26/06/2023 15:14:30

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Auction Notice

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General Detail

Office/Zone : Ministry of Agriculture and Farmers Welfare
-Department of Agricultural Research and Education (DARE)
-Indian Council of Agricultural Research (ICAR)

Seller/Auctioneer Name : Manoj Kumar Sethy-Auctioneer

Reference No. : 02/Store/e-Auction/2023-24

Category : Others

Auction Brief : Auction/ Lease of Integrated Farming Systems (IFS) of ICAR-NRRI, Cuttack

Auction Detail :

Bids are invited **online through GeM Portal** for **Auction/ Lease of Integrated Farming Systems (IFS) of ICAR-NRRI, Cuttack for Two Years** from the eligible bidders on "**AS IS WHERE IS BASIS**" condition.

The bidder should deposit online an amount of **Rs. 10,000.00 (Rupees ten thousand only) as Bid Security / EMD** in ICAR-NRRI Account (**Name of the A/c Holder: ICAR UNIT CRRI, Cuttack, A/c No.: 10329386033, Type of A/c : Current Account, Name of the Bank: State Bank of India, Name of the Branch: Nayabazar, Cuttack-4, IFSC Code: SBIN0002094**) before the last date of EMD submission through GeM. EMD of the unsuccessful bidder shall be returned without interest at the earliest on finalization of the Auction.

Terms and conditions

1. The two IFSs is to be auctioned on lease having the land area of 1.0 ha, and 0.8 ha, respectively with definite land configuration and assets (Maps and Inventories attached in Annexure I & II).
2. Bidders/ Contractors are not allowed to alter / change the land area and the land configurations of the IFSs.
3. The details technical details of crops/ plants/ livestock/fishes to be maintained are enclosed in Annexure- I & II, which must be followed by the bidders/ contractors.
4. Total inventories list of the two Units of IFSs are attached in Annexure-I which includes area under fish, rice, bunds, number of perennial trees and other fruit plants. Information on kharif and rabi crops to be grown, vegetables to be grown on bunds, crop varieties to be raised, fish fingerlings density required, crop calendar details and all the technical information including management practices during the crop period.
5. The crop calendar and inventories should be maintained strictly by the bidder / contractors as suggested by the scientists, technical person, and or competent authorities of ICAR-NRRI, Cuttack. Any deviation from the technical aspects results in cancellation of the contract by the competent authority.
6. The scientist and technical personnel of ICAR-NRRI, Cuttack should be allowed to demonstrate the models to the visitors as and when required.
7. Supply of all the inputs required for the IFS, their maintenance should be done by the bidders /Contractors. However, they can seek advice or technical support from the Scientist and technical staffs from ICAR-NRRI, Cuttack.
8. The output or produced generated from the system can be sold by the contractors / bidders. The profit gained out of those will be sole taken by the bidder /contractors. There will no interventions or interference from the side of the ICAR-NRRI, Cuttack in the aspects of rate of the produce and the place where the produce to be sold and to whom. Selling of the produce/ products is the sole responsibility of the bidder/ contractor.
9. Based on the performance on the system technical programme may be altered any time after getting due approval from the competent authority.
10. Institute would be not responsible for any losses from the system due to maintenance and inputs issues or other unforeseen situations.
11. Bidder / Contractor has to submit the details of the persons working / engaging in the IFSs to the security of ICAR-NRRI, Cuttack.
12. **The lease out of the system will be given for the 2 years' terms initially subject to be extension after one year based on the first-year performance by the Competent authority, ICAR-NRRI, Cuttack.**
13. The assets of IFSs including land area, plantations, ponds, live materials, infrastructure, etc., must be maintained properly by the bidder/ contractor, and for that a caution money has to be deposited by the bidder to the ICAR-NRRI, Cuttack.
14. If any damage is caused to the IFS models and the institute property, liquidated damage charges shall be levied on the contractors.
15. The IFS models can be inspected by the interested parties on above mentioned date only by contacting the **Assistant Administrative Officer, Store Section, ICAR-NRRI, Cuttack-753006 at telephone 0671-2367757 (Extension No. 2248)**. No request for inspection of items will be accepted/considered outside the specified date and after submission of bid.
16. The bid shall remain valid for 45 days after the date of bid opening. If any bidder withdraws his / her bid before the said period, this office shall without prejudice to any other right or remedy, be at liberty to forfeit the Bid Security absolutely.
17. Conditional bid shall not be entertained.
18. The IFS model with two units viz., (i) Integrated farming system model for rainfed shallow lowland and (ii) Deep water system shall be auctioned out on lease basis for maintenance of the farming systems research unit by outsourcing the operations on payment of User/ Licence fee to the institute by the lessee
19. The mode and method of the contract will be as per by forward auction method on GeM, the bidder offering the highest price may be selected.
20. The base/ reserve price for both the units together will be Rs. 1.05 lakhs per annum
21. The refundable security deposit for both the units together will be Rs. 1,00,000, which needs to be deposited by the bidder in addition to the annual user fee. The security deposit without no interest thereon will be refunded after adjusting the losses / penalties caused by the agency, after the termination of the contract.

QUALIFICATION CRITERIA:

1. The Contractor/Agency/Firm(s) should be registered under the *Shop and Establishment Act* and should possess valid Registration certificate as on the date submission of bids and should be valid for the entire duration of the bid validity period relevant to the work mentioned in the tender document.
2. The Contractor/Agency/Firm(s) should have valid EPF & ESI registration certificates issued by govt.
3. The Contractor/Agency/Firm(s) have a registration with LIN number under the Contract Labour (Regulation and Abolition) Act, 1970.
4. The Contractor/Agency/Firm(s) should have valid GST Registration certificate & PAN number.
5. Average turnover of the Contractor/Agency/Firm(s) should be not less than Rs.10.00 lakhs (Rupees Forty lakhs) during the last three years i.e. (2018 -19 or 2019 – 20 or 2020-21 or 2021-22 or 2022-23).
6. The Contractors /Agency/ Firm (s) should have solvency capacity of Rs 5 lakhs from bank / submit Annual bank transaction statement.
7. Minimum three years' of experience in the field of providing such services as per the tender in Central Govt. establishments/Autonomous bodies of Govt. of India/ Corporations of Govt. of India/reputed public or private organizations', etc.
8. The firm should **not have been blacklisted** by any Government Department/ Government Educational Institutions/ Research Institutes during the last three years.

Project Location - Pin Code :

#	Pin Code	City	District	State
1	753006	Cuttack	Cuttack	ODISHA

Bid Submission Rule

Bidding Access : Open
Item wise Time : No
Reserve Price : Not Applicable
Set PQ Validation : No

EMD/Post Event Deposit

Allow EMD : Yes
Requires Item wise EMD : Yes
EMD Payment Start Date : 27/06/2023 09:00
EMD Payment End Date : 07/07/2023 12:15

Auction Timing rule

Auction Start Date & Time : 13/07/2023 09:00
Auction End Date & Time : 14/07/2023 10:00
Auto Extension : Applicable
Auto Extension Mode : Unlimited
Bidding Template : Others

View Business Rules (/eprocure/eauction/common/view-configure-rule/6187/0/0/3/5CF70249F8DF218D7C23F3BB015232EF5AB003CF)

View EMD Details (/eprocure/xcommon/view-auction-item-wise-emd/6187/C5766F08D0571B6772ADA2034FFCE696783B5F31)

Download Document

Sr. No.	Document Description	Size (MB)	Uploading Date & Time	Approval Date & Time	Status	Action
1	Detailed Bid Document. Bidders are requested to read carefully before submitting their bid.	1.59	26/06/2023 15:02	26/06/2023 15:02	Approved	Download(/eprocure/xcommon/file-download/46/6833/6187/CC467F112E855AE1808B892F9A27D519B1EBA87E

भाकृअनुप-राष्ट्रीय चावल अनुसंधान संस्थान
कटक (ओडिशा) 753 006, भारत
ICAR – NATIONAL RICE RESEARCH INSTITUTE
Cuttack (Odisha) 753 006, India
Email: director.nrri@icar.gov.in; URL: *http://www.icar-nrri.in*

Computer No: 258955 File No: NRRI/IFS/2023-24

Date:26/06/2023

E-AUCTION NOTICE

SUB: Auction/ Lease of Integrated Farming Systems (IFS) of ICAR-NRRI, Cuttack

GEM AUCTION ID: 6187

Reference No.: 02/Store/e-Auction/2023-24

Bids are invited **online through GeM Portal** for **Auction/ Lease of Integrated Farming Systems (IFS) of ICAR-NRRI, Cuttack for Two Years** from the eligible bidders on "**AS IS WHERE IS BASIS**" condition. The bids will be received online through GeM (Forward Auction) (https://forwardauction.gem.gov.in/eprocure/home) only and shall be opened as per standard operating procedure of GeM.

THE BIDS ARE INVITED FOR THE WHOLE LOT AND NO BID WOULD BE ACCEPTED FOR ANY PART OF THE SAME.

Desirous firms/agencies may download the tender document form ***https://icar-nrri.in/tender/*** **and GeM portal.**

Important dates of tender related activities are as under:

S.No	Description	Details and dates
1	The IFS Models can be inspected at:	ICAR-National Rice Research Institute Cuttack – 753006, Odisha (as is where is basis)
2	E-Auction Notice publishing date:	**26.06.2023**
3	Date & time of inspection:	**27.06.2023 to 06.07.2023 (Between Official Timings- Monday to Friday (9.00 AM to 5.30 PM excluding closed holidays**
4	**EMD Payment Last Date (Online Payment in ICAR-NRRI Account):**	**07.07.2023 at 12.15 PM**
5	Last date of mandatory document submission by mail at **nrristores@gmail.com**	**07.07.2023 at 03:00 PM**
6	Bid submission/Auction start date:	**13.07.2023 at 9.00 AM**
7	Bid submission/Auction end date:	**14.07.2023 at 10.00 AM**

Eligibility Criteria:

1. The bidder should deposit online an amount of **Rs. 10,000.00 (Rupees ten thousand only) as Bid Security / EMD** in ICAR-NRRI Account (**Name of the A/c Holder: ICAR UNIT CRRI, Cuttack, A/c No.: 10329386033, Type of A/c : Current Account, Name of the Bank: State Bank of India, Name of the Branch: Nayabazar, Cuttack-4, IFSC Code: SBIN0002094**) before the last date of EMD submission through GeM. EMD of the unsuccessful bidder shall be returned without interest at the earliest on finalization of the Auction.

Scope of Work

Outsourcing of Operation and Maintenance Works of the following Integrated Farming Systems (IFS) of ICAR-NRRI, Cuttack-753006

1. **Rainfed lowland system (Area: 1 ha)**
2. **Deep water system (Area: 0.8 ha)**

Reserve Price: Rs. 1,05,000/- per year

Physical infrastructure available in Rainfed lowland system (1 ha)

Sl.No.	Name of the unit	Stock available/maintained/to be maintained (Area/Qty)
1	Coconut trees	6 no.
2	*Acacia auriculiformis*	12 no.
3	*Acacia mangium*	3 no.
4	*Dalbergia sissoo*	1 no.
5	Teak	7 no.
6	Mango trees	8 no.
7	Guava trees	10 no.
8	Banana trees	213 no.
9	Bael trees	3 no.
10	Indian Gooseberry saplings	4 no.
11	Ou tree	1 no.
12	Papaya trees	2 no.
13	Drumstick	4 no.
14	Fish pond	650 m^2
15	Paddy area	6600 m^2 (0.66 ha) (1.65 acres)
16	Area available for growing vegetables and fruits like papaya	600 m^2
17	Poultry shed	10 feet (L) x 8 feet (B) x 6 feet (H)
18	Duck shed	10 feet (L) x 6 feet (B)
20	Goatary unit	12 feet (L) x 10 feet (B) x 9 feet (H)
22	Mushroom shed	12 feet (L) x 8 feet (B) x 6 feet (H)
23	Store room	1 no.
24	Field Laboratory room	1 no.
25	Land lease	1 acre area
26	Cement tanks (9 No.) surrounded by cement flooring and covered by iron shed with grills	15000 litres capacity
27	Small tanks	2 no. (Each 50 litre capacity)
28	Compost unit	10 feet (L) x 6 feet (B) x 3 feet (H)
29	Sintex plastic water tank	500 litre capacity

Physical infrastructure available in deep water system (0.8 ha)

Sl.No.	Name of the unit	Stock available/maintained/to be maintained (Area/Qty.)
1	Guava trees	16 no.
2	Sapota	3 no. (big trees)
3	Mango	12 no.
4	Pineapple	50 no.
5	Papaya	2 no.
6	Citrus	9 young trees
7	Banana	5 no.
8	Fish pond	1435 m^2 (0.36 acre)
9	Paddy field	2000 m^2 (0.50 acre)
10	Fruit crops area	506 m^2 (0.13 acre)
11	Vegetable garden area	422 m^2 (0.11 acre)
12	Mushroom unit	14 m^2 (12 feet (L) x 12 feet (B) x 8 feet (H))
13	Vermicompost unit	1 no.
14	Compost unit	1 no.(12 feet x 10 feet)
15	Drumstick trees	2 no.
16	Coconut trees	6 no.
17	Arecanut trees	5 no.
18	Neem tree	1 no.
19	*Acacia auriculiformis*	2 no.
20	*Acacia mangium*	10 no.
21	Bamboo tree	1 no.
22	Teak trees	5 no.
23	Duck shed (cement floor with asbestos roof and side iron grills)	1 no. (10 feet x 10 feet)
25	Chicken shed (cement floor with asbestos roof and side iron grills)	1 no. (10 feet x 6 feet)
26	Chicken	7 no.
27	Free space in front of duck and poultry shed	70 m^2
28	Bund space available for growing papaya and other vegetables	150 m^2
29	Goat shed	1 no. (10 feet x 6 feet)
31	Store room	4 no.
32	Diesel engine	1 no.

Terms and conditions

1. The two IFSs is to be auctioned on lease having the land area of 1.0 ha, and 0.8 ha, respectively with definite land configuration and assets (Maps and Inventories attached in Annexure I & II).
2. Bidders/ Contractors are not allowed to alter / change the land area and the land configurations of the IFSs.
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4. Total inventories list of the two Units of IFSs are attached in Annexure-I which includes area under fish, rice, bunds, number of perennial trees and other fruit plants. Information on kharif and rabi crops to be grown, vegetables to be grown on bunds, crop varieties to be raised, fish fingerlings density

required, crop calendar details and all the technical information including management practices during the crop period.

5. The crop calendar and inventories should be maintained strictly by the bidder / contractors as suggested by the scientists, technical person, and or competent authorities of ICAR-NRRI, Cuttack. Any deviation from the technical aspects results in cancellation of the contract by the competent authority.
6. The scientist and technical personnel of ICAR-NRRI, Cuttack should be allowed to demonstrate the models to the visitors as and when required.
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10. Institute would be not responsible for any losses from the system due to maintenance and inputs issues or other unforeseen situations.
11. Bidder / Contractor has to submit the details of the persons working / engaging in the IFSs to the security of ICAR-NRRI, Cuttack.
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15. The IFS models can be inspected by the interested parties on above mentioned date only by contacting the **Assistant Administrative Officer, Store Section, ICAR-NRRI, Cuttack-753006 at telephone 0671-2367757 (Extension No. 2248)**. No request for inspection of items will be accepted/considered outside the specified date and after submission of bid.
16. The bid shall remain valid for 45 days after the date of bid opening. If any bidder withdraws his / her bid before the said period, this office shall without prejudice to any other right or remedy, be at liberty to forfeit the Bid Security absolutely.
17. Conditional bid shall not be entertained.
18. The IFS model with two units viz., (i) Integrated farming system model for rainfed shallow lowland and (ii) Deep water system shall be auctioned out on lease basis for maintenance of the farming systems research unit by outsourcing the operations on payment of User/ Licence fee to the institute by the lessee
19. The mode and method of the contract will be as per by <u>forward auction method on GeM,</u> the bidder offering the highest price may be selected.
20. The base/ reserve price for both the units together will be Rs. 1.05 lakhs per annum
21. The refundable security deposit for both the units together will be Rs. 1,00,000, which needs to be deposited by the bidder in addition to the annual user fee. The security deposit without no interest thereon will be refunded after adjusting the losses / penalties caused by the agency, after the termination of the contract.

22. The technical qualification for consideration of the price bids will be as follows:

(I) QUALIFICATION CRITERIA:

a.	The Contractor/Agency/Firm(s) should be registered under the *Shop and Establishment Act* and should possess valid Registration certificate as on the date submission of bids and should be valid for the entire duration of the bid validity period relevant to the work mentioned in the tender document.
b.	The Contractor/Agency/Firm(s) should have valid EPF & ESI registration certificates issued by govt.
c.	The Contractor/Agency/Firm(s) have a registration with LIN number under the Contract Labour (Regulation and Abolition) Act, 1970.
d.	The Contractor/Agency/Firm(s) should have valid GST Registration certificate & PAN number.
e.	Average turnover of the Contractor/Agency/Firm(s) should be not less than Rs.10.00 lakhs (Rupees Forty lakhs) during the last three years i.e. (2018 -19 or 2019 – 20 or 2020-21 or 2021-22 or 2022-23).
f.	The Contractors /Agency/ Firm (s) should have solvency capacity of Rs 5 lakhs from bank / submit Annual bank transaction statement.
g.	Minimum three years' of experience in the field of providing such services as per the tender in Central Govt. establishments/Autonomous bodies of Govt. of India/ Corporations of Govt. of India/reputed public or private organizations', etc.
h.	The firm should **not have been blacklisted** by any Government Department/ Government Educational Institutions/ Research Institutes during the last three years.

(i) All entries in the Tender Form should be written legibly and filled clearly must be signed by the authorized signatory may be attached. Only the technically found suitable Contractor/Agency/Firm(s) Financial Bids would be considered.

(ii) The following documents / vouchers are <u>MANDATORILY</u> be forwarded by email only at (nrristores@gmail.com) along with the tender form after duly signed by the tenderer(s) as a part of the technical bid before EMD payment last date:

a) Certificate of Registration of the Contractor/Agency/Firm(s) & the license for operating Services as per applicable Rules/ Act.

b) Average Annual turnover certificate issued by Bank.

c) Copy of at least three work orders/IEO along with the details in enclosed tabular form citing **Minimum three years' of experience** in the field of providing such services as per the tender in any Central Govt. establishments/Autonomous bodies of Govt. of India/ Corporations of Govt. of India/reputed public or private organizations etc.

d) Certified copies of Balance Sheet by the Registered Chartered Accountant and Income Tax (IT) returns of the Contractor/Agency/Firm(s) for the **latest three financial or assessment year** (2018 -19 or 2019 – 20 or 2020-21 or 2021-22 or 2022-23) whichever is available with the Contractor/Agency/Firm(s), failing which tender is liable to be rejected. A copy of the PAN card also be attached.

e) Copy of EPF registration certificate issued by concerned authorities.

f) Copy of ESI registration certificate issued by concerned authorities.

g) Copy of registration certificate with the Contract Labour (Regulation and Abolition) Act, 1970 along with LIN otherwise the Contractor/Agency/Firm(s) shall obtain the labour license under this Act within 30 days from the date of issue of the work order. However, registration with appropriate authority under Contract Labour (Regulation and Abolition) Act, 1970 is mandatory.

h) Good Service Tax (GST) registration certificate issued by central or state Govt. etc.

i) The Contractors /Agency/ Firm (s) should have solvency capacity of Rs 5 lakhs from bank / submit

Annual bank transaction statement.

j) Whether the Contractor/Agency/Firm(s) has/have any legal suit/criminal case pending against it for violation of PF/WCP/ESI, Minimum Wages Act or other law (give details). The Contractor/Agency/Firm(s) must enclose a certificate indicating that there is no criminal/ legal suit pending or contemplated against it & affidavit of non-blacklisting on **non-judicial stamp paper of Rs. 10/- or more.**

(II) METHOD OF EVALUATION:

(a) Technical Bid Evaluation: Evaluation by scoring on technical qualification: The Contractor/Agency/Firm(s) should acquire minimum prescribed qualifying score in technical evaluation parameters as indicated in each category individually, with an overall minimum score of 45, to be qualified for consideration of financial bid. Only those bidders who submit all requisite documents as per clause above of this tender notice and secure minimum score of **45 in the technical qualification on parameters mentioned below will be declared as qualified for considering Financial Bids:**

Parameter	Minimum qualifying score
1. Experience of serving in Govt. (Centre/State) Departments/ Autonomous Bodies/PSUs/PSES/Bank & Insurance Companies or other equivalent & companies/ organizations of high repute:- • Less than 3 years - 0 Marks • 3 years and above & up to 5 years - 25 marks • Exceeding 5 years & up to 10 years - 30 Marks • Exceeding 10 years - 40 Marks	**25 Marks**
2. Average turnover of the firm during last three years:- • Less than Rs. 10.00 lakhs - 0 Marks • Rs. 10.00 lakhs and above & up to 20 lakhs - 20 marks • Exceeding 20.00 lakhs & up to 50.00 lakhs - 50 Marks • Exceeding 50 lakhs - 60 Marks	**20 Marks**

(b) **Financial Evaluation:**

The Firm has to quote all-inclusive user fee charges in Rupees to be deposited by them in the financial bid part on the GeM portal. It may be noted that the **NRRI, Cuttack has prescribed the base rate / reserve price considering the prevailing market rates. The rate quoted by the bidders less than the base price will not be accepted for consideration for financial evaluation. Selection of the bidder will be made solely on the highest rate among the valid financial bids (H-1) subject to the fulfillment other terms and condition of the tender. Afterwards, order will be issued for the contract period, for execution of the agreement with NRRI, Cuttack.**

1. **Evaluation criteria**: Highest bid will be accepted subject to the approval of Competent Authority. **The successful H1 bidder should deposit transaction charges in GeM Portal as applicable as per GeM provision before award of contract.**
2. All the bidders shall fill the details of EMD column on GeM Portal if the option is available before submission of bids.
3. The undersigned will not entertain any claim for damage done by the way of theft, fire or any other unforeseen calamity after realizing full payment against the auctioned Material/items/Units.
4. The auctioned **IFS models** will be handed over on the issue of Release Order on making full payment **within 15 days** in the form of online payment **in ICAR-NRRI Account (Name of the A/c Holder: ICAR UNIT CRRI, Cuttack, A/c No.: 10329386033, Type of A/c : Current Account, Name of the Bank: State Bank of India, Name of the Branch: Nayabazar, Cuttack-4, IFSC Code:**

SBIN0002094). Otherwise, the EMD money deposited will stand forfeited and the offer shall be awarded to the next eligible bidder.

5. **The applicable Transaction Charges shall be paid by the successful Bidder to GeM within 3 (three) working days of winning the auction lot. GeM at its sole discretion can extend the time for payment of the transaction charge**.
6. The bid without EMD (online payment) will be liable for rejection. No offline EMD will be accepted.
7. The Institute does not guarantee to make any definite quantity and quality of articles available to the buyer.
8. The list of items shown is indicative, ICAR-NRRI reserves the right to add/delete/modify the quantity as found necessary.
9. At any time ICAR-NRRI may modify the bidding document by amendment thereto. The amendment will be notified on ICAR-NRRI's website only, which will be binding on bidders. Bidders should regularly visit the website ***https://icar-nrri.in/tender/*** to keep themselves updated.
10. Tenders not complying with the above conditions are liable to be rejected.
11. The Director, ICAR-National Rice Research Institute, Cuttack reserves the right to accept or reject any or all the bids received with assigning any reason thereof.
12. All disputes including court proceeding shall be settled within the Cuttack Jurisdiction only.

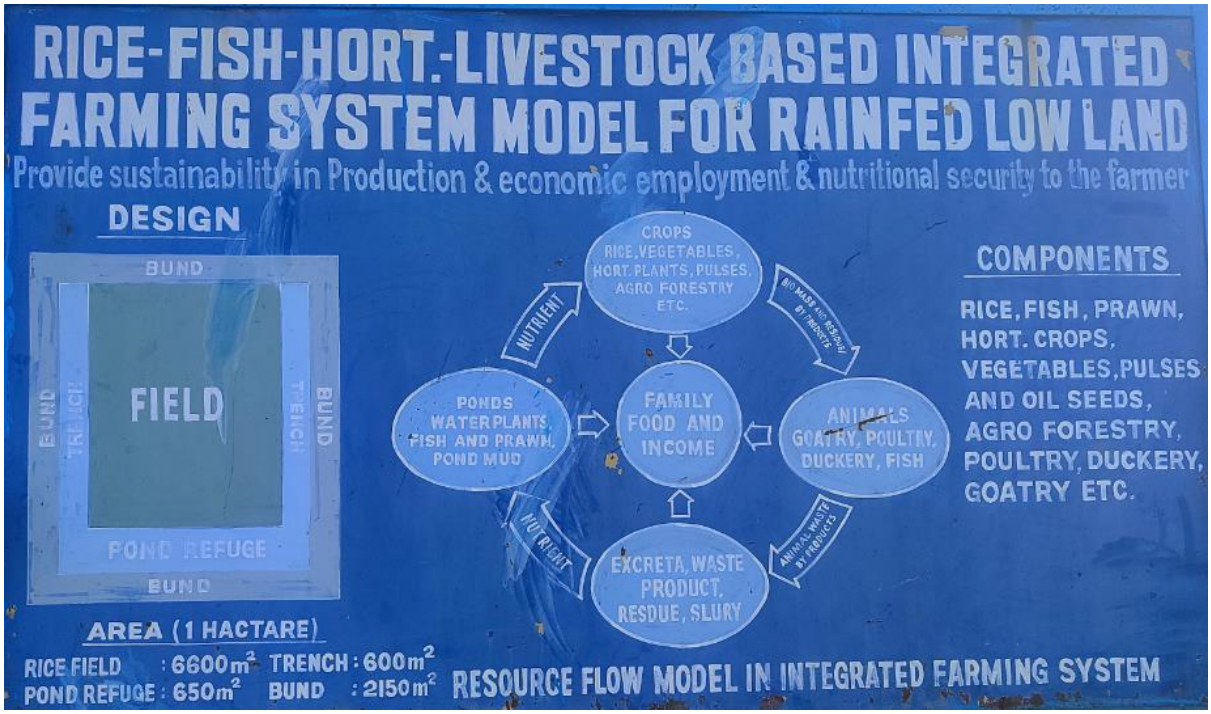
Sd/-
Asst. Administrative Officer
Store Section, ICAR-NRRI, Cuttack-753006

Annexure-1

Model I: Rice–fish–livestock-horticulture-based farming system for rainfed lowland areas (for Auction)

Detailed Technical Program:

Rice –Fish–Livestock-Horticulture based farming system for rainfed lowland areas



1. The area under the model is 1 ha.
2. Field design includes wide bunds (dykes) all around.
3. A pond refuge connected with trenches on two sides (water harvesting come fish refuge system) and guarded outlet.
4. The area allotments are 21.5% for bunds (2150 m^2)
    a) 12.5% for pond refuge and trenches (1250 m^2)
    b) 66% for main field (6600 m^2)
5. Pond refuge measures 65 m length and 10 m wide and 1.75m deep at the lower end of the field
6. The two side trenches are of 3 m width and average 1 m depth and have gentle (0.5%) bed slope towards the pond refuge.
7. A small duck shed measuring 10 feet (L) x 6 feet (B)is on front bund of the system with cement flooring and asbestos roof.
8. A poultry unit measuring 10 feet (L) x 8 feet (B) x 6 feet (H) (with asbestos roof and iron mesh on bottom and sides) over the left bund of the system with some portion intruded on the fish pond.
9. A small *goat-shed* unit on the corner of left bund measuring 12 feet (L) x 10 feet (B) x 9 feet (H).
10. Space for growing vegetables on the Bund: 600 m^2

Layout of the system

Design and Layout

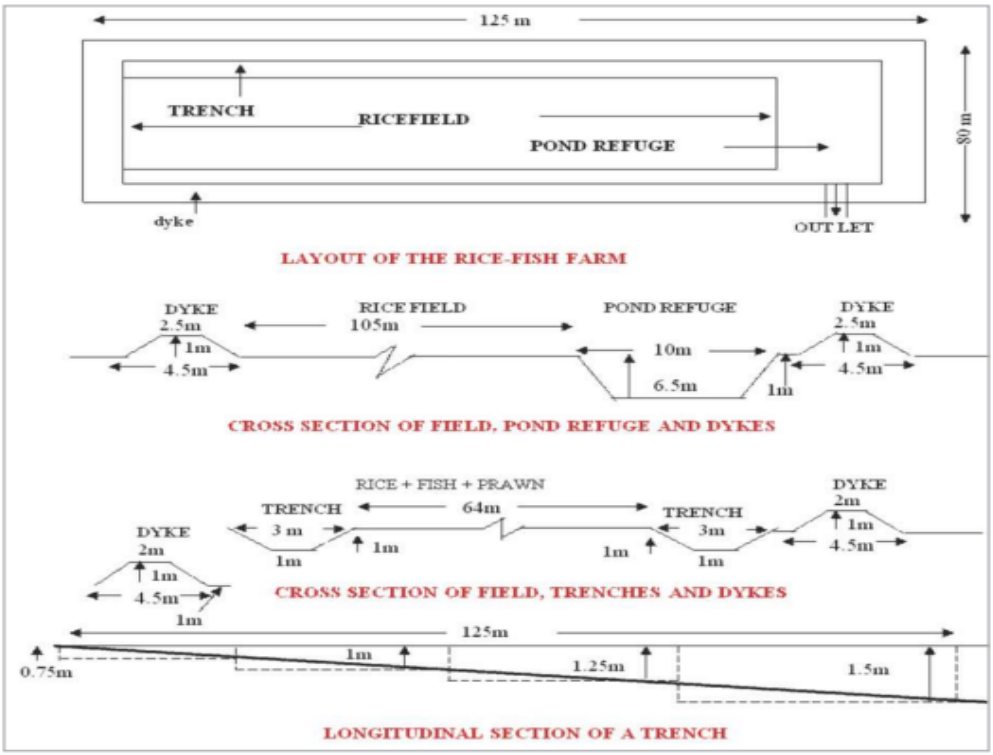


Fig 1. Layout of Rice –fish –Livestock- Horticulture based farming system for rainfed lowland areas

Inventories at present

Perennial tree component

- Mango – 8 no.
- Guava – 10 no.
- Banana – 213 no.
- Coconut – 6 no.
- Bael – 3 no.
- Ou -1 no.
- Indian Gooseberry saplings – 4 no.
- Papaya – 2 no.
- Drumstick – 4 no.
- *Acacia auriculiformis* -12 no.
- *Acacia mangium* – 3 no.
- *Dalbergia sissoo* – 1no.
- Teak – 7 no.

Animal component

- Goats – 12 no**. to be maintained**

Other infrastructure

- Compost unit – 1 no. (10 feet (L) x 6 feet (B) x 3 feet (H))
- Mushroom shed – 1 no. (12 feet (L) x 8 feet (B) x 6 feet (H))
- Duck shed – 1 no. (10 feet (L) x 6 feet (B))
- Poultry shed – 1 no. (10 feet (L) x 8 feet (B) x 6 feet (H))
- Goatary unit – 1 no. (12 feet (L) x 10 feet (B) x 9 feet (H))
- Azolla growing cement tanks – 9 no. (total 15000 litre capacity)
- Small azolla tanks – 2 no. (each 50 litre capacity)
- Store room – 1 no.
- Field Laboratory room – 1 no.
- Sintex plastic water tank – 500 litre capacity

Technical Plans need to be followed:

Rice

- The rice varieties to be grown in wet season are Gayatri, Sarala, Durga, Varshadhan, CR Dhan 506 and other suitable varieties for this ecology
- If irrigation is available rice varieties such as Naveen, CR Dhan 303, CR Dhan 304, CR Dhan 305 and CR Dhan 306 etc. can be grown in rabi season. Or else (if irrigation is not available) other dry season crops such as mung bean or vegetables, etc can be grown in the main field.
- Use finger weeder in dry condition and cono-weeder in standing water (5-10 cm) for weeding.
- Avoid using insecticides and herbicides in the model.
- 5pheromene traps need to be installed for pest monitoring.
- Management of insect-pests in rice crop should be done with the use of botanicals (Netherin/ Nimbicidin spray at 1%, etc.).

Nutrient Management

Wet season

- Apply FYM @ 5 t/ha at the time of land preparation
- In irrigated lands, transplant healthy rice seedlings with spacing of 20 cm x 15 cm
- In rainfed lowlands, do dry seeding with line sowing before the monsoon (@75-80 kg seed/ha with a spacing of 20 cm between the rows)
- Apply fertilizer NPK @60:30:30 kg/ha with nitrogen in three splits (50% as basal dose, and rest in two equal splits during active tillering and panicle initiation stages) and entire phosphorus and potassium as basal dosages in transplanted rice.

- In rainfed conditions, apply fertilizer NPK @ 40:20:20 kg/ha as basal dose only

Dry season

- Prepare the land with application of FYM @ 5 t/ha and do puddling for rice transplanting
- Apply NPK @ 80:40:40 kg/ha with nitrogen in three splits (50% during planting and the remaining in two equal splits during active tillering and panicle initiation stages) and entire phosphorus and potassium as basal doses
- Avoid using insecticides and herbicides and do manual weeding
- In the absence of irrigation facilities, rabi rice is not recommended
- Farmer should practice alternate crops like watermelon, groundnut, sunflower, mung bean, okra, pumpkin, etc. by using stored rain water

Fish and Prawn culture

Pre-stocking management

- Weeds should be removed while unwanted and predatory fishes and other animals like frog, snake, crab and water insects etc. should be eradicated by repeated netting in water refuge area
- Prior to release of fish fingerlings and juvenile of prawn, eradicate the predatory and weed fishes using bleaching powder (150-200 kg/ha) or sun drying or application of mahua oil cake (@ 2500 kg/ha) and prepare the pond with application of lime (@200-250 kg/ha)
- However, rate of application of lime depends on soil pH (if pH 5.1-6.5 @ 1000 kg/ha, 6.6-7.5 @ 500 kg/ha), 7.6-8.5 @ 200 kg/ha and if soil pH is 8.6-9.5, then no need of application of lime
- Apply cow dung slurry @5000 kg/ha, and inorganic fertilizers (30:15:15 kg/ha of Urea, Triple super phosphate and Muriate of Potash)
- After 15-20 days of transplanting in July depending on water availability in water refuge area, stocking of fish fingerlings (4-6-inch size, stunted fingerlings) @ 6000-7000 nos./ha with the ratio of 30:30:40 as surface feeder, column feeder and bottom feeder and prawn juveniles @ 2-4 nos./m2 should be maintained
- Fish and prawn should be regularly fed at 2% of total biomass with mixture containing 95% of oil cake +rice bran (1:1) and 5% of fish meal.
- In rice-fish system, a combination of six fish species is ideal (viz., surface feeder – catla (*Catla catla*) and silver carp (*Hypopthalmichthys molitrix*), Column feeder – rohu (*labeo rohita*), bottom feeder – mrigal (*Cirrhinus mrigala*) and common carp (*Cyprinus carpio*), and vegetation feeder (*Puntius Javonicus*), however, addition of compatible prawn juveniles

(*Microbrachium rosenbergii* and *Microbrachiummalcomsonii*) species are also recommended

Post-stocking management

- After release of fish fingerlings, supplementary feed (combination of rice bran, oil cake and fish meal: 1:1:0.5 ratio) to be provided for 10-15 days within the water refuge area at a rate of 4-5% of their total biomass, and then allowed to roam inside the paddy field
- At this stage, there must be at least 6-10" water in the field
- After that the supplementary feed (combination of rice bran, oil cake and fish meal: 1:1:0.5 ratio) should be given at the rate of 1-2% of total fish biomass
- Fish can be harvested in the month of November/December
    - In irrigated field, if bidder decides to cultivate rabi rice, fish culture can be continued without harvesting the crop or again initiated by releasing newer fingerlings

Duck husbandry practice

- Duck breeds i.e Indian Runner, Khaki Campbell (egg layer) or their cross with indigenous local ducks are preferred. Khaki Campbell (egg layer) and White pekin (meat type) are well adopted in rice fields, however selection of duck breeds could be based on local availability and farmer's needs
- Brooding of ducklings: Procure one-day old disease free ducklings from the reliable sources or Govt. agencies like duck breeding and hatching farms, and rear for 21-28 days (0-4 weeks for Khaki Campbell and 2 to 3 weeks for white pekin) to avoid mortality
- Ducklings may be brooded in wire floor, litter or batteries. A wire floor space of 0.046 m^2/bird or solid floor space of 0.093 m^2/bird would be sufficient up to 3 weeks of age
- For 100 ducklings, 1-2 sq. meter area i.e. average 150 sq.cms/ducklings is convenient for brooding
- Maintain temperature of 29 to 32^oC in the first week of rearing, and reduces about 3^oC per week till it reaches 24^oC during the fourth week period
- In case higher temperature (summer) exists, then air circulation should be increased
- In winter (air temperature is lower) season, for increasing temperature of the room, a 100 to 200 watt electric bulb needs to be glow within the room (1-1.5 meter height from the ground level or as desired) or hot air blower may put on for maintaining the room temperature

- Duckling fed initially using water drinkers (5 to 7.5 cm deep), and fed with starter poultry feed (using feeder device), sprinkled with water
- From 2nd day onwards ducklings are fed as much as desired
- As the duckling grows bigger suitable size of feeders are used
- After 28 days rearing, ducklings are released to water refuge area for 2-3 hour for one-week period and after acclimatization ducks allowed to forage in the rice fields during the day times
- The forage in rice fields should be restricted at the time of rice transplanting (15 days after transplanting) and during flowering to rice harvesting (30 days)
- For adult bird, a floor space of 2-2.5 sq.ft (or 0.5 m^2) area per bird required for night shelter
- Provide supplementary feed (consisting of standard poultry feed or mixture of rice bran and cooked grain etc. @ 2% body weight) daily during evening hour. Care should be taken to avoid wet and left out feed to consume in the next day.
- Moist chaff rice, vegetable waste, horticultural waste and kitchen waste etc. are also used for feeding ducks which reduces the feed cost, however culture of Azolla in the rice fields or culturing Azolla in the embankment (by creating pits) further reduces the cost of duck feed

Ducks diseases and their Management

- Ducks are less susceptible to diseases than chicken
- Bad environmental conditions or contaminated food material cause diseases to duck
- Regular vaccination is essential for prevention of diseases in duck
- Purchasing disease free stock, maintaining sanitation, mineral & vitamin supplementation, periodic use of coccidiostate, de-worming are important steps for prevention of diseases
- Some other common medication to be followed
  1) Electral (10g/lit water at the time of arrival of duckling
  2) Stresroak @ 20g/lit water at the time of arrival and once in a week
  3) Multivitamins like Vimeral 5 ml/lit water should give 5 days continuously every month
  4) Amprolium (Anti-coccidiostate) @ 1g/lit water on normal bird starting after 3 weeks of age continued for one week and repeat every 2 months
  5) Tetracycline @ 5g/lit water for 5-7 days control the diarrhea

Common duck diseases, symptoms and their control measures

Sl.	Diseases	Causative factors	Susceptibility	Symptoms	Prevention and control
1.	Duck plague or Viral enteritis	Herpes virus	All age groups	Listless with drooping wings, ruffled feather, no desire to walk, dull cornea, nasal discharge, laboured breathing, greenish yellow diarrhoea, conjunctivitis and drop in egg production	No treatment available, except vaccination with Duck plague vaccine and should be administered at the 8-12 weeks.
2.	Aflatoxicosis	Ingestion of aflatoxin, the toxic metabolite of the fungus *Aspergillus flavus* from infected maize- meal, soya meal, and groundnut cakes. 4 types of Aflatoxin (B1, B2, G1, G2) of which B1 is the most toxic.	All age groups	Poor growth, loss of appetite, falling of feather, lameness, purple discolouration of feet and drop in egg production etc. If aflatoxin present in high concentration in feeds it leads to death.	Quality feed ingredients to be checked for aflatoxin. Replace the infected feed with good quality feed immediately
3.	Botulism	C-type toxin produced by *Cl. botulinum*.	Food borne poisoning for both young and adult birds	Dullness, ruffled feather, lameness, coma and death.	With low infection levels of toxin, sick bird removed and providing the rest with fresh and clean water. Avoid ducks scavenging on decaying plant materials. Epsom salt in drinking water can be used.
4.	Aspergillosis	Respiratory disease caused by *Aspergillus fumigatus*. It may be transmitted through the air.	All groups	Loss of appetite, laboured breathing, and emaciation.	No treatment available for prevention the hatching eggs should be properly cleaned and disinfected. Moldy litter should be immediately removed.
5.	Colibacillosis	Caused by *E. coli*.	Young duckling from 2-3 week.		Both sulphonamides and broad-spectrum antibiotics are useful. Maintenance of good hygiene is essential.
6.	Ornithosis	*Chlamydia psittaci*. The disease is transmitted through the egg and contact.	Young ducks are more susceptible than adults.	Conjunctivitis, blindness, general weakness, watery diarrhea and emaciation.	Broad spectrum antibiotics control the disease. Infected flock needs isolation.
7.	Duck viral hepatitis	Hepatitis virus	Mainly affects duckling of 2 to 4 week of age.	Characterized by an acute course and primarily hepatitis.	There is no treatment. The day-old duckling may be protected with attenuated virus vaccine.
8.	Duck cholera (Pasteurell-osis)	Infectious disease caused by *Pasteurella multocida*	In ducks over 4 weeks of age.	In peracute form death occurs without any symptoms. In acute form the bird show loss of appetite, increased thirst, and mucous discharge from mouth, high body temperature, and diarrhoea. Liver and spleen are enlarged.	Prevention and control with sulpha drugs. Vaccinate the birds (Duck Cholera (Pasteurellosis)) first at the age of 4 week and again 18 weeks.
9.	Parasites	Ducks are resistance to internal parasites (flukes, tape worm, and round worm). The infestation is prevalent only among those ducks which have access to stagnant water, overcrowded ponds. The external parasites include lice, mite ticks and ticks.	All groups	Reduces growth	Prevention and control with use of different types of anathematic drugs.

Poultry husbandry

- The breeds of poultry bird to be reared depends on farmer choice i.e broiler or layer birds or both mixed types
- The breeds of Rhode Island, Leghorn, Black rock and Vanaraja are suitable for rearing in rice based system
- 0.2-0.3 m^2 space is required for each bird
- Rearing of 50-75 nos.poultry birds/ha is ideal when combined with duckery and goatery
- Procure one day old chicks from hatching farm and do brooding for 3-4 weeks (with a desirable temperature, adequate feed, drinking water and space) and then reared in rice based farming sytem with provisioning of supplementary feeds (poultry feed, waste rice, chaff rice including vegetable watse etc.)
- Layer birds are reared upto 18 months and each bird lays approx. 210-250 eggs per year

- The broiler type bird after 2-3 months of rearing attains 2.5-3.5 kg of weight and sold in the market. The farmer may continue 2-3 cycles in a year

Goat husbandry

- About 20 numbers of black Bengal goat (20 females: 1 male ratio) is ideal for rearing in rice based farming system
- However, indigenous local goat breeds i.e. Malkangiri goat, Koraput Hill goat, Ganjam Hill goat, Raighar goat, Narayanapatnam goat, Phulbani goat and Dorangi goat etc. can be reared in the farming system depending on their availability and ecological conditions of the system
- Space requirement for female goat is 1.0-1.2 m^2, male buck is 1.8 – 3.2 m^2 and kid is 1.5 m^2
- Stall feed daily with 3-4 kg of green fodder, 1-2 kg of dry fodder and 200-250 grams of ready-made seeds as concentrates
- Incase of partial stall feeding, at least 50 per cent of the above quantities should be fed to goat
- The concentrate feed ingredients include groundnut cake, maize, sorghum, broken rice and wheat grains
- In addition to the grains, goat requires green cereal fodders (hybrid napier, guineagrass, sorghum, bajra, etc.) and legume fodders (stylo, berseem, hedge Lucerne, cowpea, Desmanthus) and some tree fodders (velvel, seemaikaruvel, arasu, subabul, agathi, glyricidia, vagai, karuvel and kodukapuli etc.) for achieving better growth

Azolla cultivation and production

- Azolla fixes atmospheric nitrogen, used as bio-fertilizer, feed for livestock and bio-fuel
- Azolla grows at a temperature of 20-28ºC with 50% of sunlight, relative humidity 65-80% and water pH 5.0-7.5
- For culturing, Azolla bed is prepared by constructing 2 m x 2 m x 0.3 m rectangular (spreading silpaulin sheets for water retention) or constructing cement structures
- 10 to 15 kg of sieved soil has to be uniformly spread over the pit or tank.

Fill the with water and add cow dung (4-5 kg raw dung) slurry + P_2O_5

- Inoculate with 0.5-1.0 kg of pure mother Azolla culture seed material, spread uniformly over the water of the pits and sprinkle with fresh water over the Azolla immediately to make the Azolla plants upright
- After 7-10 days, Azolla growth will form a thick mat, and can be harvested
- It should be washed thoroughly and mix with table salt for making well palatable and fed to ducks, poultry and goats

- Using Azolla as livestock feed reduces the cost of supplementary feed requirements
- Excess Azolla production can be sold to market (Rs 10/kg)
- Additionally, Azolla can be cultured in rice field and helpful in the process of supplementing nitrogen requirements of rice

Components on bund

Vegetables:

- Location specific seasonal vegetables such as okra, gourd, radish, brinjal, leafy vegetables, etc could be grown.
- During winter tomato, French bean, radish, pumpkin, leafy vegetables, etc can be grown

Fruits:

- Dwarf papaya (Pusa dwarf, Pusa majesty, Pusa nanha, CO-2, Coorg and Honey Dew), banana (Cavendish, Robusta or tissue cultured, Poovan, Bonthal), Coconut (TxD), areacanuts, guava and improved mango could be grown.

Agroforestry

- *Acacia mangium*, *Acacia auriculiformis*, *Eucalyptus globulus* are ideal
- Planted 2-3 meter apart east to west on northern and north to south on western side of bunds.
- Prune the tree every year and leaves could be used as fodder or composting.
- In shaded areas, turmeric, ginger, amorphophallus, yam, Colocasia, pineapple, etc., could be grown.

Waste recycling

- Organic wastes generated from farming systems can be converted into high quality manure through vermicomposting or composting in a pit
- Vermicomposting unit set up in bund tree shaded area using vermibed (purchased from market) or constructing tanks using brick with standard size (12 ft x 4 ft x 2 ft) with adequate provision of drainage facilities.
- Bottom layer would be filled with loamy soil (15 cm) followed by organic waste and cow dung (10 cm each) for 3-4 layers, covered with banana leaves and kept moist with spraying water daily.
- The vermi worm *Eisenia fetida* (epigeic species) inoculated with 2-3 kg worm per bed.
- After 3-4 months high quality vermicompost could be harvested and used for plant growth.

Gourds optional)

- Creeper vegetables such as snake gourd, bitter gourd, ridge gourd, bottle gourd, ash gourd and pumpkin etc. can be grown on the extended platform over the water refuge area or seepage gallery.

Mushroom (optional)

- Two types of mushrooms i.e. Oyster mushroom (*Pleurotus* spp.) and Paddy straw mushroom (*Volvariella* spp.) can be grown in bund area
- Straw mushroom (*Volvariella* spp)reareddduring March to September
- Oyster mushroom (*Pleurotus* spp.) reared during October to February
- Oyster mushroom cultivation includes soaking of chopped straw in water for 12 hours, followed by sterilization, water draining and spreading mushroom spawn in between the straw layers (3-4 layers) in the polythene bag having 10-15 holes in the tops and hanging in a rope. Water sprayed twice daily regularly for maintaining moisture content. In the span of 30 days 2.0 to 2.5 kg of mushroom/bed would be harvested.
- Straw mushroom cultivation includes soaking of straw bundle (2 ft length) for 12 hours in water, sterilize, drained completely, making bed on bamboo frame and placing straw and mushroom spawn along with pulse powder (pegion pea/Bengal gram/ horse gram) alternatively for 3-4 layers and covered with transparent plastic polythene sheets (removed after 6-7 days). Water sprayed daily (twice) for maintaining moisture levels in the bed. Within span of 30 days after sprouting yields 2.0 to 2.5 kg mushroom/bed.

Apiculture (optional)

- Two to three bee boxes could be kept on bunds and honey can be harvested at regular intervals.

Floriculture (optional)

- Marigold and tuberose can be grown on bunds.

Fodder grass (optional)

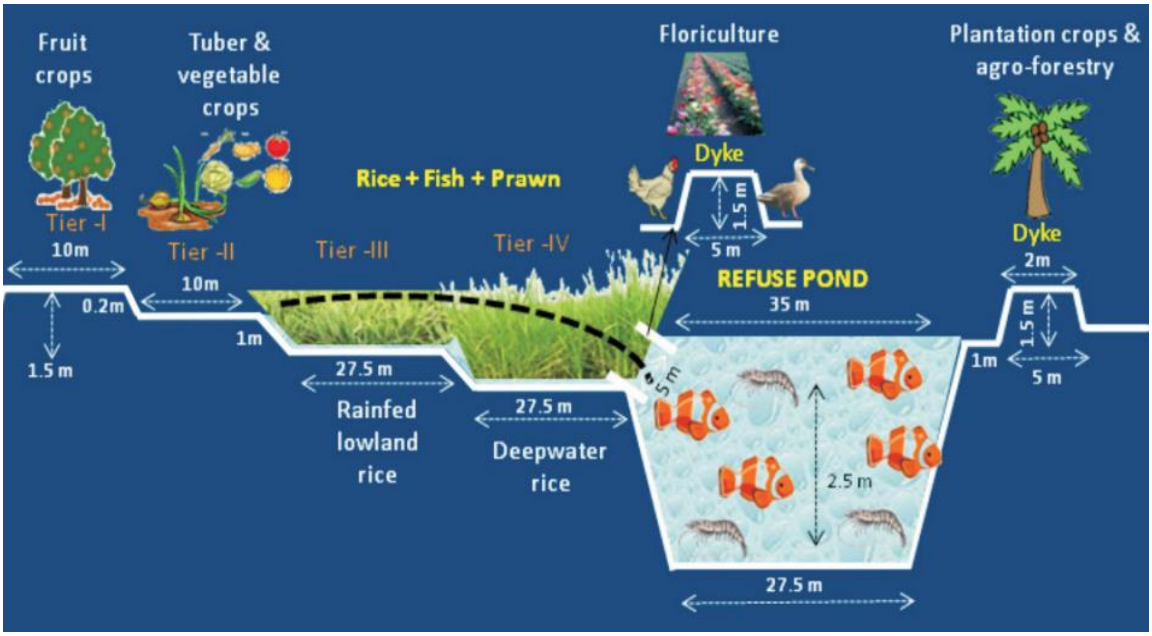
- Fodder like napier, guinea grass, legume fodder cowpea/lobia can be taken up on bund areas

Annexure-2

Model II: Multi-tier rice-fish-horticulture-agroforestry-based farming system for deep water (For auction)

Detailed Technical Programme

Multi-tier rice-fish-prawn-horticulture-agro-forestry based farming system for deep water



Selection through the length of a deep water rice-fish farm (0.8 ha)

1. The area under the model: 0.8 ha
2. Field design includes uplands (tier I and tier II) of928 m^2 of field area (1500 m^2) followed by rice field area of 2000 m^2as rainfed lowland (tier III) and deep water (tier IV).
3. Rice field connected to micro water shed-cum fish refuge (pond) of 1600 m^2 area for growing fishes(catla, rohu, mrigal, silvercarp, silver barb) along with the rice crop.
4. Raised and widebunds located all around in 25% of the farm area (2000 m^2).
5. Area under fruit crops: 422 m^2
6. Area under vegetable garden area: 422 m^2
7. Freespace available infront of duck and poultry shed: 70 m^2
8. Bundspace available for growing papaya/vegetables etc.: 150 m^2
9. Duck and poultry sheds are with cement flooring and asbestos roof with side iron grill, whereas goat shed has cement flooring and side walls and asbestos roof

Inventories at present

Perennial tree component

- Mango – 12 no.
- Guava – 16 no.
- Sapota – 3 no.
- Banana – 5 no.
- Coconut – 6 no.
- Papaya – 2 no.
- Pineapple – 50 no.
- Arecanut – 5 no.
- Citrus – 9 young trees
- Drumstick – 2 no.
- *Acacia auriculiformis* - 2 no.
- *Acacia mangium* – 10 no.
- Teak – 5 no.
- Neem tree – 1 no.
- Bamboo tree – 1 no.

Animal component

- Chicken – 7 no.

Other infrastructure

- Compost unit – 1 no. (12 feet (L) x 10 feet (B))

- Vermicompost unit – 1 no.
- Mushroom shed – 1 no. (12 feet (L) x 12 feet (B) x 8 feet (H)) – 14 m^2
- Duck shed – 1 no. (10 feet (L) x 10 feet (B))
- Poultry shed – 1 no. (10 feet (L) x 6 feet (B))
- Goat shed – 1 no. (10 feet (L) x 6 feet (B))
- Store room – 4 no.
- Diesel engine – 1 no.

Technical Plans need to be followed:

The production technology for deep water integrated farming system model provided below

<u>In upland (Tier I and II)</u>

Mango

- Plant 15 seedlings of improved (grafted) mango varieties such as Gulabhas, Amrapali, Mallika, Dashehari, Banganapalli *etc*. after 3-4 monsoon showers with a spacing of 5m x 5m between rows and plants
- Follow management practices like canopy management, manure and fertilizer application, irrigation, pest and disease control, mulching and pruning as per crop calender.
- Rely more on Integrated Pest Management (IPM), bio pesticides and organic sources of nutrients

Guava

- Plant 15 seedlings of improved (air-layered or grafted) guava varieties like Allahabad safeda, Arka amulya, Arka mridula, Safed jam, Sardar etc. during rainy season with a gap of 4-5 m in between rows and plants
- Maintain low plant height by regular pruning
- Follow all management practices as in the case of mango plants

Sapota

- Plant 6 seedlings of improved sapota cultivars like Kalipatti, Cricket Ball, CO-1, CO-2, PKM-1, PKM-2 during rainy season with a gap of 5m x 5m between rows and plants
- Follow management practices as in the case of mango and guava plants

Papaya

- In the initial 2-3 years, plant 100 seedlings of dwarf varieties *viz*., Coorg Honey Dew, Pusa Dwarf, Pusa Majesty, Pusa Giant, Pusa Nanha, Pusa Delicious, CO-2, CO-6, Washington etc. during wet season with a gap of 1.5-2.0 m in the interspaces between mango, guava and sapota plants.
- Adopt proper management practices
- Replace regularly the virus infected plants with healthy ones

Banana

- In the initial years, plant 25 suckers of improved/tissue cultured varieties of both table (ripe fruits) and vegetable (plantain) purpose in the interspaces of other fruit crops during rainy season in a gap of 2m
- Popular banana varieties are Dwarf cavendish, Robusta, Grande naine, Rasthali, Monthan, Poovan etc.
- Adopt proper management practices

Pineapple

- Plant 300 pineapple suckers in the interspaces of fruit crops during rainy season in staggered double row system with a spacing of 30 cm between plants, 60 cm between rows and 90 cm between two beds
- Grow varieties like Queen, Kew etc.
- In the later years, grow the pineapple crop under the canopy of mango, guava and sapota plants
- Follow the management practices like fertilization, irrigation and pest and disease control

Elephant foot yam

- Grow 100 plants of Elephant foot yam (*var*.Gajendra) as intercrop in between papaya plants in initial years
- However, in the later period also, this crop can be grown as intercrop in guava orchard
- Apart from these crops, vegetables like cowpea, okra, French bean, chilli etc. can be grown in the available vacant areas during the initial years

Tier II

Tuber Crops

- Grow improved varieties of tuber crops like sweet potato (*Vars*. Samrat, Sourin, Kalinga, Kishan, Gouri, Sankar, Pusa safed, Rajendra sakarkand, Bidhan jagannath, Narendra malti), Elephant foot yam (Gajendra, Sree padma, Sree Athira, Bidhan kusum, NDA-9, NDA-5), Colocasia (Mukthakesi, Satamukhi, Sree pallavi, Sree rashmi, Bidhan chaitanya, Bidhan joydeb) and yam (Orissa elite, Hatikhoja, Sree shilp, Sree karthika, Konwari aloo, Indu).
- Follow recommended management practices such as land preparation, planting, intercultural operations (mulching, weeding, earthingup, staking), fertilizer and manure application, irrigation, pests and disease control, harvesting etc.
- In the sweet potato growing portion of the field, follow a cropping pattern as okra (June-September)- sweet potato (October/November-January/February)-cowpea (February-April)

Vegetable crops

- Grow round the year location specific vegetables using high yielding varieties
- Grow vegetables like okra, ridge gourd, cowpea, snake gourd, bottle gourd etc. during wet season, tomato, french bean, radish, cabbage, cauliflower, leafy vegetables etc. during winter season and amaranthus, cowpea, bitter gourd, pumpkin, cucumber etc. during summer season
- Follow the recommended management practices like land preparation, sowing, manure and fertilizer application, irrigation, weeding, earthingup, insect pests and disease control and harvesting

In lowland (Tier III and IV)

In wet season

Rice

- During wet season, high-yielding rice cultivars with the desirable characters such as semi-tall/tall, long duration, stiff-culmed, photo-period sensitive and in-built tolerance to pests and diseases could be grown
- **In Tier III** (rainfed lowland), cultivate varieties like Gayatri, Pooja, Sarala, Bhudev, Golak, Jogen, Sudha, Maduhkar, Barh Awarodhi, Ranjit, Jalashree etc.
- **In Tier IV** (semi deep/deep water) grow cultivars such as Varshadhan, Durga, Hanseswari, Saraswathi, Jalaprabha, Jalpriya etc.

In dry season

- **In Tier III** (rainfed lowland), grow non-rice crops like sweet potato, watermelon, mung bean, groundnut, sunflower, vegetables with irrigation from the harvested rain water
- Zero tillage established sweet potato can also be grown after rice with the advantages like saving of two irrigations and reducing crop duration by about two weeks
- **In Tier IV** (deep water), cultivate high yielding dry season rice varieties like, Naveen, Shatabdi, Lalat, IR 36 etc after deepwater rice in half of the area or more/less depending upon the amount of harvested rain water. In the remaining area, grow vegetable like okra.

Management

Wet season rice

- Prepare the land well before the monsoon using bullock/tractor drawn plough
- Apply FYM@5t/ha at the time of land preparation

- Sow in dry soil well before the monsoon using 75-100 kg/ha of good quality seed
- Use a spacing of 20 cm in between plants
- Line sowing preferably, dibble seeding using 3-5 seeds is advantageous
- Transplant, if so required, early using around 40 days old and healthy seedlings
- Apply fertilizer at the time of sowing @ 50:25:25 kg N, P_2O_5 and K_2O/ha for the lowland rice in Tier III and @40:20:20 kg N, P_2O_5 and K_2O/ha for the deep water rice in Tier IV
- For weeding, use finger weeder in dry condition and/or cono-weeder in 5-10 cm standing water
- Fill the gap with fresh seedlings
- Avoid insecticides and herbicides
- Use sex pheromone traps @ 20 no./ha in rice field and light traps (electric bulb or kerosene lamp above water of pond refuge in 3 to 4 places) for control of yellow stem borer and other insect pests
- In sex pheromone traps, replace the chemical (sex pheromone) once or twice with a fresh one during the rice growing season
- Neem based botanicals like Nethrin or Nimbecidine @ 1% can also be used for control of insect pests

Dry season rice

- Puddle the field twice in a gap of 7-8 days between initial and final puddling and properly level the land
- Apply 5t/ha of FYM during land preparation
- Apply fertilizer @ 120: 60:60 kg N, P_2O_5 and K_2O/ha
- Apply 50% of nitrogen, entire phosphorus and 75% of potassium as basal or 10-15 days after planting in the case of nitrogen and apply the rest amount of nitrogen in two equal splits at 3 weeks after transplanting and at panicle initiation stage
- Apply remaining 25% of potassium at panicle initiation
- Alternatively, wet sowing of sprouted seeds @ 70 kg/ha in puddle condition using drum seeder is a viable and labour saving option
- Avoid use of herbicides and insecticides
- Use sex pheromone and/or light traps for control of yellow stem borer and other insects
- Neem based botanicals like Nethrin or Nimbecidine @ 1% can also be used for control of insect pests

- However, seedling root-dip with Chlorpyrifos @0.02% or with Imidacloprid @0.01% for overnight before transplanting can also effective be effective

Fish and Prawn

Grow-out culture in pond refuge-rice field environment (during wet season)

Fish

- Grow Indian major carps *viz*., catla, rohu, mrigal.
- Other species like, silver carp, common carp and silver barb (*Puntius gonionotus*) can also be grown with the advantage of weed control in rice field

Prawn

- Grow freshwater giant prawn (*Macrobrachium rosenbergii*) with fish
- The fish and prawn can be grown in the waterlogged rice field and pond refuge during wet season, after which they can be reared further in the pond refuge after the harvest of rice crop

Management

- Release fish fingerlings of 8-10 cm size and prawn juveniles of 5-8 cm size in the ratio of 7:3 at 7000 population/ha of water area
- Maintain a species ratio of 30% surface feeder (catla), 20% column feeder (rohu) and 50% bottom feeder (mrigal and prawn)
- However, in the absence of prawn, release 35% each of surface feeder (catla, silver carp) and column feeder (rohu, silver barb) and rest 30% as bottom feeder (mrigal and common carp).
- Apply cow dung @5-10 t/ha and 200-500 kg lime/ha of water area in monthly split doses
- Provide feed daily @ 2% of body weight of fish and prawn with a mixture containing 95% of oil cake+rice bran (1:1) and 5% of fish meal
- Provide hideouts (earthen pipes, twigs) for shelter of prawn during moulting
- Monitor health condition by regular nettings
- Control deadly disease like Epizootic Ulcerative Syndrome with the application of CIFAX @ 1 litre/ha-m of water
- Alternatively, lime application @ 200 kg/ha can also effectively control the infection at preliminary stage
- Harvest periodically the bigger size fish and prawn from the pond refuge

On bunds

Fruit crops

- Plant 150 seedlings of improved varieties of papaya and 50 suckers of banana of ripe fruit and plantain types

Plantation crops

- Plant 20 coconut (TxD varieties) and 20 arecanut on bunds of the pond refuge.
- Follow the management practices like manure and fertilizer application, irrigation, pruning and pests and diseases control

Agro-forestry

- Plant *Acacia mangium*, *Acacia auriculiformis* 2-3 m apart east to west on northern and north to south on western side bunds

Floriculture

- Grow marigold, tube rose, gladiolus, rose etc.

Apiculture:

- Maintain 3-4 bee boxes on upland and bund and harvest honey at regular intervals

On platforms

- Make raised platforms of bamboo/other low-cost materials over the water of pond refuge to grow around the year creepers vegetables like snake gourd, bitter gourd, ridge gourd, bottle gourd, ash gourd etc.

Duckery

- Rear 50-100 ducks of Khaki Campbell or other improved breeds
- Allow them to graze in rice field until flowering of the rice crop and after that put them in an enclosure on pond refuge

Poultry

- Rear in cage 75-100 dual purpose coloured birds of breed Vanaraja, Gramapriya, Swarnadhara, Cari devendra and Upcari
- Follow four cycles (75-90 days in each cycle) of birds rearing in a year

Goat husbandry

- About 20 numbers of black Bengal goat (20 females: 1 male ratio) can be ideal for rearing in rice based farming system
- However, indigenous local goat breeds i.e. Malkangiri goat, Koraput hill goat, Ganjam hill goat, Raighar goat, Narayanapatnam goat, Phulbani goat and Dorangi goat etc. can be reared in the farming system depending on their availability and ecological conditions of the system
- Space requirement for female goat 1.0-1.2 m^2, male buck 1.8 – 3.2 m^2 and kid 1.5 m^2
- Stall feed daily with 3-4 kg of green fodder, 1-2 kg of dry fodder and 200-250 grams of ready-made seeds as concentrates
- Incase of partial stall feeding, at least 50 per cent of the above quantities should be fed to goat
- The concentrate feed ingredients include groundnut cake, maize, sorghum, broken rice and wheat grains

- In addition to the grains, goat requires green cereal fodders (hybrid napier, guineagrass, sorghum, bajra, etc.) and legume fodders (stylo, berseem, hedge Lucerne, cowpea, Desmanthus) and some tree fodders (velvel, seemaikaruvel, arasu, subabul, agathi, glyricidia, vagai, karuvel and kodukapuli etc.) for achieving better growth

Mushroom (optional)

- Two types of mushrooms i.e. Oyster mushroom (*Pleurotus* spp.) and Paddy straw mushroom (*Volvariella* spp.) can be grown in bund area in rice-based IFS
- Straw mushroom (*Volvariella* spp) reared during March to September
- Oyster mushroom (*Pleurotus* spp.) reared during October to February
- Oyster mushroom cultivation includes soaking of chopped straw in water for 12 hours, followed by sterilization, water draining and spreading mushroom spawn in between the straw layers (3-4 layers) in the polythene bag having 10-15 holes in the tops and hanging in a rope. Water sprayed twice daily regularly for maintaining moisture content. In the span of 30 days 2.0 to 2.5 kg of mushroom/bed would be harvested.
- Straw mushroom cultivation includes soaking of straw bundle (2 ft length) for 12 hours in water, sterilize, drained completely, making bed on bamboo frame and placing straw and mushroom spawn along with pulse powder (pigeon pea/Bengal gram/ horse gram) alternatively for 3-4 layers and covered with transparent plastic polythene sheets (removed after 6-7 days). Water sprayed daily (twice) for maintaining moisture levels in the bed. Within span of 30 days after sprouting yields 2.0 to 2.5 kg mushroom/bed.