to lack of rain since three years. Bore wells are the major sources of irrigation. Farmers usually purchase water from the neighboring farmers having bore wells. Ground water level is 80 feet. Bamboo boring is practiced earlier but not seen now due to failure. The success of bamboo boring depends on the nature of soil. Open wells and canals are other sources of irrigation. Lift irrigation from canals is in practice in some places.
Soil salinity is a major problem seen here but farmers do not take any corrective measures. Wilt problem is commonly seen due to water logging during flood conditions.
Pesticide use: Pesticides are used in vegetables like Brinjal, Cauliflower, Cabbage and Paddy. Pesticide use is not much on Maize, except initial applications.

Livestock:
PoP and poor have mostly sheep and goat. Most of the loans from the project can be taken for livestock.
Fodder: Grazing lands are not available in villages. Large farmers cultivate fodder. Green fodder from gandak river banks is used in that area. Paddy straw is purchased. Other crop residues are also used as fodder. Fodder cutting machines are present with almost all large farmers and the small farmers cut fodder manually suing small implements. Fodder from trees in the villages is used for sheep and goat.
Dung: Only large farmers use dung as manure. Other farmers use as fuel as fuel wood is very costly Rs. 3/- per kg.

Visit to Goghardia Prakand Vikas Samsthan, Goghardia: Date 30th January

Interaction with Mr. Rajendar Singh, Coordinator
Founder is Shri. Kapeswar Singh.
The major work area is RCH. The regular staff is around 30-40 in addition to the field

staff. The organisation works with 240 women groups. Their own savings are up to 24 lakhs. They work in three blocks – Goghardia, Pulpara and SC sutona.
Facilities available in their clinic are safe delivery and mobile van health clinic.

The organisation also works in disaster management under PACS – 'Swimming with the flood' with a net work of 5 NGOs in 6 blocks (Madhepur, Luckra, Jhajarpur, -----, Pulpar, Goghardia), 35 Pachayats (160 villages).
CBOs – *Apada Sahajeevan Samithi* are organized.
SHGs – Organized since 3 years.
Total savings of CBOs and SHGs is around 26 lakhs.
During October, November flood preparedness and coping measures for seed and fodder are taken up. Training is given for raising depog nurseries for rice. Traditional birth attendants are trained. Food (Kitchidi) is supplied as part of flood relief work.
Social watch groups are formed to check the Government programmes and NGO programmes. The stake holders include a chain of people from village to district. Village-Panchayat- Block-Sub Division-District. Meetings and discussion happen at every level.

Recommendation: Higher community hall for flood shelters with stairs. 14 shelters were done.
Fodder conservation practices promoted are urea, jaggery, salt treatment and silage making.
In Janjarpur Child and Meternal health are being promoted.
Use of herbal medicines is being promoted in 40 Panchayats. Under this programme traditional Vaids (munfiz) are being identified. Herbal gardens are being promoted. Herbs are easily available in these villages. The problem is only with identification.
Vision centre is established for cataract cure.

In area of sustainable Agriculture:
Vermicompost is being promoted in 7 villages.
11 farmer groups are formed.
Cattle urine spray is being promoted as crop stimulant.
Herbal pesticides like Chilli, Garlic, Neem are being promoted.
Fodder trees like Subabul and Satooth are being promoted.
Smokeless chulhas (*Nirdhum chulhas*) are being promoted. These are well used in this area.

1 khatta land equals to 400 sq ft.

Visit to Madhubani (North Bihar): Date: 31st January

Rajnagar Block, Rati Panchayat

Interaction with project staff:
Total households in the village are 1450.
7 staff members – 4 CCs and 3ACs
325 old groups are present in the block (of DRDA, WDC and other NGOs). 28 new groups are formed by the project.

Livelihoods:
Livelihood diversion is seen to mason, labor from agriculture and Makhana cultivation.
Traditional livelihoods in this area are agriculture, fish culture, Makhana and singhada cultivation.

Madhubani Paintings:
Madhubani paintings are major livelihood here but the marketing is the problem as there is no fixed price. In case of Madhubani paintings, input cost is less and time consumption is more.
Types of paintings: Wall, card board, table cloth, screens.
Most of the loans from project may be utilized for Madhubani paintings.
Required material for these paintings are hand made paper, pens, brushes, and colors (fabric paintings for cloths and natural colors for paper).
Natural colors: Bean leaf juice, babul gums are pounded and mixed. Apargita flower juice is also used (Blue flower). Peepal bark boiled in half cup, gives brown color.
Marigold and turmeric are used for yellow colour and lamp soot for black colour.

Makhana cultivation:
Makhana is generally cultivated by large farmers.
Land less people work as laborers for operations like sowing, harvesting, pesticide spraying etc. It not always certain that they will get opportunity for labor.

Cultivation details:
In March – April they start sowing nursery. The plants are later transplanted to other ponds. May – June is the flowering season. The seeds are harvested during August-September.
Pest infestation is seen (mosquito like insect) for which pesticides are applied. They are mixed in water and sprayed.
Endrin and Endosulphan are the pesticides commonly used (for singhada).
Safety measures like covering the face with cloth mask are being followed.
The pesticide containers are reused for household purposes like storing cooking oil, hair oil etc. before reusing them they clean the containers with surf and hot water.
In Makahana water is disturbed to kill the pest which infests the leaves so that the pest falls into the water.
The fruits of Makhana contain thorns. They are left into water and allowed to rot during monsoon. Then clean up Makhana down the pond bed.

For harvesting they dive into the bottom of the pond collect the seeds. They use bamboo spade to pull the seeds up.
The members do not prefer to take land on lese for Makhana cultivation as the risk is always high.
The size of the ponds vary from 300 sq. ft to 10,000 sq. ft.

Singhada cultivation:
Main product is fruit containing seeds.
The seeds are planted in nursery and the plants are transplanted into ponds. Planting is done in July and harvesting in October. Number of harvests are taken up to December.
Weeding is done.
One water insect infests the pants. Plants decay after this. Pesticides are used during flowering and fruiting stage for control of this pest.
The major risk in cultivation is droughts and floods.
Singhada is choice of loan support. The loan amount will be used for lease, seed, pesticide and labor.

Fisheries:
Fish seed is purchased from Dharbangha. First the seed is left in nursery pond from Jan-Feb. Later the seed is allowed in to the main pond.
Lime, oil cake, salt and paddy straw are applied as feed.
Fish are caught during May.
The members work as laborers in fish culture also. They get paid at the rate of Rs. 50 per day or some % of harvest.

Agriculture: The members also work as agricultural laborers. Mostly for paddy harvest.

Livestock:
1 to 2 animals are present per family. Source of fodder is grazing lands, purchased dry fodder, harvested green fodder. Dry fodder is available @ Rs. 1-1.5 per kg. But the space is not sufficient for storing the fodder. During July -August - September it is sold at a price of Rs. 5/- per kg.
Cow dung cakes are used for fuel only not as fertilizer. The cow dung cakes are also sold.
No poultry and duck rearing are in practice here.

Visit to KVK, Chand Basantpura. Madhubani: Date: 31st January

The mandate of KVK is transfer of technology from lab to land and assignment and refinement of technologies to local specific situations.
KVK offers the following trainings:
Vocational trainings to farmers, youth, women on crop science, horticulture, Animal husbandry, fisheries, home science, extension and agricultural engineering. Prior action plan need to be developed for this.
Two villages are adopted every year by KVK. PRA survey will be conducted with farmers, departments, Panchayat, NGOs etc for required interventions.
On campus trainings are organized for youth. It will be advertised in paper and notice

will be sent to villages. The trainings include vermicompost, raising nurseries, mango grafting etc. Loans are being provided by the Government for raising nurseries.
Two types of trainings are given:
Short duration trainings: 2 - 4 day training programmes for farmers for increasing production and productivity.
Long duration programmes: 1 week to 3 months trainings.
New and high yielding varieties are also promoted through training both at KVK and at farmer's fields.
Fisheries yield in Madhubani is 8 qtls/ha. KVK is trying for 10-15 qtls/ha.
KVK has trained 2-3 women groups in fisheries.
Under IPM, KVK is experimenting and promoting intercropping to avoid pest attack.
Research is being done in Makhana also. For Makhana pest KVK is recommending neem cake at the rate of 50 kgs per ha. Also gives technical support on other inputs, water level, spacing etc.
Seed production is also done through 'seed village' approach.
Technology demonstrations are taken up in farmers fields. Kisan melas are organized.

Fuel wood scarcity seems to be the major problem in this area. Cow dung cakes, dry leaves, tree bark and burnt out wastes mixed in cow dung are being used for fuel purpose. Another problem is fodder scarcity. All the available green material – weeds (dug with hoe and cut into small bits), leaves of cabbage, cauliflower, bamboo leaves are chopped into pieces and are fed to cattle along with dry fodder.

Photographs:


Interaction with SHG


Reuse of pesticide bottles


Fodder chaffing


Dung made as fuel

Dry leaves stacked for use as fodder

Weeds collected as fodder

Visit to NGOs

Banding on mango and silk cotton trees

Visit to Nalanda: Date: 1st February

Harnauth block, Dihree Panchayat, Birju milki village.
Staff: Mr. Shankar Kumar Thakur, Nirupama
CRP, Urmila Devi (member).

Total number of households in the village is 700. 400 households belong to the dominant caste *Kurmi* (with land holdings of 50-100) and population of PoP is around 4000 and they belong to Musahar caste. On an average 5-6 children are present in each family. Lands are fertile here and the main occupation is agriculture. Other non land holders work as agricultural labors. Most of the medium farmers have migrated to Delhi, Kolkata and others take land on lease (*pesgi*). Lease for one acre of land is 3000-4000/-.
23 groups were formed in the village. Three old groups are already present (2 of DRDA and 1 under PACS). All the members in 20 groups are landless. For other members the land holdings are around 5-10 *kattas*. 1/5th of the members do agriculture on lease. Loans are taken at an interest of 10% per month from land lords.
Lease farming could be encouraged by loans from the project. The major crops grown are Vegetables, Pulses, Paddy, and Onion.
The daily wages to the agricultural labor are paid in kind, which is 2.5 kgs of rice or wheat flour.
Land holdings are measured in Kattas and Bhigas.
20 *kattas* – 1 Bhiga
32 *kattas* – 1 acre
Interaction with member Mrs. Urmila Devi:
Taken 13 *kattas* of land on lease for 1 yr for 2,800/-.for cultivating paddy in this land the expenses came up to Rs. 3000/- (350 for ploughing, 50 for bunds, 800 for irrigation from neighbors bore well for 4 waterings (12000 for 13 bighas), 1100 for fertilizers – 60 kg urea, 20 kg DAP). No pesticides are used as they are not able to afford for. Other farmers in the village use pesticides and growth promoters like Endrin, Dithane, Furadon, Chloripyriphos, Hexaconozol, Mancozeb, Folidol, Alphamethrin, Triconozole etc. etc at flowering stage. The pesticide bottles are reused for storing cooking oil, jeera, masala etc. sometimes they are sold. Pesticides are sprayed without pest also by the advice of dealers.
Aahars are being constructed by Government in this village.
Farm bunds are constructed for water conservation and protection from floods. Depth of ground water is 60 ft. scarcity of fuel wood is the major problem faced by the villagers.

Livestock:
Here cattle are also taken on lease. The farmers who are not having cattle will take the conceived cattle and bring it up and the calf will be shared between the two (50%). Thus even though 25% of people own livestock, 90% of the people do cattle rearing.
PoP families hold cattle at the rate of 1-2 mostly cows and buffaloes and sheep and goat to some extent.
Dry fodder is the major source of fodder. It is cut into small pieces and fed. Mustard oil cake is also fed. Dry fodder production is very high in this village, 5000 trucks of dry fodder is sold outside. Green fodder is collected from agricultural fields. The weeds are collected, chopped into small pieces and fed. Fodder scarcity is severe during floods

(July, August, and September) as the beneficiaries will not store enough fodder due to space constraints, and green fodder is not available due to water stagnation.
Cattle are housed in constructed sheds during night time. Manure is not used in fields but is used as fuel.
Concentrates like wheat floor, oil cake will be fed. Any how the high reliance is only on dry fodder as the animals here are habituated to this. Training on urea treatment has happened but the acceptance is very less.
Milk collection centre Baisal Pataliputra Dugdh Producers's which is tied up with Patna Sudha. 99 members formed the cooperative with 2 office bearers, Chairman and Secretary. The expense to take milk is 0.20 paisa per lit. The milk yield is 5-6 kilos per animal (905 gms – 1 lit). The price is Rs.10-12 per kilo. The experience of this village with improved breeds is not very good.

Fisheries:
75 households in this village are from fishermen community (*Kebat*). Fishing is done in Dhoba river nearby. October, November is the fishing season. Unsold left over fish are dumped back into the river.

Other minor activities in the village are desheling of Bengal gram seeds. For deseeding 5 kg bundles Rs. 5/- is paid. Adults as well as children are involved in this job.

Meeting at KVK, Nalanda:

KVK offers trainings for Panchayat representatives and farmers.
3-4 day training programmes are organized on Mushroom cultivation, bee keeping, horticulture, vegetable and fruit cultivation, cultivation of medicinal and aromatic plants, vermicompost etc.
Self employment trainings are organized for rural youth. Regarding training the CRPs leaders of SHGs can be trained as master trainers.
This year 5 villages are selected for demonstrations and farmer trainings.
Diagnostic service is offered for pest and disease identification.
Seed village progrmme is active under KVK.

Problems in all over the district:
Irrigation facilities are not sufficient especially due to lack of electricity. Motors are run on diesel.

Interaction with Veterinary Officer, Department of Animal Husbandry, Nalanda:

The major programme being implemented in the district is breed up gradation through Artificial Insemination (AI). 20 AI centres are present in each block and at present the Veterinary Doctors are only involved in this process. The department is planning to train paravets in this process. Climate suitability for the breeds here is good. Paravet trainings will be provided to youth for a period of 3 months at Department training centre – Dumrou of Bhojpur district.

Fodder: Major source of fodder is dry fodder. The district produces sufficient amount of dry fodder for the cattle, from here the dry fodder is supplied to other districts also. Fodder cutting machines are also supplied from the department. Urea treatment for dry fodder is being promoted

Poultry: Loans are being provided for setting up poultry farms. Training for this will be given at 'Central Poultry Farm – Patna'.

Interaction with Department of Fisheries

Deputy Director: Nishant Sharma, Mr. Manoj

Training support available from the Department: At present department is providing training on different methods of fishing. Net fishing is in practice in the state. Guidelines are issued on ban season, net size etc.

The department is planning to send the fish culturing farmers to AP (Kakinada) for training by March. Around 1000 farmers will be sent in first batch.

Two district level training centres are there at Kishangunj. By next year a residential training institute will come up at Patna.

Use of feed is not in practice, mostly relied on natural feed. Some farmers (less than 5%) use Triple Super Phosphate, where as others use cow dung, rice bran, mustard oil cake in culture fisheries.

Water pollution is very less in fish culture in Bihar state due to non use of fertilizers which is also a reason for less production.

In case of makhana after roasting the seeds are broken for kernels when they are red hot. Hand blisters are common for the laborers involved. One NGO promoted use of gloves by the beneficiaries but they are not of very good quality.

Coming to the loan support from the department, here in Patna the land holdings will be on the names of forefathers and assigning authority to land and obtaining a loan is difficult process.

Interaction with Mr. Singh, Department of Irrigation:

Schemes and ground water status:
Private tube well scheme supported by NABARD is in progress in the state.
The Government target during 10^{th} 5 year plan was 6 lakh tube wells.
30% was subsidy, 20% own contribution and 50% bank loan.
All categories of farmers with land holdings are eligible under this scheme.
The allowed depth is 70 mts in selected blocks of south and north Bihar. In other places it is 45 mts. The ground water is available mostly at a depth of 30 mts.
Under the scheme tube wells along with pump set or tube well are allowed but not the pump set alone.
No over exploitation has happened in the state. The ground water exploitation was still below 50% only.
Bamboo borings are allowed only in Purnea and other districts as they can not go beyond 20-30 mts. They can extract water from that level only. The other problem for bamboo borings is theft problem since the fields are far away. The life period is 2-3 years but 7 yrs as per farmers. In place of coir, nylon ropes are being used.

Ground water act: Bihar Ground water (Regulation and control) Development and Management.

Ahars are initially under Revenue Department. Now the restoration and renovation are handed over to minor irrigation and are under control of Panchayat which is implementing this under National Rural Employment Guarantee Scheme and State Rural Employment Scheme. *Aahar* bunds can support only one crop, not rabi and summer crops.
Ground water authority is a 9 member body from different departments headed by a chairman gives sanctions permissions for drilling bore wells.
The motors are run with diesel due to lack of electricity which involves high cost.
Lift irrigation was in practice earlier (15-20 yrs back), but is out of practice due to changing course of rivers.

Barge lift irrigations pumps with 1 HP motor can irrigate 20 ha of field. Flexible treadle pumps can not lift beyond 25 ft depth.
Open wells are seen only in hilly areas where tube wells can not be drilled.

Another programme is 'On Farm Water Development Programme' of Government of India which involves micro irrigation (drip and sprinkler) is under Department of Agriculture. For these 12,000 will be subsidy, 28,000 farmer's contribution. For SC, ST farmer's bank loan is 40% and beneficiary contribution is 10%.
Other government schemes are surface irrigation schemes like check dams, sluices, gates etc.

Interaction with Mr. Anil Jha, Agricultural specialist, PPM cell, Ministry of Agriculture:

Most of the farmers involved in agriculture are small farmers (with land holdings less than one acre), land less farmers (who take land on lease). Mechanization is not possible in these fragmented holdings.
Packages with completed support required may help in uplifting these farmers.
Agricultural productivity in North Bihar is very low due to floods.
Value attached to agriculture is very less in overall Bihar.
Quality inputs especially seed and fertilizers are very important.
Extension system in Bihar is not very strong.
Using farmers (progressive farmers – district level ATMA offices will have the list) as trainers and motivators may help.
District ATMAs have done the bench mark survey and have developed strategic research and extension plan.
Fisheries can be encouraged in Madhubani.

Photographs:

Ahar for water conservation

Interaction with SHGs

Channels for water conservation

Reuse of fungicide bags