FEBRUARY 2023

Report on

Assam & Jharkhand Rice Value Chain

By:

SEMA

Equipment & Energy Private Limited

SELCO FOUNDATION

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1. Importance of Rice

Rice, the world's primary food crop, is a staple diet for more than half of the world's population. It also provides more than 20% of the world's per capita human energy.

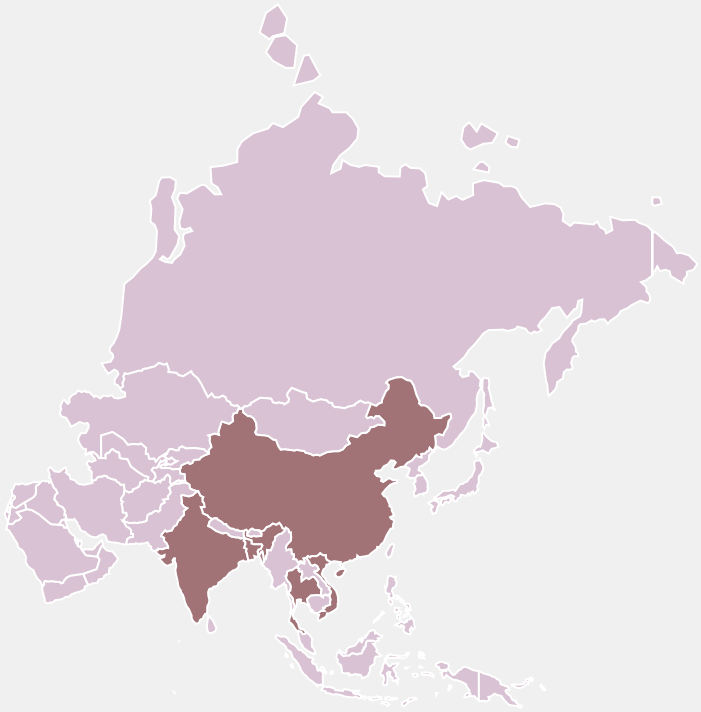
However, rice consumption is not uniform around the world. It is consumed disproportionately by the world's most impoverished and poorest populations, who are predominantly concentrated in global south regions such as East and South Asia, the Middle East, Africa, the West Indies, and Latin America. This gap is evident since rice consumption in many Asian nations surpasses 100 kilograms per capita per year, but the US average is 10 kg per capita per year. As a result of the most vulnerable people's overdependence on rice, rice is critical for global food security and socioeconomic stability.

Rice Consumption in US:
10 kg per capita per year

Rice Consumption in many Asian countries:
100 kg per capita per year

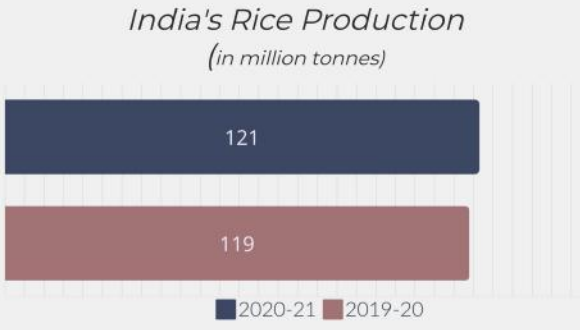
2. Global & Indian Rice Production Trends & Reasons

Rice is cultivated in over 100 nations, with Asia accounting for 90% of total global output. China, India, Indonesia, Bangladesh, Vietnam and Thailand are the top producing countries, accounting for more than 75% of global rice output.



Asian countries have significantly increased their output during the last five decades. This was brought about not just by an expansion in paddy farming area, but also by the adoption of high-yielding rice varieties produced by the International Rice Research Institute (IRRI) in the Philippines. As Asia began to employ these high-yielding varieties, production increased, lowering actual prices and ushering in the Asian Green Revolution.

India is the world's second largest producer of rice, with a record 121.46 million tonnes in the 2020-21 crop year, up from 118.87 million tonnes the previous year. Except for six states (Kerala, Mizoram, Pondicherry, Tamil Nadu, Sikkim and Goa), the trend in rice production was positive. West Bengal, Uttar Pradesh, and Punjab are key rice producing states. For the period 2014-19, the average area was 43.9 million hectares, the output was 109.76 million tonnes, and the yield was 2499.96 kg/hectare.



There are over 6000 rice types in India, ranging from basmati rice to small size rice such as red rice and parboiled rice. India can cater to all client groups, and Indian rice has price and quality competitiveness in the global market. For example, Indian basmati rice, which accounts for just around 5% of global output, is world-renowned for its aroma, taste, and flavour. The average length of Indian basmati rice is 8.5 mm, making it the world's longest. Furthermore, Indian rice has a low glycemic index and is easy to digest.

It is important to highlight that the rise in output has been attributed to better agronomic methods, extension of irrigation systems, and breakthroughs in biotechnology, which have made high-yielding rice varieties available to marginal and small farmers. As the benefits of biotechnology breakthroughs have declined, it is becoming increasingly vital to boost output through mechanisation of rice agriculture. Low mechanisation has maintained rice yields in India substantially below the global average, with huge fluctuations in productivity across the country and among the key producing states.

3. Global Rice Consumption Trends & Reasons

Rice is an inferior good. As individual wealth increases, per capita rice consumption falls as people choose higher-quality foods with more protein and vitamins, such as vegetables, bread, fish, and meat. This is evident in booming Asian countries like China, Japan, and India as they develop and enhance their affluence and urbanisation.

However, despite growing earnings and falling per capita paddy consumption, total rice demand will rise due to population expansion. Every year, 50-70 million new consumers will be added globally. Furthermore, nations such as India still have a significant percentage of their people living in poverty and will require extensive broad-based development before they can begin to replace rice with other food commodities.

4. Indian Rice Consumption & Exports: Trends & Reasons

Domestic consumption in India is roughly 100 million tonnes per year, accounting for approximately 80% of total output of approximately 120 million tonnes. The Indian government needs 11.5 million tonnes of rice as operating stock and 2 million tonnes as a strategic reserve.

Per annum Indian Rice Consumption Statistics:

Saudi Arabia, Iran, Iraq, Yemen and the UAE are important basmati rice importers, whereas Benin, Nepal, Togo, Senegal and Côte d'Ivoire are major non-basmati rice importers. China has just lately begun to purchase non-basmati rice from India. Africa is also a key market for Indian rice, with constant export volumes.

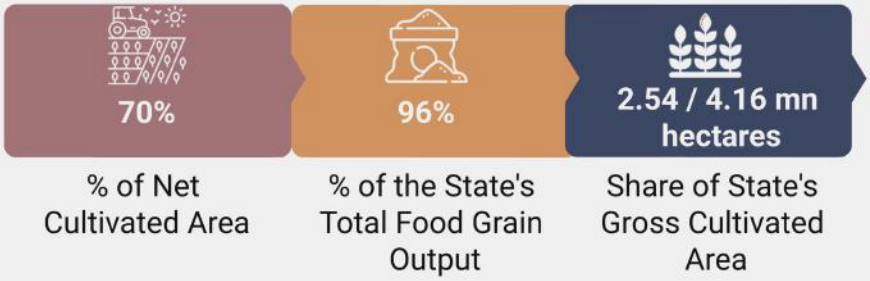
In the fiscal year 2020-21, India exported a record quantity of non-basmati rice, totaling 13.03 million MT. The primary driver of this increase in exports is increased demand from China, Vietnam, and Bangladesh.

5. Rice in Assam

5.1. Overview of Rice in Assam

Rice is the most important crop in Assam, accounting for over 70% of net cultivated area. It accounts for 96% of the state's total food grain output and constitutes 2.54 million hectares of the state's gross cultivated area of 4.16 million ha. Assam is well-known for its significant rice genetic variety, accounting for around 6% of national rice land and 4% of Indian rice output. Furthermore, its position in the consumption basket (average monthly intake per capita is around 13kg) speaks volumes about the state's rice orientation.

Statistics of Rice Cultivation in Assam:



5.2. Rice Varieties in Assam

Rice farming in a variety of agroecological situations has resulted in the creation of a diverse range of strains with specialised adaptations throughout time, owing to natural selection and farmer discretion. In the state, three major varieties of rice are grown.

1. Sali, also known as winter rice, spans 17 lakh hectares (71% of rice land) and accounts for 73% of total rice output. It is the most important in terms of acreage and production volume.
   a. Asra and Bao sub-varieties have the capacity to withstand water stagnation or flood to various levels
   b. Sali sub variety is mainly suitable as post flood crop in flood endemic and also when ahu crop is delayed due to late occurrence of monsoon in flood-free double cropped areas.
2. Autumn or Ahu rice (March/ April - June/July) is the state's second most important significant crop.

3. Boro rice or Summer rice (November/ December - May/June), which is produced in specific low-lying areas, is gaining popularity owing to its better production potential.

It is here to comment on the cultivation pattern of the above mentioned rice varieties:

- With the installation of irrigation facilities particularly in the flood prone areas, the rice crop can be shifted from risk prone Sali area to risk free season.
- In Assam, Boro and early Ahu are grown in drier season and expansions of areas under these crops are the key to raise the productivity of rice in the State

Agricultural Classes of Indigenous Rice in Assam:

SEASONAL CLASS	GROWING SEASON	DURATION	REMARKS
A. Ahu (Autumn rice)	March/ April	80-130	Photoperiod insensitive, early maturing usually broadcast, grown under variable water depth (0-25 cm). In Barak valley, ahu rice is further classified as Dumai, Murali and Chengri.
Dumai		80-90	Generally grown broadcast, Red kernelled
Murali		90-100	Generally grown broadcast, Red kernelled
Chengri		90-100	Generally grown broadcast, Red kernelled
Ahu (transplanted)		>100	Grown transplanted

B. Sali (winter rice)	Jun/Jul Nov/Dec	150-180	Photoperiod insensitive, long duration, grown transplanted under variable water depth (0-30 cm). There are sub classes like sali, lahi and joha based on the grain characteristics.
Sali		150-180	Coarse grained called sail in Barak valley
Lahi		150-180	Medium grained
Joha		150-180	Scented, fine grained
Bora		150-180	Glutinous or sticky rice, called birain in Barak valley
Chakuwa		150-180	Soft rice with low amylose content
Asra	Apr/ May Dec/Jan	240-270	Medium deep water rice, grown broadcast or transplanted in the low lying areas, can endure water depth < 100 cm. Sown at the time of ahu rice is sown and harvested at the time when sali

Bao	Apr/May Dec/Jan	270-300	Deep water or floating rice, normally grown broadcast, can endure water depth>100 cm. Sown at the time when ahu rice is sown and harvested at the time when sali rice is harvested
C. Boro (Summer rice)	Nov - May/Jun	180-200	Photoperiod insensitive, cold tolerant at the vegetative stage, grown transplanted, traditionally in the beel and marshy land situation with minimal or no tillage.
D. Hill Rice (Jhum)	Mar/ Apr to Sep/Oct	210-250	Photoperiod insensitive. Grown in hills slope as direct seeded.

5.3. Climatic & Geographical Features of Rice Cultivation Areas in Assam

In terms of rainfall, the monsoon season, which begins in the first week of June, receives the most rainfall (62-65% of total annual rainfall), followed by the pre-monsoon (20-23%), post-monsoon (6-8%), and winter (2-3%) seasons.

During the monsoon season, a rain-shadow belt encompassing Karbi Anglong and Nagaon and extending partly to Golaghat is observed. The driest season is winter during which time hailstorms are a regular occurrence.

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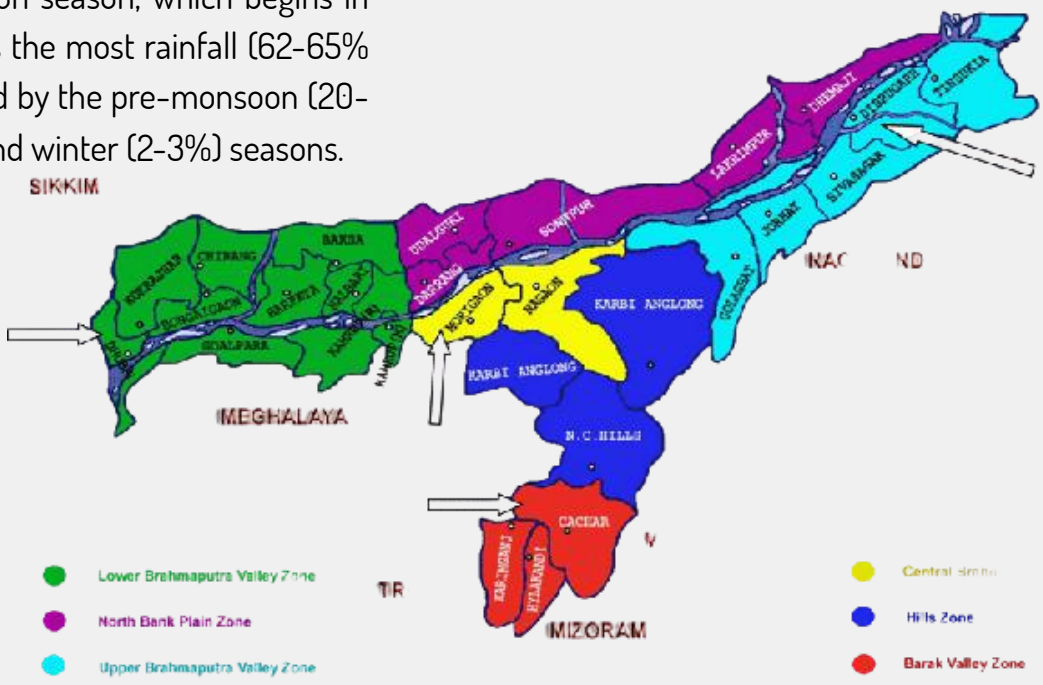


Based on these physical features of Assam, rice growing regions are divided into six zones: Upper Brahmaputra Valley Zone, North Bank Plain Zone, Lower Brahmaputra Valley Zone, Hill Zone, Central Brahmaputra Valley Zone, and Barak Valley Zone.

5.4. Challenges for Rice Cultivation in Assam

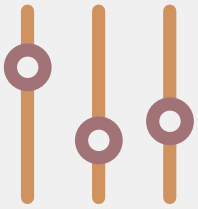
More than 90 percent of the rice cultivated areas of Assam is rainfed. Drought, submergence and flash floods, farmers' limited resource base, and a lack of adequate technology are all hurdles to increased rice output in rainfed locations. Flooding damages more over 4 lakh hectares of sali rice growing regions in Assam, and floods may harm additional farmed areas. Though rice research has helped to reduce poverty and increase food security in low-lying places, contemporary technology are yet to have an effect in Assam's flood-prone districts.

6. Rice in Jharkhand

Jharkhand, India's 28th state, is located in Agro-Climatic Zone VII (Eastern Plateau and Hill Region) and is split into three subzones: subzone IV (Central and North-Eastern Plateau), subzone V (Western Plateau Region), and subzone VI (Western Plateau Region) South Eastern Plateau).

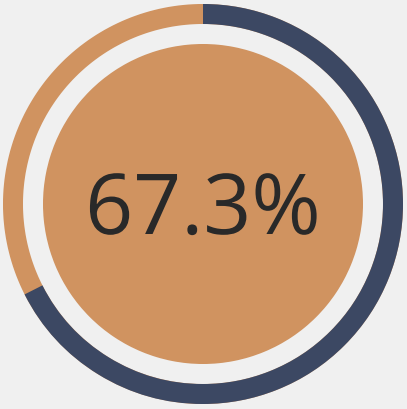
6.1. Importance of Rice: Jharkhand as a Poor Agricultural State

Jharkhand is predominantly an agricultural state. Considering roughly 78% of the population lives in villages, their primary source of income is agriculture and related activities. Kharif, Rabi, and Summer are the three primary crop seasons. Food grain output in the state is relatively poor and does not fulfil the needs of the people of Jharkhand. The state generates slightly less than half of its food grain needs.



Per Capita Food Grain Availability:
All-India Average: 523 gm
Minimum Need: 480 gm
Jharkhand Average: 230 gm

6.2. Climatic & Geographical Features of Rice Cultivation Areas in Jharkhand



Rain-fed rice is the predominant crop in Jharkhand, accounting for 67.3% (1.48 million hectares) and yielding 10-14 q/ha (1.0-1.4t/ha). Agro-climatically, the state benefits from abundant rainfall, diverse soil types, with a predominance of medium and deep black soils, and a favourable temperature regime for year-round cultivation. Due to low rice yields, farmers are continually in debt, forcing them to migrate to neighboring areas to sell their last resource, labour. Furthermore, malnutrition in women and children was observed to be widespread.

Because of the porous structure of the soil and the undulating landscape, the water storage capacity of the State soil is quite poor. Soils are categorised into three types based on their topography: upland, medium land, and lowland.

- Upland: Upland soils are often red, acidic (pH 5.5-5.9), and have low water retention capacity. During rains, moisture is rapidly soaked, and moisture is quickly released in highland conditions. It is appropriate for Khari pulses.
- Medium land: Medium land soils are yellowish in colour, mildly acidic (pH 6.0-6.5), and have a medium water retention capacity. It is appropriate for Rabi pulses.
- Low land: These soils are greyish, somewhat alkaline (pH 7.0-7.3), and have a good water retention capacity. Low land can be used in the spring and summer. Low ground is often vacated after harvesting transplanted paddy in the second week of December to the second week of January, as moisture removal takes time. Farmers can cultivate transplanted spring-rice or summer moong.

6.3. Land Holding in Jharkhand

Due to the state's poor land-man ratio, agricultural operations are of the subsistence nature. The land allocation pattern among cultivators is very inequitable, and many holdings are reported to be uneconomic. The average land holding size in the state is 1.58 hectares. Small and marginal farmers (with land holdings of up to 2 hectares) account for 82.6% of all land holdings in the state, while major farmers (with land holdings of more than 10 hectares) account for just 0.7%. Medium farmers with land holdings of 2 to 10 hectares account for 16.7% of overall land holdings. Majority of the farmers thus come under the category of small and marginal farmers holding only 30-35% of the cultivable land subsisting on a very small earning from farming operations.

7. Central Government Schemes

AGRICULTURAL INSURANCE

Whom to Contact: Nearest branches of Bank/ PACS/Cooperative Banks/ Common Service Centre (CSC) Empanelled General Insurance Companies notified for the area and District Agriculture Officer/Block Development Officer may be contacted or visit web portal www.pmfby.gov.in

Compulsory, if you avail crop loan for notified crops. Voluntary for non-loanee farmers.

- Pradhan Mantri Fasal Bima Yojana (PMFBY)
  - Insurance protection for food crops, oilseeds and annual horticulture/ commercial crops notified by state government.
  - If the sowing is not done due to adverse weather/ climate, claims up to 25% of sum insured will be paid for prevented sowing/ planting risk.
  - When the crop yield is less than the guaranteed yield of notified crops, the claim payment equal to shortfall in yield is payable to all insured farmers
  - Losses caused by inundation, hailstorm and landslide would be assessed at individual farm level.

- Weather Based Crop Insurance Scheme (WBCIS)
  - When the weather indices (rainfall/ temperature/ relative humidity/ wind speed etc.) is different (less or higher) from the Guaranteed Weather Index of notified crops, the claim payment equal to deviation/ shortfall is payable to all insured farmers of notified area.
  - Provision for assessment of losses caused by hailstorm and cloudburst at individual farm level.

SOIL CONSERVATION AND MICRONUTRIENTS

Whom to Contact: District Agriculture Officer / District Horticulture Officer / Project Director ATMA

- Soil Health Card Scheme
  - Soil health card will be provided to all farm holdings in the country at an interval of 2 years so as to enable the farmers to apply appropriate recommended dosages of nutrients for crop production and improving soil health and its fertility.
  - Rs.2500/ha as assistance for Soil Improvement for Distribution of Micronutrients & soil ameliorants
  - Setting up of Soil testing project at village level: 75% of the cost or Rs.3,75,000 whichever is lower

- National Food Security Mission (NFSM) & Bringing Green Revolution to Eastern India (BGREI)
  - Micronutrients (Rice, Wheat, Pulses & NutriCereals): 50% of the cost limited to Rs.500/- per ha.
  - Lime/ liming materials (Rice & Pulses): 50% of the cost of the material limited to Rs.1000/ha.

- RKVY sub-scheme on Reclamation of Problem Soil (RPS)
  - Reclamation of Problem Soil
    - Alkaline/ Saline Soil: Rs.60,000/ha
    - Acidic Soil: Rs.15,000/ha

IRRIGATION

Whom to Contact: District Agriculture Officer / District Soil Conservation Officer / Project Director ATMA/ District Horticulture Officer.

- Pradhan Mantri Krishi Sinchai Yojana (PMKSY): Ensure access to some means of protective irrigation to all agricultural farms in the country - to produce per drop more crop
  - Per Drop More Crop component
    - For Drip Irrigation and Sprinkler Irrigation (Portable, mini, micro, semi, permanent, large volume/ rain gun etc.)
  - Details regarding Assistance
    - Financial assistance up to 55% for small & marginal farmers and 45% for other farmers
    - Maximum permissible assistance will be restricted to 5 hectare per beneficiary

- Rainfed Area Development Programme (RADP) under National Mission for Sustainable Agriculture (NMSA)
  - Water Harvesting Systems for Individuals:
    - 50% of Cost limited to Rs.75,000/- in plains and Rs.90,000/- in hilly areas
  - For Communities (Tanks, on-farm ponds, check dams, reservoirs)
    - 100% of the cost limited to Rs.20 lakhs/ unit in plain areas, Rs.25 lakhs/ unit in hilly areas, for 10 ha of command area or any other smaller size
  - Water lifting Devices (Electric, Diesel, Wind/ Solar)
    - 50% of the cost of installation limited to Rs.15,000/- per electric/ diesel unit and Rs.50,000/- per solar/ wind unit

AGRICULTURAL MARKETING

Procedures involved: Farmers can get the price information of their produce which is available on Agmarknet website (www.agmarknet.nic.in) or through Kisan Call Centres or SMS.

- Pradhan Agricultural Marketing Infrastructure (AMI) sub-scheme of Integrated Scheme for Agricultural Marketing (ISAM)
  - Ernstwhile two schemes viz. (i) Grameen Bhandaran Yojana (GBY) implemented since 01.04.2021, and (ii) Scheme for Strengthening/ Development of Agricultural Marketing Infrastructure, Grading & Standardization (AMIGS) implemented since 20.10.2004 have been subsumed into this scheme
  - Continuation till 31st March 2023 at least
  - Implemented by the Ministry of Agriculture and Farmers' Welfare, Government of India. NABARD is the channelizing agency.
  - Whom to Contact: Dy. Agricultural Marketing Advisor (AMI), Directorate of Marketing & Inspection (DMI), CGO Complex, NH-IV, Faridabad (Haryana) Tel.: 0129-2434348; Email: rgs.agri@nic.in

- National Agriculture Market (e-NAM): Not available in Assam, but it is available in Jharkhand
  - A pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities
  - Small Farmers Agribusiness Consortium (SFAC) is the lead agency for implementing eNAM under the aegis of Ministry of Agriculture and Farmers' Welfare, Government of India.
  - For further details please contact Small Farmers Agribusiness Consortium (SFAC), New Delhi (Email ID: nam@sfac.in)

Further details of the scheme are also available at www.enam.gov.in

ORGANIC FARMING

- Paramparagat Krishi Vikas Yojana (PKVY)" a sub- component of Soil Health Management (SHM) scheme under National Mission of Sustainable Agriculture (NMSA)
  - Aims at development of models of excellence in organic farming through a mix of traditional wisdom and modern science in value chain mode to install sustainability, ensure long term soil fertility buildup, resource conservation and to offer safe and healthy food grown through organic practices without the use of agro- chemicals

- Also aims at empowering farmers through institutional development through clusters for not only in farm practices management, input production, quality assurance but also in value addition and direct marketing.
- Organic Area Selection Criteria:
  - Will be promoted preferably in hilly, tribal and rain-fed areas where utilisation of chemical fertilisers and pesticides is less and the area has good accessibility for developing market linkages.
  - Cluster approach will be adopted in large patches of up to 1000 ha area.
  - Cluster chosen shall be in contiguous patch, as far as possible, may be extending over few adjacent villages (but not over large areas in sparsely distributed villages)
  - Formation of Gram Panchayat based Farmer Producer Organizations will be encouraged or already existing FPOs will be promoted under the scheme.
  - The ceiling of subsidy a farmer is eligible will be for a maximum of one hectare.
  - In a cluster, there should be at least 65% of small and marginal farmers.
  - Women farmers/SHGs should be given preference
- Incentive to farmers for organic conversion, inputs, on-farm input infrastructure to be provided as DBT for direct farmers account for at least 3 years
- Whom to Contact?
  - At the state level: Director (Horticulture/ Agriculture) of States
  - At District level: District Horticulture Officers, District Agricultural Officers/ Project Director of States

- Mission Organic Value Chain Development for North Eastern Region
  - For implementation in the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura
  - Aims at development of certified organic production in a value chain mode to link growers with customers and to support the development of entire value chain starting from inputs, seeds, certification, to the creation of facilities for collection, aggregation, processing, marketing and brand building initiative.
  - Launched by Ministry of Agriculture & Farmers Welfare
  - Farmers get assistance for:
    - On-farm input production infrastructure
    - Quality seed and planting material
    - Setting up of input delivery, distribution and agri-machinery custom hiring centre through state lead agencies

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- Cluster approach will be adopted in large patches of up to 1000 ha area.
- Cluster chosen shall be in contiguous patch, as far as possible, may be extending over few adjacent villages (but not over large areas in sparsely distributed villages)
- Formation of Gram Panchayat based Farmer Producer Organizations will be encouraged or already existing FPOs will be promoted under the scheme.
- The ceiling of subsidy a farmer is eligible will be for a maximum of one hectare.
- In a cluster, there should be at least 65% of small and marginal farmers.
- Women farmers/SHGs should be given preference
- Services for training, hand holding and certification at production stage
- Setting up of functional infrastructure for collection, aggregation, grading units and NE organic Bazaar
- Setting up of value addition and processing units including packaging, storage and transportation
- Value/ chain packaging, storage and transportation

MECHANIZATION AND TECHNOLOGY

- Sub-Mission on Agricultural Mechanization (SMAM)
  - Financial Assistance for Procurement of Agricultural Machinery and Equipments such as seeders, tractors, power tillers, rice transplanters, self-propelled rice transplanters, rotovators, manure spreaders, fertiliser spreaders, harvesters and threshers.
    - For post processing, mini-rice mills, dehydration units, packing units and dehuskers, polishers, boilers/ steamers are also included in these schemes.
  - Relaxations or higher assistance is given in priority for SC, ST, Small & Marginal farmers, Women and NE States beneficiary

TRAINING AND EXTENSION FOR FARMERS

Whom to Contact: District Agriculture Officer / District Horticulture Officer / Project Director ATMA

- Kisan Call Centres:
  - Nationwide single toll free number : 1800 180 1551.
  - KCC is Operational 365 days from 6 AM to 10 PM.
  - Reply of farmers queries are given in 22 languages from 21 locations in the country.
  - All states and UTs covered

- mKisan Portal (mkisan.gov.in): More than 4.23 crore farmers are registered and experts/ scientists of different departments like IMD, ICAR, State Government, State Agriculture Universities send information to farmers in local languages. The services available are:
  - Weather information about likelihood of rainfall, temperature, etc. to enable farmers make informed decisions in choice of seed varieties, and decide on timing of sowing and harvesting.
  - Market information: Farmers are better informed about markets to sell produce, prevailing market prices and quantity demanded in the market
- Farmer's Portal: A one stop shop for farmers where a farmer can get relevant information on a range of topics including seeds, fertiliser, pesticides, credit, good practices, dealer network, availability of inputs, agromet advisory etc.
- Kisan Suvidha mobile app: Can be used to provide relevant information to farmers through mobile. Information on following parameters can be made available to farmer: Weather, Market Prices, Plant Protection, Agro-advisory, Extreme Weather Alerts, Dealers - Seed, Pesticide, Fertilizer, Farm Machinery, Soil Health Card, Cold Storage & Godowns
  - It is available in 7 languages: English, Hindi, Tamil, Gujarati, Oriya, Punjabi, Marath
- Seed Village Programme (SMSP): Training of groups of 50-150 farmers on seed production and seed technology aspect.
- Plant Protection Scheme: Training on plant protection measures to group of 40 farmers
- Sub-Mission on Agricultural Mechanization (SMAM): Training on Repair, Maintenance, Operation and selection of various Agricultural Machinery & Equipments and Post Harvest Management
- Agricultural Technology Management Agency (ATMA) Scheme offers various training schemes related to farmer technologies
- Skill Development Programmes:
  - Skill Development training courses for rural youth and farmers to create skilled manpower in the agriculture & allied sectors.
  - Courses developed by Agriculture Skill Council of India (ASCI) being adopted by the DAC&FW and ICAR
  - All these courses are free of cost for rural youth and farmers
  - Selection of candidates is made by the concerned training institutes (KVKs/Agricultural Universities and ICAR Institutes and Institutes under DAC&FW)
  - Whom to Contact:
    - Programme Coordinator of selected Krishi Vigyan Kendras at district level/ ICAR Institute/ State Agriculture Universities.

- Agriculture Skill Council of India (ASCI) – www.asci.india.com, agricoop.nic.in

- Diploma in Agricultural Extension Services for Input Dealers (DAESI)
  - To impart training to Input Dealers on crop production technologies and laws related to regulation of agricultural inputs.
  - One year training course in 48 Class Room Sessions (40 Theory + 8 Field Visits) to transform Input Dealers into para-extension workers for effective transfer to technology to farmers.
  - Course fee Rs. 20,000/- subsidy upto 10,000/- by Government of India per input Dealer. Agri-Input Companies can also sponsor their Input Dealers by bearing 50% of Training Cost.
  - Whom to Contact:
    - Courses are organised by Krishi Vigyan Kendra, State Agricultural Universities, approved training centres and State Agriculture Management & Extension Training Institute (SAMETI).
    - For more information, you can also contact Director General, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, https://www.manage.gov.in/Default.asp
- Agri-Clinics and Agri-Business Centres (AC&ABC) Scheme:
  - To impart training to Input Dealers on crop production technologies and laws related to regulation of agricultural inputs.
  - Implemented by the Ministry of Agriculture and Farmers' Welfare, Government of India, with The National Institute of Agricultural Extension Management (MANAGE), Hyderabad as the implementing agency for Training Components.
  - Residential training of 60 days duration is imparted to unemployed candidates who possess degree/diploma in agriculture and allied subjects, intermediate in agriculture and science graduates with PG in agriculture related courses through selected Nodal Training Institutes (NTIs) in various parts of the country.
  - For more information, you can also contact Director General, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, https://www.manage.gov.in/Default.asp

AGRICULTURAL CREDIT

- Kisan Credit Card: Farmers can avail crop loan through Kisan Credit Card. Loan /credit limit is fixed on the basis of crop sown and area under cultivation. Kisan Credit Cards are valid for 3-5 years. Farmers are also provided risk coverage in the event of accidental death/disability. Crop coverage loans are covered under the Crop Insurance Scheme.

- Minimum Support Price (MSP): Minimum Support Price (MSP) is the minimum price set by the government for certain agricultural products, at which the products would directly be bought from the farmers if the open market prices are less than the cost incurred.
- PM-KISAN Samman Nidhi: Under the scheme an income support of Rs. 6,000/- per year in three equal instalments will be provided to all land holding farmer families.
  - The fund will be directly transferred to the bank accounts of the beneficiaries.
  - PM-KISAN Mobile App is available for farmers ease of access to the scheme
- Whom to Contact?
  - Joint Secretary (Cooperation), Department of Agriculture Cooperation and Farmers Welfare, Krishi Bhawan, New Delhi.
  - Regional Offices of NAFED & SFAC located in State Capitals.
  - District Level Offices of Cooperative Marketing/Commodities Federations.
  - Marketing Cooperative Societies at Tehsil Level and FPOs/ FPCs at Block Level

8. Assam Schemes

MECHANISATION

- Mukhya Mantri Krishi Sa Sajuli Yojana (MMKSSY): A State Owned Priority Development (SOPD) scheme or farmers launched by the Assam government. The main purpose of launching MMKSSY or CM Farm Tool Scheme for farmers is their holistic development by implementing several farm mechanisation schemes.
  - Rs.5,000/- will be provided to each farmer.
  - The number of beneficiaries will be a total of 5 lakh farmers
  - The assistance is to procure farm tools & farm implements.
  - Scheme will be implemented on Direct Benefit Transfer by electronic transfer into accounts of the beneficiaries
  - The selection of beneficiaries will be done by a District Level Committee headed by the Deputy Commissioner of the District. The Principal Secretaries will chair the DLC in case of BTAD and Autonomous Districts.
  - Eligibility: Only resident small and marginal farmers above 21 years of age who have been involved in cultivation for at least three consecutive years
    - All KCC card holders are eligible.
    - The applicant Beneficiary should have a live bank account.
    - Only one farmer per family shall be eligible for the benefit under the scheme.

- Tenant farmers, share croppers may also be considered subject to a minimum area of cultivation, say 1 acre.
- Process of Application:
  - Agriculture Department will publish advertisement through print and electronic media inviting application from respective website.
  - Applications will be collected by an Agriculture Extension Assistant (AEAs) along with Bank account details of the beneficiaries along with the mobile numbers, if available.

- Chief Minister Samagra Gramya Unnayan Yojana (CMSGUY): In order to enhance farm mechanization in the state and to facilitate double cropping, one tractor unit comprising of one tractor, its accessories with/without matching implements (depending upon choice of beneficiary) will be provided to one selected beneficiary group in each revenue village at subsidized rate (70% subsidy to a maximum of Rs. 5.5 Lakhs).
  - Eligibility: Any group of 8-10 members who are the actual adult farmers of the same village. The group should have a common bank account and will apply jointly with signatures of each member on the application form preferably along with particulars of land and crops cultivated. The applicant group should not have more than one member from one family.
  - Applications need to be submitted to District Agricultural Officer (DAO).

9. Jharkhand Schemes

CREDIT FACILITY

- Mukhyamantri Krishi Ashirwad Yojna (MKAY): at improving the financial situation of farmers and provide them with timely investment support before the start of the Kharif season.
  - Benefits: Marginal and small farmers will be given Rs 5000 per acre per year (maximum up to 5 Acres) through Direct Benefit Transfer in their bank account.
  - Eligibility: All the small and marginal farmers of the state, who have arable land up to a maximum of 5 acres are eligible to apply under the scheme.
  - How to apply: Online application can be done at https://mmkay.jharkhand.gov.in/About.aspx
- Interest Free Farm Loan Scheme: Only applicable for one year
  - Other benefits also include zero premium crop insurance to be paid & information on crops, weather, schemes & subsidies will be provided via mobile apps.

INSURANCE

- Jharkhand Kisan Fasal Rahat Yojana: to provide security cover to Jharkhand/ resident farmers in case of crop damage due to natural calamity.
  - Eligibility: Small and marginal, land and landless farmers
  - Implementing Agency: Department of Agriculture, Animal Husbandry & Co-operatives, Government of Jharkhand.

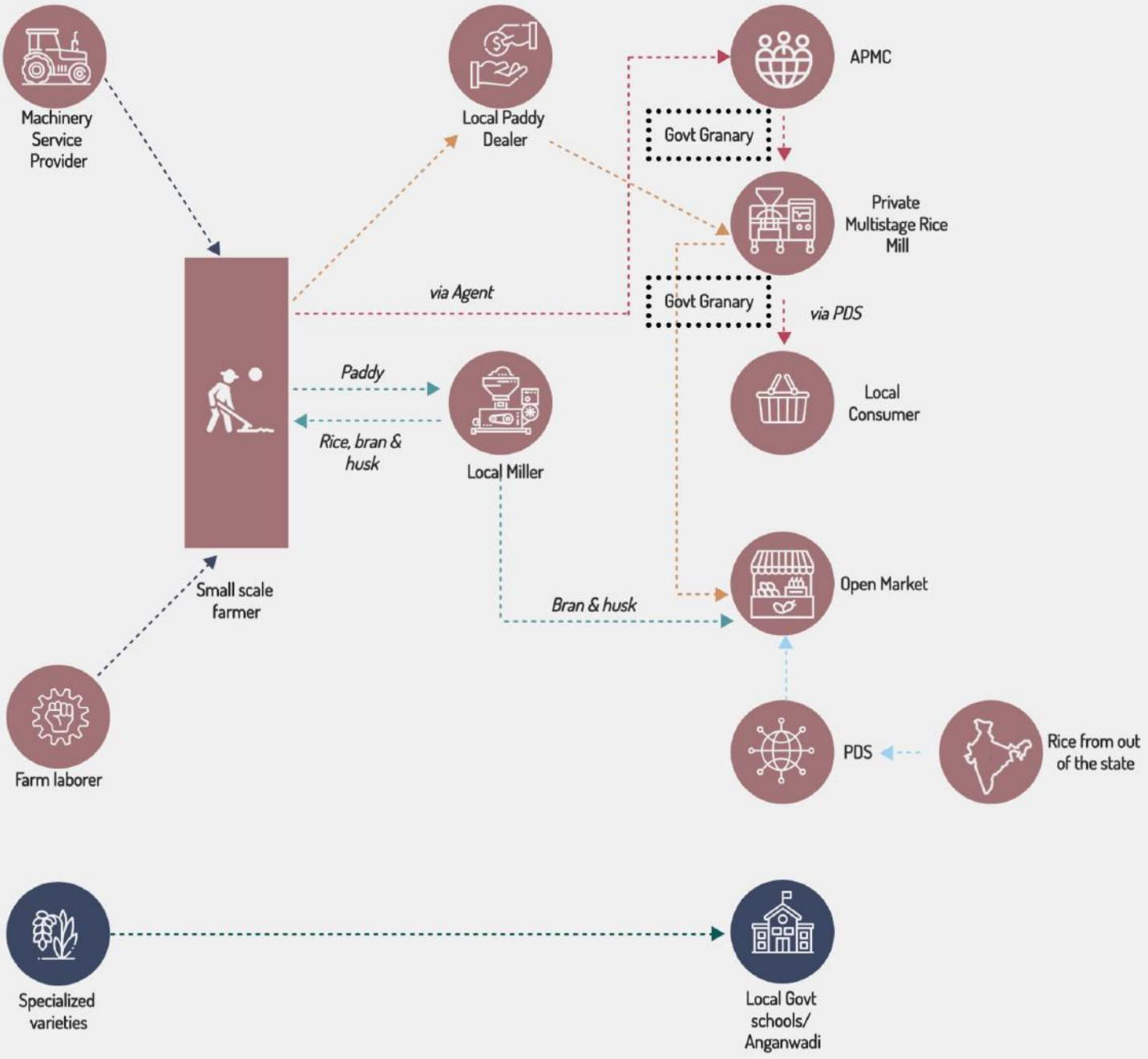
MECHANIZATION

- Jharkhand Kisan Samakit Birsa Gram Vikas Yojana cum Krishak Pathshala: One agriculture farm in every district will be selected and will be provided with various state of the art technologies and tools of modern-day farming apart from new irrigation techniques.
  - Farmers will be provided training and will also be empowered to increase their incomes.

MISCELLANEOUS

- Birsa Kisan Yojana (BKY): A unique feature that will generate a unique ID card with a barcode for every farmer of the Jharkhand state
  - Farmers can take benefit of different government schemes without any middleman
  - Farmers can also get agricultural training, loans etc.
  - According to Government announcements, farmers can register themselves online on Pragya Kendra
- Attracting & Retaining Youth in Agriculture (ARYA) Scheme: Attract rural youth in agriculture by providing them skill training and make the state self-dependent in agriculture.
  - Agriculture Technology Management Agency (ATMA) provide training to the rural youth

10. Selling Flows - Assam



I.

This pertains to the paddy used for self-consumption. Here, the small-scale farmer takes the paddy to the local single-stage miller for processing. The farmer visits the millers at an average interval of one month. At one instance, an approximate of 40 kgs of paddy is milled, depending on the family size. In this chain, the farmer gets back the bran and husk along with the rice and pays a milling fee. The bran, husk and broken rice is used for feeding pigs.

II.

This is similar to the previous chain, the difference being in this chain the bran, husk and broken rice is considered as payment and no further milling charge is incurred by the farmer. The local miller sells the bran, broken rice and husk in the open market at an approximate of Rs.12-15 per kg. The procurers would mainly be piggery owners.

III.

The farmers interact with the APMC via agents. This chain is rarely used since the APMC mechanization is yet to be operational in the entire state. Further, based on the interviews conducted with the farmers it was understood that their attempts to sell to the APMC via agents have been limited due to a lag in payment being made to the farmers. The lag is not permissible to the farmers since the payment to the labourers are to be made immediately. The APMC further sends the grain to the government granaries for storage, from where the grain is sent for milling to the government contracted mills and the rice is collected back. The collected rice is then distributed to the local consumers via PDS.

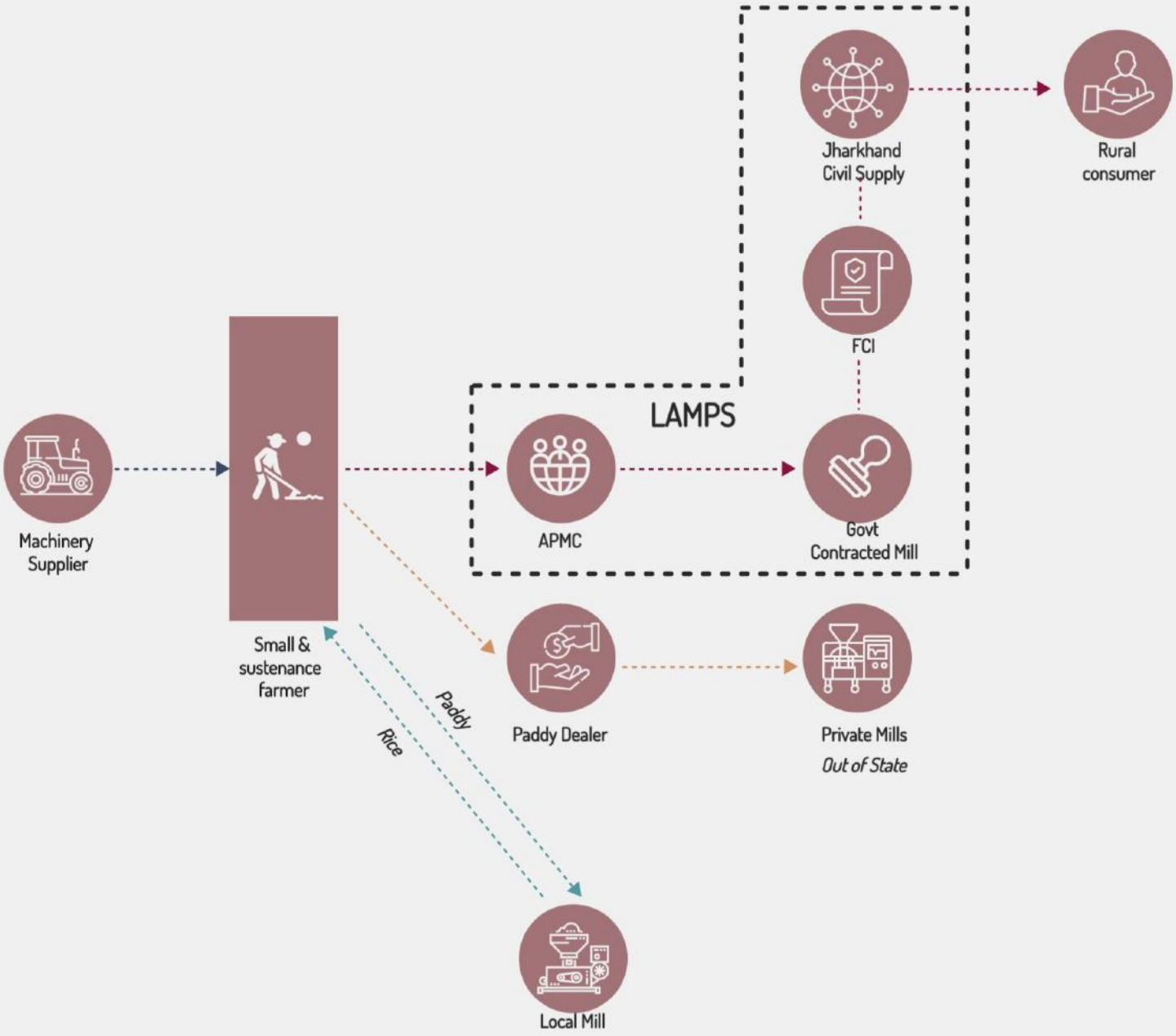
IV.

The paddy is cleaned, dried and stored in the granary by the farmer. When the farmer wants to sell the paddy, he contacts the paddy dealer. The local paddy dealer visits the farm to inspect the paddy and he proceeds to weigh and pack the grain, which he further transports to private multistage mills. There can be instances wherein he further sells the crop to larger aggregators who then proceeds to sell to private mills. At present, there are a just about a handful of large mills in Assam, hence most of the grain is sent to mills in other states for processing. PDS procures the processed rice from the other states and then distributes the same to the end local consumers.

V.

There are special varieties such as Jaswa, Pakari, Full Pakari, Tengrai and Bordona which are cultivated by farmers with a prior agreement in place with local government employees such as school teachers and anganwadis. The farmers are interested in cultivated in these varieties despite them being low-yielding and long duration crops in order to keep them from phasing out. These varieties are nutritious and are climate-resilient. The government employees are procuring them for their nutritional and medicinal values. These are grown in small pockets of one-sixth of an acre.

11. Selling Flows - Jharkhand



I.

In this scenario, the small and sustenance farmers mill their paddy for their own consumption. They approach the local single stage miller who charges a service fee. The farmer does not collect the bran from the miller since there are no piggeries in Jharkhand. The bran is further sold in the market by the miller.

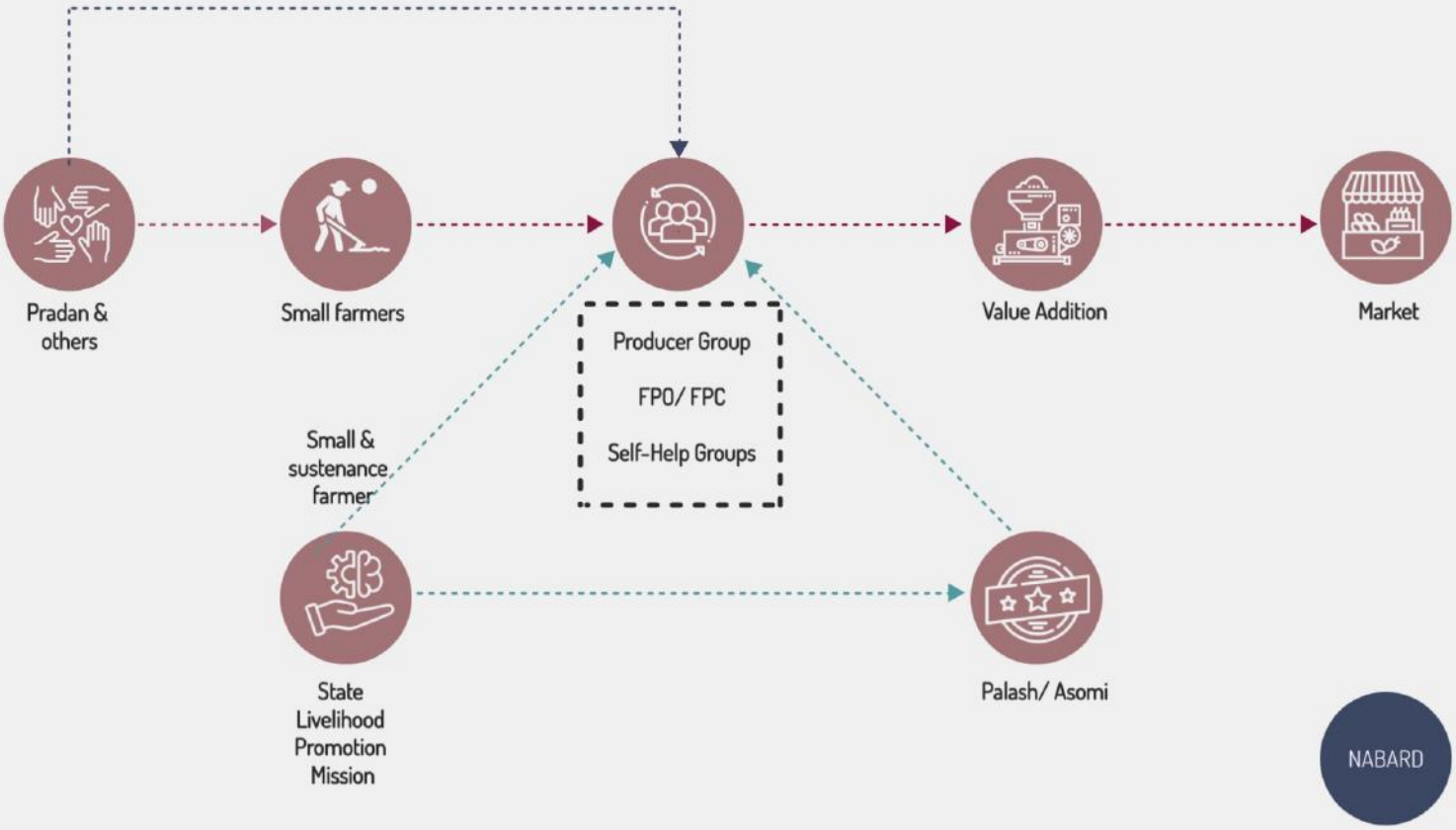
II.

Under the guidance of the FCI, LAMPS procures paddy at MSP from the local farmers via the APMC. The rice is further processed by government contracted mills and is distributed to the end users by the PDS system, which would be the Jharkhand Civil Supply in this instance.

III.

In this case, the farmer contacts the paddy dealers for sale of their produce. The paddy dealer inspects and collects the paddy and further sells them to private mills which are mostly located out of the state. It is also important to note that the paddy dealer acts like a financier for cash-strapped farmers since there is a delay in payment from the APMC. Hence, the paddy dealer buys the paddy at discounted rates.

12. Key Influencers & Ownership Models - Assam & Jharkhand



Before we dive into the key influencers in the agricultural space, it is important to take a step back and understand why there are self-help groups being set up. The drive to set up comes from the top, the government along with the agricultural bodies promote setting up of self-help groups in order for these communities to have a stronger foot while voicing their concerns and taking up their demand to the authorities. Farmers, by themselves, will find it difficult to navigate through the bureaucracy. By organizing themselves into self-help groups, it is easier for them to reach out for loans and other amenities, and likewise it is easier for organizations to help them.

A group of 8 to 10 farmers come together to form a self-help group. These self-help groups can either be formal or informal. Formal self-help groups get themselves registered with a Farmer Producer Organisation (FPO) or Farmer Producer Company (FPC) and usually have a bank account or some other kind of documented existence.

Farmer Producer Organizations help the farmer self-help groups by lending tools and machinery and enabling access to quality seeds and inputs.

Farmer Producer Companies, on the other hand operate on more downstream activities and help the registered self-help groups with outreach by marketing their produce.

The ownership of Farmer Producer Organizations and Farmer Producer Companies are defined by shares and the share-holding is private in nature and is owned and controlled by influential farmers. The size of a farmer producer organizations and farmer producer companies is usually 50-100 farmers.

The FPOs and FPCs further roll into Producer Groups. Producer Groups are more niche in nature and are focused on a specific commodity. They work on a taluk-level and support the FPOs and FPCs with their work. They are more hierarchical in nature and they usually have a chairman and a vice-chairman at the top of the board influencing decision making. Producer groups can have as many as 3000 farmers in them.

Co-operative Societies, like LAMPS in Jharkhand, operate on a district level focusing on certain communities. They aid these communities from end-to-end, right from identifying best practices, inputs, outreach, marketing, exposure and machinery.

These co-operative societies come under the influence of the State Livelihood Promotion Mission like the JSRLPS (Jharkhand State Rural Livelihood Promotion Society).

In addition to these influencers, we have organizations who brand the produce of the state and market them under the brand in order to help them with their outreach. Palash in Jharkhand and Asomi in Assam are two such organizations.

There are also NGOs such as Pradan who operate in the various states and help self-help groups with loans, processing, technology interventions and marketing. For instance, Pradan started with helping the rice-farming communities in order to address the main problem of sustenance and then proceeded to make changes in the other sectors.

While we are in the subject of key influencers, it is important to mention NABARD – National Bank for Agriculture and Rural Development. The main objective of NABARD is to advance the agriculture sector and to extend credit to the rural parts of the country. In addition to financing, they are also involved in policy making.

13. Context and Background for Paddy Cultivation in Assam and Jharkhand as observed

13.1. Topography

Depending on the geography and the methods of cultivation farmers in Assam can be classified multiple ways. However, for the sake of this study three types of farmers are considered namely farming in plains, flood farming and terrace farming. The corresponding areas for the same are the lower Brahmaputra valley, central Brahmaputra valley and hills zone in Assam. The farmers in each of these areas have their own variations on paddy farming that are largely dependent on the external factors that shape how they cultivate their paddy crop.

Hilly geography dominates the state of Jharkhand. Farming is done in three different areas of the hills namely lowlands, midlands, and uplands. The lowlands have the most fertile soil and readily accessible water. This reduces as one goes up the hill. Locally they are known as 1,2,3 land with low land, mid land, and upland respectively. All the three types of land are cultivated. Several decades ago, forests and jungle terrain used to dominate the uplands and the midlands. With increased pressure from the population, they were cut down and converted into agricultural lands. This has had very severe consequences years later. The current generation say that they do not remember when the uplands were forested. All they have known their entire life was the eroded and denuded upland. Farmers also mentioned once upon a time the uplands were cultivated once yearly and the rest of the year it was exposed to the elements. The soil became so eroded that it could not support agriculture. Once a year became once in two years then once in four years. Once a crop is harvested farmers are forced to wait 4 years for the soil to regenerate before it becomes viable to farm once.

13.2. Access to Water - Challenges

The lack of accessible surface and groundwater makes it difficult to multicrop over the year. Therefore, the primary cropping season is the kharif crop where paddy is grown. In the midlands and lowlands vegetables and other crops are grown in a small scale where the extent of cultivation is largely dependent on the degree to which farmers can manually irrigate.

In both Assam and Jharkhand, the farmers are largely dependent on the rain for the irrigation of the crops. There is a distinct lack of surface water and easily accessible sub surface water capable of meeting the entire farm requirements for the whole year.

In Assam water for irrigation is purely used during the nursery preparation to ensure seedlings have adequate amounts of water during germination whereas in Jharkhand irrigation is wholly dependent on the rains. The rains themselves are more than enough to meet water requirements during the Sail / Kharif paddy season. However, with climate change the rains are getting less predictable and affecting crop yields as it does not come on time.

13.3. Activities in Non-Farming Season - Challenges

Farmers in both states practice open cattle grazing during the non-paddy cultivation season. There are no partitions / barricades between the lands owned by the farmers. This makes it very difficult to grow paddy or any other crop during the rest of the year even if adequate water is available. When one farmer is cultivating paddy and the other has let their cattle graze, then when the cattle eats the paddy which results in conflicts between farmers.

In Assam in the non-paddy cultivation season (from Dec to May) farmers cultivate small amounts of vegetables for self-consumption and sell the excess. The quantum of land under vegetable cultivation is only about 2 bighas (0.66 acres) at most in the farms visited. This quantum of land is usually determined by the amount of land they can irrigate manually.

Farmers in the flood prone regions (central valley region) have more than adequate water. Their lands are prone to floods on a yearly basis. On the other hand, there is adequate water to cultivate paddy for two consecutive seasons. From June to November and from December to March / April. After cultivating paddy, vegetables are also grown till June. However, the quantum of land under vegetable cultivation is only a small fraction when compared to land under paddy cultivation.

13.4. Terrace Farming

Farmers in the terrace regions are largely dependent on the rains for paddy cultivation. The terrain of the land requires special modification for sustainable paddy cultivation. Terraces need to be cut into the slopes converting it into steps. In each step paddy is cultivated. Each step has its own embankment that prevents the water from flowing out. There are multiple advantages to carrying out this special process. First terrace farming minimizes soil erosion and prevents landslides. Water retention and groundwater recharge is supercharged as the water is forced to stagnate in each step before it is allowed to flow down. Terrace farming lends itself very well to community-based farming and subsistence farming in a small footprint.

Farmers in the terrace regions are largely dependent on the rains for paddy cultivation.. The CenterPoint of

the terrace farming system is the presence of a lake or a large waterbody atop the hill. The small canals and drainage ditches bring water from the lake to the different plots in the terrace. Through gates the flow of water is manipulated to the different fields. After each shower the lake catches water which is used when it is needed. Due to the presence of a readily accessible water source , water is available as and when required.

13.4.1. Challenges in Terrace Farming

While it has its own advantages there are multiple disadvantages. Firstly, it is difficult to increase the yields using mechanization as the shape and form of the land is not conducive for bringing machinery into the field. The use of external inorganic fertilizers and inputs benefits some at the expense of others due to the output from one field is the input for the next. This can also magnify the impacts of pesticides and fertilizers due to leaching and biomagnification as the water descends the slopes.

14. Key Actors in Rice Value Chain in Jharkhand and Assam

14.1. Paddy Procurement and Distribution Centre (AMPC/ PDS)

The procurement centres act as government regulated marketplaces for farmers to sell their paddy at government stipulated prices. The procurement of paddy is done as follows:

1) The prospective farmers need to register his details in the database through the e. uparjan.in website. The farmer uploads the details such as identity proof, proof of land ownership/ proof of cultivation of paddy, address.

2) The farmer gets the updates from his registered phone number. To register in the portal, a registered mobile number is a must.

3) The documentation is verified during transplanting time by agricultural department officials

4) The procurement season begins from 15th December and goes all the way to march end. The procurement centres have their own procurement targets which need to be met. This quota is determined by the agricultural department.

5) When the paddy is harvested, the farmer dries and cleans his paddy and brings it to the procurement centre.

6) The moisture content of the paddy is measured, the paddy is weighed. If the moisture content is above 17 % it is rejected immediately. If it is less than 17% it is accepted.

7) A sample of paddy is taken from a sack and sieved to determine the amount of dirt and other impurities. The weight of the impurities is calculated and its weight is subtracted from the total weight of paddy.

8) The price per ton of paddy is determined by the central government . this price is known as the minimum support price (MSP). To ensure the MSP reaches as many farmers as possible, there is an upper limit on the quantity.

9) A farmer can sell up to 1600 kg per acre for a maximum combined weight of 20,000 kg of paddy

10) All payments are done electronically directly to the farmer's bank account.

11) The farmer receives 50 % of the money during the time of sale and the remainder is sent after 3 months.

12) For a payment to be processed verification and approval from 3 different officilas are required.

13) The government contracted mill transports the paddy from the procurement center to the mill as and when the centre reaches full capacity. The paddy is milled and the miller gives the government 68kg of rice

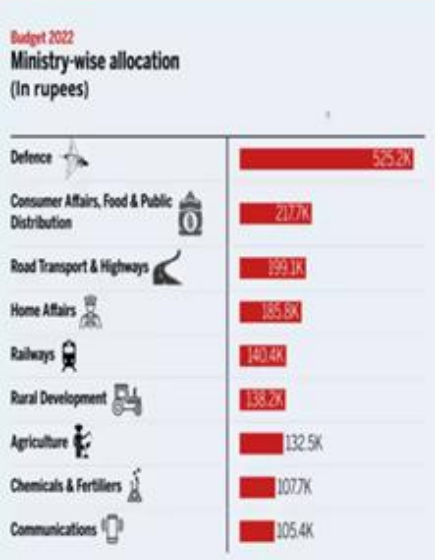
for every 100kg of paddy milled. The miller receives a per kg milling fee from the government for milling and storage of paddy.

14.1.1. Ownership/ Structure of Jharkhand

In Jharkhand paddy procurement centres are run by LAMPS. The Large-Scale Adivasi Multi-Purpose Societies (LAMPS) are co-operative Societies set up by the government for integrated tribal development in regions with essential tribal populations. They are generally one per taluka, and their membership is controlled by adult members of any Scheduled Tribe community. The procurement of paddy for the civil supplies department is done by procurement centres which are run by the LAMPS. The LAMPS in each taluka acts as the nodal agency for paddy procurement in the state. These centres are present at a block and taluka level.

The LAMP in each block consists of multiple affiliated producer groups and self-help groups which produce all kinds of products such as handicrafts, non-timber forest produce and home-made foods etc. As the LAMPS are closely tied with the local populace, they are given the duty of procuring paddy from the block they originate from.

14.1.2. Food Corporation of India - Economics of PDS

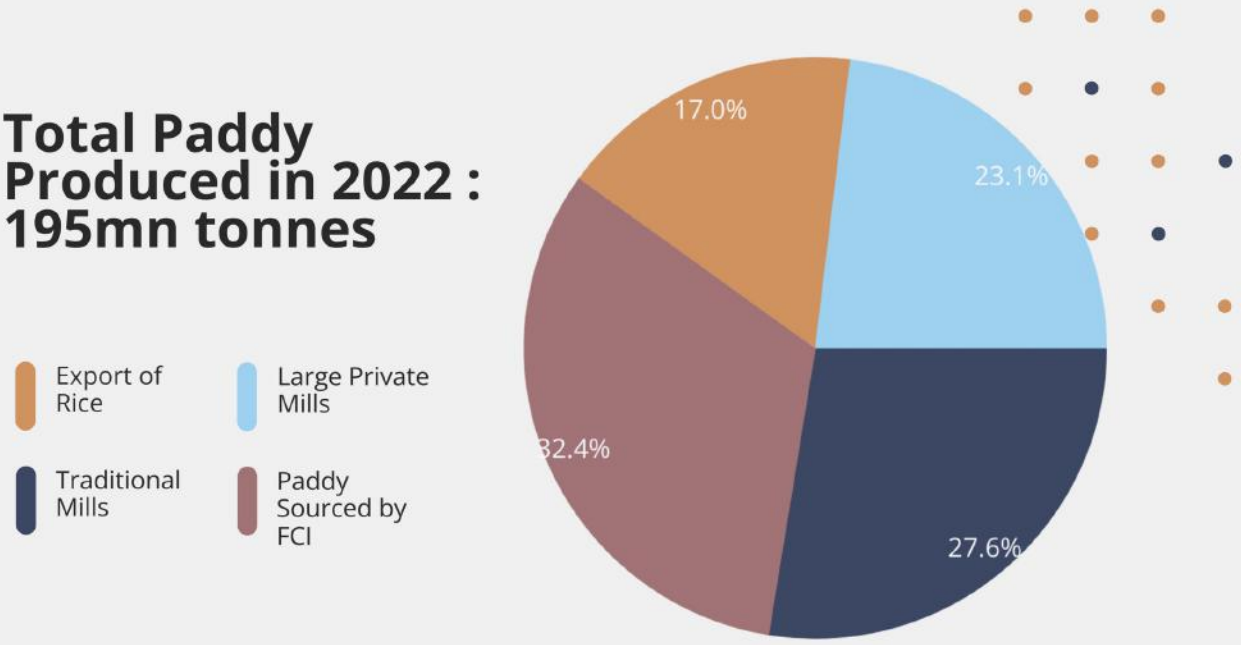


A certain amount of budget allocated for grain procurement every year as per the national budget. The procurement of paddy is done by the central government through the. Food corporation of India (FCI). The food corporation of India appoints other entities like LAMPS, Assam state agricultural marketing board to procure, store and mill paddy on its behalf.

The overall budget for paddy procurement for the year 2022-2023 is 2,17,684 Crore INR. More than 30% of all paddies produced in the country is procured by the government through the FCI. by then. The paddy is sourced and milled through private contractors and then is allocated to the state government who then use it for the PDS and

other schemes like mid-day meal scheme.

Note: All though both Assam and Jharkhand are paddy surplus state, the geography and the lack of paddy milling infrastructure result in paddy taken out of state to be milled and brought back. The lack of infrastructure and centres of procurement also make it difficult for farmers to sell their paddy to these centres due to the distance. Also, a large portion of the farmers are small scale farmers who grow their paddy for their own self consumption. Efforts are being taken by the respective state governments to improve the milling infrastructure and other related structures through subsidies and other tax benefits.



In Jharkhand the paddy procurement target for 2021 -2022 was 80,00,000 tonnes. Of which the state achieved 71% procurement. The government procured about 5680000 tonnes of paddy. The procurement was done by 214 centres across 24 districts in Jharkhand.

In Assam the paddy procurement target for 2019-2020 was 25000 metric tonnes however only 5891.11 MT was procured as of 20/5/2020. This procurement was done via 36 paddy procurement canter. One thing to keep in mind is that the all India agency for procurement and maintenance of civil food supplies , Food Corporation of India started operations in the financial year 1997-1998 in Assam. Compared to other states the procurement infrastructure and policies began later.

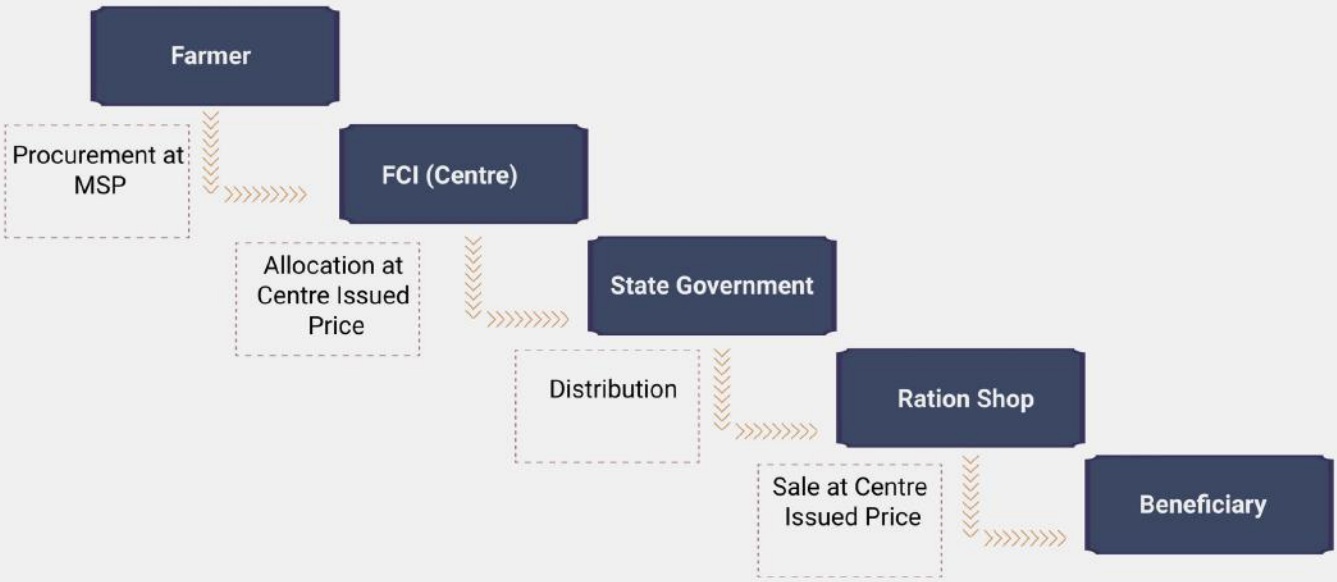
14.1.3. Public Distribution System

The public distribution system as a food security program initiated in 1972. The predecessor of the PDS started as a rationing measure in the interwar period (1919 1939) and as a distribution system for the urban poor was implemented in the 1960s. The PDS that is known as today was started in 1972 with the intent to provide rations at a highly subsidised rate to the poor all across the country. It was designed as a system of scarcity management through the sale of grains at an affordable price. The Public distribution system is run jointly by the central, state and the union territory governments. The central government through the food corporation of India is responsible for the procurement, storage, distribution, and bulk allocation of grains to the state governments. The state governments are responsible for allocation within the state, identification of eligible families, issue of ration cards, maintenance of and supervision of fair price shops. Under the public distribution system, the following commodities are being provided to the populace at a subsidised price.

- Wheat
- Rice
- Sugar
- Kerosene
- Pulses
- Edible
- Oil
- Spices
- Salt
- And other relevant goods as per the season.

The procurement of paddy by the government is done through the procurement centres and regulated market prices set up by the government across the country. Here the paddy is bought at a minimum support price which is stipulated by the government. From the procurement centre there are two locations where the grains are sent namely the government contracted mill and the government go down where the grains are stored for future use. The government contracted paddy mills mill the paddy and send the rice to the FCI operated god owns. The FCI then allocates the grains to the state governments who transfer them to the state civil supplies department. From here it goes to the ration shops. The ration shops then sell

predetermined quantities to end users. The quantity sold per family is dependent on the number of family members living in the same household in the area served by the PDS.



In Jharkhand there are a total of 24405 ration shops served a total of 59,86,519 ration card holders. The state does not have any godowns where the civil supplies are stored. All the goods come from other states.

In Assam there are a total of 33913 ration shops serving a total of 56,31,796 ration card holders. The ration shops are served by a total of 916 godown of which 49 of them belong to the FCI and the remaining belong to the state other private enterprises.

14.1.4. Gaps & Challenges for Paddy Procurement and Distribution in India

The government aims to cover as many farmers as possible through its procurement scheme but a lot of them fall through the cracks due to the following reasons:

- Red tape and bureaucratic delay in registration of farmers in the procurement portal.
- The procurement agencies are often understaffed and poorly equipped to deal with farmer complaints and issue which result in farmers losing faith in the system.
- In Jharkhand nodal agency responsible for procurement o falls under the jurisdiction of multiple departments.
- Improper maintenance and updating of land records of farmers which result in loss of clarity in the ownership of land. This also results in the mismatch of records in archives. This also delays registration.

- The cost of transport for farmers to sell their paddy to the procurement canter is very high which discourages them from selling
- The farmers are not paid fully and are paid in two instalments. 50 % at the time of sale and the remainder after 3 months. Many if not most farmers have an immediate cash requirement during the post-harvest season.
- Farmers prefer to have cash at hand while selling their produce which the private dealers provide. Paddy sold at the procurement canter results in money being directly transferred to the account. The farmer must spend additional time and effort to withdraw money from the ATM which are not easily available in rural areas and have maximum withdrawal limits.

§ There are also multiple challenges in the procurement, distribution, and storage as well.

- The storage capacity of paddy has not kept up with the production and procurement of paddy across the country. This has resulted in the short-term storage deals and agreements with millers and other warehousing agents. When the deals fall through or get delayed the procurement gets affected.
- When external storage sites are used, quality control and oversight become difficult. Oftentimes proper measures are not taken in the storage sites resulting in spoilage. It is also difficult to implement proper storage practices especially when the contract storage periods are short, and the investment does not justify the return.

14.2. Farmers in Assam and Jharkhand

Based on the data collected the farmers are the primary producers. They can be broadly classified into two types . sustenance and small-scale farmers. These two categories combined account for 95 % of the total farmers visited and interviewed. Both the types of farmers have their similarities and differences. The most common and straightforward between the two is the dependency on rain for irrigation and lack of mechanisation in on farm processes post land preparation. Farmers from both the states suffer from having difficult terrain making transportation and trade difficult. However, rapid progress in improving connectivity is taking place in both the states.

Compared to farmers visited in Jharkhand, farmers in Assam have made more progress in mechanising farm activities. The best example of the same was the wide use of a power tiller and portable diesel / petrol water pump. This was not present in Jharkhand. The power tiller was used for multiple operations and helped to minimise labour in farm activities such as tilling of soil, threshing and winnowing. The power tiller was able to save at least 50 % of labour when comparing labour requirements in both the states for the above-mentioned activities.

14.2.1. Sustenance Farmer

A sustenance farmer is a farmer whose goal is to produce only whatever grain is required for consumption for the rest of the year. The land holding of the sustenance farmers is very small. Farmers interviewed under this category had less than 0.5 acres of cultivable land. These farmers also tend to be the most marginalised in the community they live in. Most if not all of the produce is dedicated to self-consumption. If there is any extra, it is sold. Interestingly it is these farmers that tend to sell to the procurement centres. For starters paddy cultivation is a family activity. Everyone in the family pitches in. therefore mitigating the need for labour or eliminating it entirely. These farmers also do not tend to use fertiliser and other chemical inputs. There can be many reasons for the same such as affordability, unwillingness to use chemical inputs for food earmarked for themselves , lack of aim to increase yields as the goal is to only ensure self-sufficiency.

With the largest components of cost to paddy cultivation mitigated, the immediate need for money after harvest is not there. The procurement system of the state provides the maximum price for the paddy which is at MSP (Minimum Support Price 20.5 INR/ kg) however payment is done in two equal tranches 3 months apart. These farmers can afford to wait for the payments as the primary goal of ensuring self-sufficiency has been guaranteed.

14.2.2. Small Scale Farmer

The small-scale farmers tend to have more land when compared to the sustenance farmers. This is usually to the extent of 2-3 acres. The land cultivated is too large to be only cultivated by the family while it is too small to hire full time workers. Therefore, when work needs to be done additional workers are hired to compliment the family. The goal of the farmer is also to maximise yield and therefore external inputs are applied and as much as possible paddy cultivation schedule is maintained. Mechanisation where applicable is also done. All this requires the help of external labour which is hired as and when required.

Once the crop is harvested the farmer has spent a lot of money or has a lot of dues to pay. The local paddy dealer offers a lower price (14-18 INR / kg) when compared to the MSP, but it is all paid in one go and there is no additional cost incurred for the sale to go through. The small farmer prefers to sell here as it nets him immediate money which can then be used to settle the bills. However due to the relatively large amount of paddy produced, the paddy is sold in batches. Mostly to the paddy dealer and if opportunity arises to the state procurement system.

14.2.3. Activities Performed by Small & Marginal Farmers

Activities	Description of Activities Done	Assam Plains	Assam Riverine	Jharkhand Hills	Assam Terrace
Land Preparation	The land needs to be prepared such that it can hold water when it rains.	Land preparation is done by the farmer and his family. After the first rains when the land is soaked and gets softened, drainage ditches are dug, embankments are built to hold the water in,			Land preparation is jointly done by the community using handheld tools. Terraces are carved and regularly maintained into the slope of the land. A water collection tank and Canals are dug to hold and redirect rainwater to different sections of the land
Seed-Selection and Preparation	Seed selection is the process of separating unhealthy seeds. It is done to ensure maximum yield. It is crucial step to ensure efficient use of resources.	Seeds are soaked in water and the seeds that float are discarded. in a separate vessel water is filled and a fresh egg is dropped. salt is constantly added to the water until the egg floats. The egg is then removed, and the seeds put in. Now the seeds that float to the top in the salt water are then discarded. The seeds are then washed in fresh water and put in a gunny bag which is immersed in fresh water overnight so that the seeds sprout. in areas with water issues soaking of seeds in salt water is not done.		Seed selection is not done as many farmers buy seeds from the market or they use seeds from the previous harvests. The sustenance farmers do not carry out seed selection processes as they are not looking to maximise yields.	The method of seed selection followed here is like that of the processes followed in the riverine areas and plains of assam
Nursing Preparation	The nursery bed is used to protect the seedlings at its most fragile state. Although this process is laborious, this ensures high yield and optimised use of resources. the nursery bed is usually a bed of 20*30 square ft bed. which is raised by 6 inches above the ground.	In Assam nursery preparation is done by first tilling the nursery bed. after tilling, fertiliser is applied, and germinated seeds are broadcasted. Then the bed is irrigated using a petrol / diesel water pump.		In Jharkhand, special attention is paid to one area of the land during ploughing which acts as the nursery. Cow dung is generously applied to the soil. Once there is adequate rain fall after preparing the nursery bed the seeds are sown.	A part of the terrace is dedicated for nursery preparation, after the first rain when the tank on top of the hills is slightly full water is redirected for nursery preparation.

Activities	Description of Activities Done	Assam Plains	Assam Riverine	Jharkhand Hills	Assam Terrace
Transplanting	Once the seedlings are ready, they are transplanted to the field while maintaining spacing between the seedlings. Roughly a spacing of 15 cm is maintained between the seedlings. this length is approximately the distance between the tip of the middle finger to the thumb	Transplanting is done after 15-25 days. transplanting is done by women of the household and additional women from the village. up to 15 workers are required to transplant one acre in 2 days. In Assam transplanting is done after 21-25 days. transplanting is done by both men and women of the household and additional workers from the village. 30 workers are required to transplant one acre in a single day or 15 in 2 days			
Irrigation	Irrigation is dependent on the rain. however, if there is a delay in the rain for more than two weeks water pump sets are used to irrigate the field.			Irrigation is wholly dependent on the rain with no other recourse.	After rainwater is redirected into the different sections of Terrace.
Weeding	Weeding is the process of removing unwanted plants from the field. This decreased competition for nutrients for the paddy.	Weeding is generally done 20-25 days after transplanting. After the weeds emerge, they are uprooted and disposed of from the fields.			

Activities	Description of Activities Done	Assam Plains	Assam Riverine	Jharkhand Hills	Assam Terrace
Fertilizer Application	Fertilisers are applied for promoting the growth of paddy. when applied at critical times such as flowering stage and paddy ripening stage the yield of paddy can be drastically increased.	The first round of fertilisers is applied just after weeding. usually about 25 days after transplanting. DAP, Urea, and potash form the trio of fertilisers used in the field with urea being used the most.	The use of inorganic fertilisers in the areas visited is widely accepted and encouraged. fertiliser is applied in the nursery, the flowering stage and the paddy maturing stage.	Fertiliser use seems to be inversely proportional to the ease of access of the farm to the urban / market areas. Farmers with better connectivity are using inorganic fertilisers while those without options to travels are using cow dung during the land preparation stage. Inorganic fertilisers are applied during the flowering stage after weeding All the farmers visited are using cow dung during the land preparation stage to improve fertility of the soil.	Fish farming and snail farming is done along with paddy cultivation this acts as a method of de-weeding and provides fertilizer.
Spraying	To stop pest attacks and mitigate weed infestations pesticides and weedicides are applied.	When a labour shortage is expected, weedicides are used 3-4 weeks after transplanting.	Pesticides are sprayed about 1 month after transplanting. The selection of pesticides to be sprayed is dependent on brand awareness rather than effectiveness of the pesticides. A pesticide known as prolix is used to protect the crop from the pests	Similar to fertiliser application, weedicide application also follows the same pattern. Farmers in remote places are not using weedicides and pesticides but fully dependant on manual labour to remove the weeds and pests are ignored.	Spraying is not done
HARVESTING					
Mechanised	Where terrain is conducive and combine harvesters are available. The machinery can cut, threshing and cleaning the paddy simultaneously.	Combines harvesters are not being used	Combine harvesters are not being used	In very selected geographies such as East Singh hum district, combine harvesters are being used.	Combine harvesters are not being used
Manual	The harvesting of paddy consists of multiple steps namely cutting, bundling, drying and transport.	Paddy is harvested by hand. The stalks are cut and laid down in the ground to dry. This takes about 25-30 workers or 12 workers for 0.33 to do one acre in one day. The paddy is allowed to dry for about 2-3 days. After this the paddy is bundled and transported back home to carry out this work 2-3 workers are required.			

Activities	Description of Activities Done	Assam Plains	Assam Riverine	Jharkhand Hills	Assam Terrace
POST HARVESTING PROCESSING					
Threshing	The goal of threshing is to separate the paddy from the paddy stalks with minimal.	Power tillers are the go-to choose of machinery for threshing operations. A power tiller is driven over 50-60 bundles of paddy for about 3-4 hours. This action dislodges the paddy from the stalks. paddy threshers are also appearing with active support from the government and other private agencies.		Three primary methods were observed for threshing of paddy. The first is to manually beat paddy bundles onto a hard surface which dislodges the paddy and the second is to use cattle to trample the paddy bundles. the last method is to use a traditional manually powered paddy threshing machine to thresh the paddy.	
Winnowing	The process of winnowing is to separate the paddy from the chaff to clean the paddy.	Winnowing is done by taking advantage of natural flow of air. grain is tossed in the air and caught using traditional winnowing tray. when the grain is caught in the tray, it arranges itself in such a manner that the light components of the dirty paddy are at the edge of the tray and the heavier components inside. this makes it easy to separate the chaff and other impurities. in very few places electric fans are used to clean the paddy.			
Drying	The drying of paddy reduces the moisture content and makes it suitable for long term storage.	Paddy is sun dried for the 2-3 days on a clean surface. usually, women are responsible for the paddy drying process.			
Storage	Once the paddy is dried it is packed and stored.	An individual room in a house act as the granary. compared to other room it is well shaded and relatively cooler. the paddy is packed in gunny bags and stored. In Assam traditional granaries known as dule are built. It consists of a bamboo framework covered in clay. This structure is a raised structure, and its base is located about 1 foot above the ground. the paddy is stored in these granaries. some farmers choose to dump the paddy as is in the grana Winnriy while others prefer to pack in bags and then put it inside.			

14.2.4. Current Technologies Used for Paddy Cultivation - As Observed

Technologies	Assam	Jharkhand	Remarks
Tractors	Used	Used in well-connected locations	Tractors are used in both states in well connected farms
Power tiller	Extensively used	Not observed at all	Power tillers are used for tilling, threshing and winnowing
Bullocks for ploughing	Not present at home	Used in remote villages	In remote villages bullocks are the lifeline for agriculture
Sprayers	Used	Used	Manual sprayers are used widely
Motor pumps for irrigation	Used	Not used	Irrigation in Jharkhand is wholly dependent on rain. Motor pumps are only used to irrigate the nursery and is option of last resort if rains do not come on time.
Mechanical threshers	Used	Not observed	Highly dependent on FPOs
Traditional threshers	Not observed	Used by small scale farmers	Mentioned by farmers in assam
Pedestal fans	Used for winnowing	Used for winnowing	Used by farmers who do not have access power tiller.

The major technologies used are:

- Tractors
- Power tillers
- Sprayers
- Motor pumps
- Threshers
- Traditional threshing machinery

Most of the farmers are involved in small-scale subsistence farming. They own small plots of land which are further divided into smaller sub sections and fragments which make it easier for an individual to maintain the land on their own. This fragmentation of the land also makes it difficult to introduce mechanisation and improved agricultural practices through technology.

However certain technologies have made their way into farming practices due to their sheer requirement and usability. Case in point would be the use of tractors and power tillers for ploughing. Mechanisation of land preparation has become a universal feature across paddy landscapes while only being limited / non-existent in hilly and remote areas.

In Assam compared to tractors, the power tiller is the king due to its sheer versatility and compact size. Farmers depend on the power tiller to plough lands, thresh, and clean the paddy as well. If a farmer does not own a power tiller, he tries his best to rent one to complete his farm activities. Subsequently the use and ownership of a power tiller is much more than the tractors.

In Jharkhand only in developed areas like east signum use of tractors was noticed, the majority of sustenance farmers are still dependent on bulls or manual labour for their works

14.2.5. Rental Charges

Machinery Name	Rental Charges for Acres in Assam	Rental Charges for Acres in Jharkhand
Water Pump	150 per hour	NA
Tractor	1050 per hour	1400-1600 per hour
Powertiller for ploughing	1200	NA
Powertiller for threshing	1800	NA

14.2.6. Threshing & Winnowing - Technology as Observed

The set of machinery used after spraying the fields is observed on post harvest activities namely in threshing of paddy and winnowing.

In general threshers are rented by farmers from rental centres or FPOs in the area. It is more of an exception rather than the norm due to the lack of FPOs and rental centres that can provide machinery for rent. This can be largely attributed to the geography, difficulty in maneuvering the terrain and the relative remoteness of the state. The high capital cost of the thresher makes it very difficult for a small-scale farmer to buy one especially if its use is limited to just a few days a year.

14.2.7. Economics of Power Tiller for Threshing

Number of bundles threshed in one round of threshing	50-60
Time taken for one round of threshing	3-4 hours
Number of bundles threshed in one day	150-180
Average yield per bigha (acre) in bundles harvested	80 (240)
Rental charges for threshing	600 per bigha
Rental charges for one day of threshing (2 bighas)	1200
Fuel consumed	3-3.5 litres

14.2.8. Economics of Tractor for Threshing

Number of bundles threshed in one round of threshing	480-600 bundles
Time taken to thresh one round of paddy	3-4 hours
Average yield per bigha (acre) in bundles harvested	80 (240)
Rental charges for threshing	300 per bigha (0.3301 acre) 900 per acre

14.2.9. Winnowing

Winnowing of paddy is done using the power tiller. To winnow the gathered grain, a large fan is attached to a rotating shaft of the power tiller and the power tiller is allowed to idle in neutral. Paddy is poured in from the fan which blows away the chaff and light impurities leaving the clean paddy at the bottom below the fan. This is done multiple times until the paddy is clean. In general, it takes about 30 minutes to winnow about 40 kg of paddy.

In Jharkhand manually operated paddy thresher was widely used . It is a simple machine used to thresh paddy. Workers press bundles of paddy stalks against the rotating cylindrical cage. The rotating cage knocks off the paddy seeds from the paddy bundles. The rotating cage is powered via a pedal with human power like that of a bicycle. There are also electrically powered versions of the machine as well. Those who do not have this machinery rent it from other farmers.

14.2.10. Economics of Paddy Farmers

14.2.10.1. Input Materials Cost Per Acre (Component A)

Assam				
Material	Cost Per Bag	Cost Per Kg	Quantity Used Per Season Kg	Total Cost For Farmers In Assam
Urea	550 (45 kg)	12.22	42	513
Potash	1900 (50 kg)	38.02	33	1254
DAP	1700 (50 kg)	34	9	306
Seeds	800 (5 kg)	160	20	3200
Pesticide	250 (250 ml)	1000	270 ml	270
Total Component A for Assam				5543

Sustenance Farmer Jharkhand				
Material	Cost Per Bag	Cost Per Kg	Quantity Used Per Season Kg	Total Cost For Farmers In Jharkhand
Urea	450(50 kg)	9	15	135
Cow dung	NA	NA	2000	2500*
Potash	1900 (50 kg)	NA	NA	NA
DAP	1400 (50 kg)	27.85	15	418
Seeds	400 (3 kg)	133	6	800
Total Component A for Small Farmer Jharkhand				3853
*Transportation and loading charges for 2000 kg cow dung				

Small Farmer Jharkhand				
Material	Cost Per Bag	Cost Per Kg	Quantity Used Per Season Kg	Total Cost For Farmers In Jharkhand
Urea	450(50 kg)	9	15	135
Cow dung	NA	NA	2000	2500*
Potash	1900 (50 kg)	38	5	190
DAP	1400 (50 kg)	28	15	420
Seeds	30 (1 kg)	30	15	450
Pesticide	110 (100 ml) + 100**			
Total Component A for Small Farmer Jharkhand				3853
*Transportation and loading charges for 2000 kg cow dung				
**Travel Costs Incurred For Purchase (Only Bought When Required)				

14.2.10.2. Labour Cost per Acre (Component B)

Assam					
Farm Task (farm activities)	No of Labour (own)(external)	Cost per labour per day	Duration needed to complete activity once	Number of times the activity is done	Total cost (only labour)
Ploughing using tractor	1	NA	1.5 hours	once	NA
Ploughing using powertiller	1	NA	2.25 hours	4 times	NA
Land preparation	1(2)	350	1 days	once	700
Sowing	1(2)	NA	1 day (12 hours)	once	700
transplanting	1(2)	350	3 days	Once	2100
Irrigating	1 (5)	NA	1 day	once	NA
Weeding	NA	NA	NA	NA	NA
Fertiliser application	1	NA	1 day	3 times	NA
Spraying	1	NA	3-4 hours	1	NA
Cutting and bundling	05-Oct	3600 per acre	1 day	once	3600
transport	1	350	1 day	once	350
Threshing and winnowing	1(2)	350	2 days (activity done simultaneously)	once	1400
Drying	02-Mar	NA	2-3 days	once	NA
Total Component B for Assam					8850

Sustenance Farmer Jharkhand					
Farm Task (farm activities)	No of Labour (own)(external)	Cost per labour per day	Duration needed to complete activity once	Number of times the activity is done	Total cost (only labour)
Ploughing using bullocks	2	NA	1.5 hours	1 time	300
Land preparation	1(2)	100	1 days	once	200
Sowing	1(2)	NA	1 day (12 hours)	once	200
transplanting	1(30)	100	1 days	Once	3000
Irrigating	NA	NA	NA	NA	NA
Weeding	NA	NA	NA	NA	NA
Fertiliser application	NA	NA	NA	NA	NA
Spraying	NA	NA	NA	NA	NA
Cutting and bundling	15	120	1 day	once	1800
Transport	10	100	1 day	once	1000
Threshing	1(2)	120	1 days	once	240
winnowing	1(3)	120	1 day	once	360
Drying	02-Mar	NA	2-3 days	once	NA
Total Component B- Sustenance Farmer Jharkhand					6800

Small Farmer Jharkhand					
Farm Task (farm activities)	No of Labour (own)(external)	Cost per labour per day	Duration needed to complete activity once	Number of times the activity is done	Total cost (only labour)
Ploughing using tractor	1	NA	1 hours	2 times	NA
Land preparation	1(2)	150	1 days	1	300
Sowing	1()	NA	1 day (12 hours)	1	NA
transplanting	1(18)	120	1 days	1	2160
Irrigating	NA	NA	NA	NA	NA
Weeding	1(1)	150	3 days	1	450
Fertiliser application	1	NA	1 day	2 times	NA
Spraying	1	NA	3-4 hours	1	NA
Cutting and bundling	18	120	2 day	1	4320
transport					
Threshing	1(2)	120	2 days	1	480
winnowing	1(2)	120	1 day	1	240
Drying	02-Mar	NA	2-3 days	1	NA
Total Component B Small Farmer Jharkhand					7950

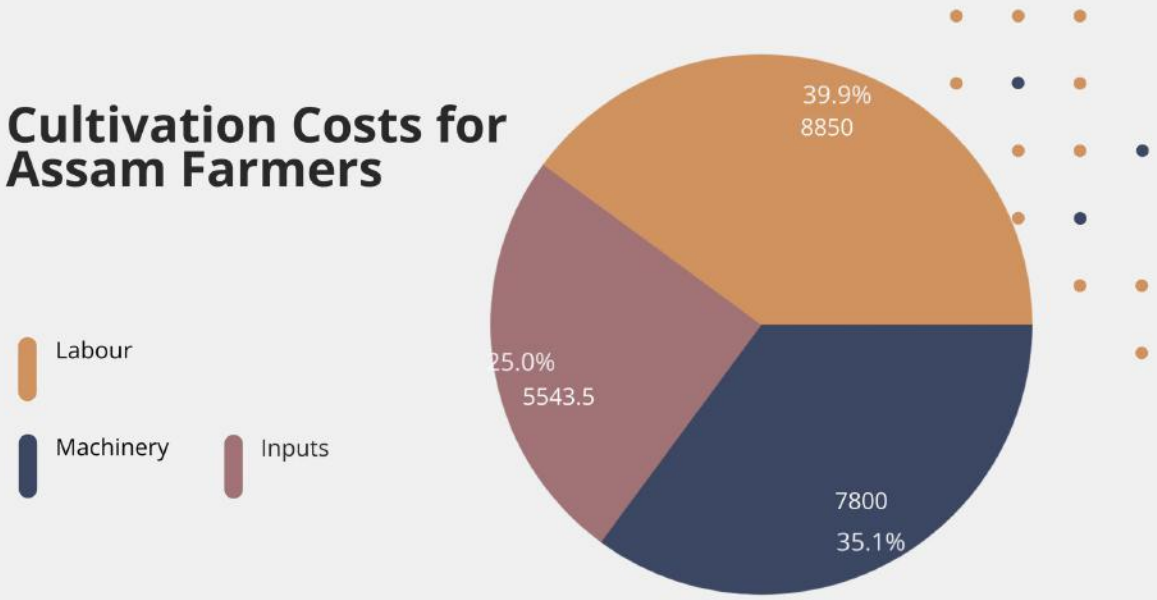
14.2.10.3. Machinery Expenses for Rentals

Assam			
Machinery name	Duration of rental	Cost of rental per unit	Total cost of rental
Tractor	1 hour/ for one acre	350/ bigha	1050
Power tiller ploughing	10 hours / for one acre , ploughing 4 times	400 per bigha	4800
Water pump	1 hour	150 per hour	150
Power tiller threshing and winnowing	1 day for 240 bundles (80 bundles in one bigha)	600 per bigha	1800
Thresher (if available)	1 hour	300 per bigha	900
Total Component C - Assam			7800 (not including thresher)

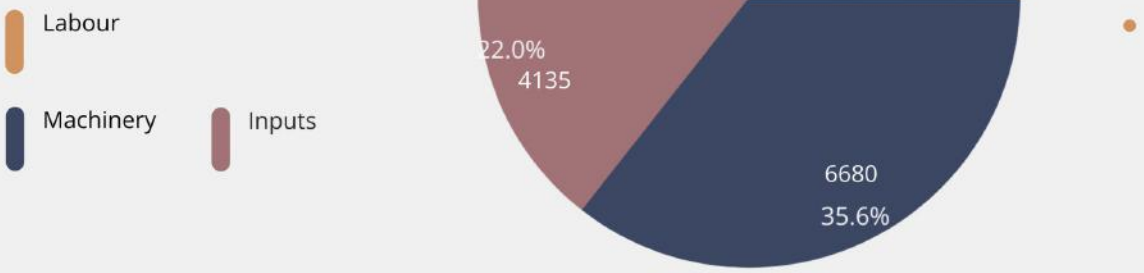
Jharkhand Sustenance/Small Farmer				
Machinery / tech name	Duration of rental	Cost of rental per unit	Jharkhand small	Jharkhand marginal
Tractor (small / marginal)	2 hour 1.5 hour/ for one acre	1400 / 1600	5600	NA
Bullocks ploughing	1 day	350	NA	350
Conoweeder	3 days	180	180	NA
sprayer	NA	NA	NA	NA
Tractor transport	1 trip	1000	1000	NA
Local traditional threshing	1 day	100	100	NA
Total component C Jharkhand small farmer			6880	350

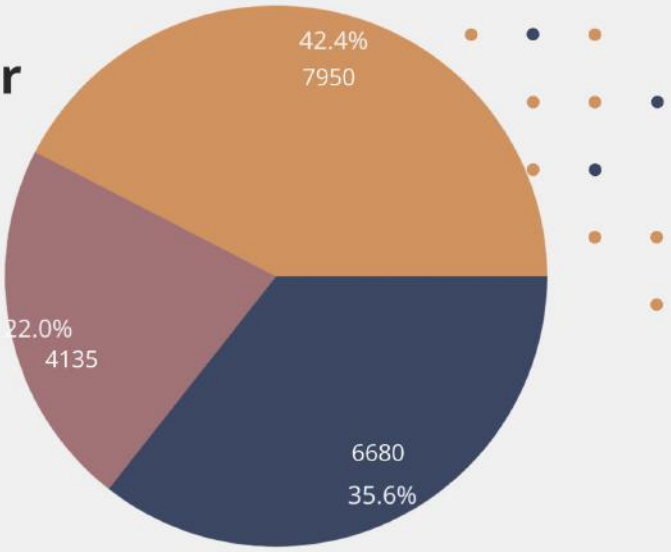
14.2.10.4. Financials

Financials			
	Assam small - hybrid	Jharkhand small scale farmer	Jharkhand tribal / sustenance farmer
Cost of cultivation (A+B+C) in INR	20093	18965	11002.75
Selling price of paddy	1550-1800 per 100 kg	1400-2050 per 100 kg	1400-2050 per 100 kg
Yield from paddy per acre	2400 kg	1600 kg	1350 kg (900 kg sold)
Total revenue from paddy	37200-43200 INR	22400-32800	12600 - 18450
Total net profit from paddy per acre	17107 - 23107 INR	3435-13835	1597.25-7447.25
average	20107	8635	4522.25
Income profile	100535	43180	7235.6

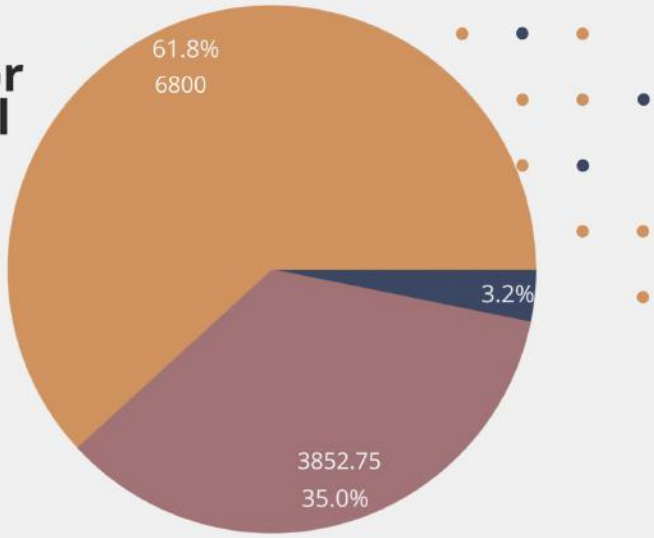


Cultivation Costs for Jharkhand Small Farmers





Cultivation Costs for Jharkhand Marginal Farmers



14.2.11. Gaps & Challenges Faced by Small and Marginal Farmers

Farming in general is a very finicky business to get into as there are multiple factors that are beyond the control of the farmer, like weather, water availability, sale price of produce and cost of production etc. This is even more so for small farmers who are even more dependent on their produce and have a very narrow margin for error. Listed below are some of the challenges faced by farmers. They have been classified into three categories based on the nature of the challenges faced.

14.2.11.1. Social Issues Faced

- Lack of access to technology and access to timely availability of tractor for farm operations
- Lack of access to tractors and inputs in a timely manner is making it difficult to maintain optimal timelines affecting yield. This is especially true for farmers belonging to Adivasi and tribal communities, there is a lack of support from tractor and machinery owners and a negative bias.
- Much of the work is still being done by hand and tools causing it to be time consuming and low efficiency
- Seeds from prior harvests are used for cultivation and exchanged with neighbours when required.
- These long duration paddy crops are slowly fading away. Open cattle grazing is a major contributor to this as the cattle feed on the paddy that is not yet harvested. Open cattle grazing makes it very difficult to grow a 2nd crop of paddy even if other factors permit it. Fields cannot be protected and cattle eat the crop causing damages. It is difficult to get remuneration for damages from the cattle owner.

14.2.11.2. Climate & Water Related Issues Faced

- In 2022, 7 days after transplanting there was no rain for about 1.5 months. The land dried due to the lack of rain. This affected the yield as the crop was under stress. It was very hot and was fully unexpected by the farmers in both Assam and Jharkhand.
- In 2021 due to excess rain the seedlings prepared for transplanting were washed away. The farmers faced two completely different and opposite climates at the time of the in two different years. This has caused a sense of helplessness and a lack of hope for the future.
- About 4-5 years ago in Assam there was abundant water carried by the drainage canals and ditches. Now old canals and ditches are dry. This can be largely attributed to people filling up the drains in front of their homes to increase habiting area, which is blocking water flow. Due to overpopulation the stress on the land has increased.

- Paddy cultivation is heavily dependent on the timely arrival of rains. If the rains are delayed then the lack of access to easily available surface and ground water when it is required at the optimal time hampers productivity and decreases yield. Even when the rains arrive the lack of means of storage. This problem is much more visible in Jharkhand where all the cultivable land is claimed for agriculture and allied activities.

14.2.11.3. Personal Issues Faced

- Labour

As seen in the above pie charts, the lion's share of the expenses incurred for cultivation is the payment for labour. farmers in both geographies mentioned getting labour is the biggest problem. To convince enough people to come work in the fields at the present time is the most difficult task. Usually farmers visit other people's houses two to three days prior to the task for which workers are to be hired. Now the problem is each farmer follows the same planting cycle with 1-2 days difference. So when one farmer needs to do weeding or transplanting , everyone needs to do it too. The transplanting and weeding schedules of each farmer more or less perfectly overlaps with almost every farmer in the surrounding area. Which increases the demand for labour when supply remains the same.

- Efforts vs Remuneration

There is a general consensus amongst the farmers interviewed that the returns from agriculture do not match the efforts put into it. This is very much visible in the cost tables shared above. Earlier the farmers were cultivating paddy as a means to ensure food security . However, now with the availability of discounted rice from the public distribution systems many farmers are having second thoughts on continuing to do agriculture. Farmers are also encouraging their children to not consider agriculture in their aspirations and future plans.

- Challenges in Inputs

Many farmers have also mentioned the difficulty of purchasing inputs for their needs. They say inputs are not available when it is required or available to a inflated cost. Oftentimes the lack of transportation and difficulty in reaching the markets results in a lot of time and money wasted in these purchases.

- Financial

Interestingly farmers do not get financial credit for their activities but all the stakeholders with whom the farmer trades with gets some kind of financial leeway. For example, farmers have to wait three months to get their dues for selling the paddy at MSP but they are expected to pay for all services contracted as and when it is completed or even before it starts. The lack of liquidity and credit forces the farmer to borrow sometimes at usury rates to pay for expenses

- Technical challenges

Paddy cultivation in India is largely done by small and marginal farmers, whose land holding is less than 5 acres. These landholdings are mostly fragmented and scattered in different plots. This makes it increasingly

difficult to mechanise and improve efficiency for on farm machinery. Most of the technologies designed for paddy cultivation tend to be optimised or be operational only at a large scale. Thereby depriving the farmers of the means to an improved farming process. This can be seen in the size of the machinery. The machinery designed for small scale operations cannot be standardised thereby increasing cost. This also makes it more difficult for farmers to purchase them.

Similarly with post-harvest technologies and value addition there is a lack of options for farmers. After hand held tools the next option available for them is the large scale combine harvester. For the combine harvester to operate it has a lot of restrictions such as a uniform terrain , road access to the field etc. There are no middle options for the farmers.

14.3. Local Mills

The number of small and marginal farmers in Assam and Jharkhand are very high. All of them save a portion of their paddy yields for self-consumption for the year.

There is one small scale mill located in every 3-4 villages and maybe more depending on the distance and relative remoteness of the place.

These small-scale mills are all single rice hullers. and are capable of milling about 0.8-1.2 tons per day over 12+ hours. Depending on the location and the proximity to the electric grid the hullers are both electric and fossil fuel powered.

The peak season for milling is usually just after harvest season starting from late November, peaking in December and early January, and slowly tapering off at mid to late January. The rest of the months there is a sustained demand for milling. Demand for milling also spikes prior to the new year that is celebrated twice/ thrice a year.

Farmers set aside anywhere between 50 - 70 mum (200-280) kg of paddy for self-consumption for the entire year. They also visit the mill on a monthly or bimonthly basis milling anywhere between 40 - 100 kg of paddy per visit. This is the demand that sustains the rice mill for the entire year. Of the total paddy produced in India, it is estimated that 27 % of paddy is milled locally or in traditional methods. However, this percentage is expected to be higher in Jharkhand and Assam the concentration of small and marginal farming much high.

14.3.1. Technology Used

Depending on the site and location, mostly single stage and obsolete two stage mills are used. These machines tend to be inefficient, crude and require much higher energy requirements to run.

SPECIFICATIONS OF MACHINERY USED:

Parameters	Assam	Jharkhand
Capacity	200 kg per hour	100 kg per hour
Power	20 hp electric motor	5 hp diesel engine
Number of hours operated per day	8-12 hours	8 hours
% of head rice obtained	35	32
% of broken rice	26	27
% of husk and bran mixture	39	41

The gross output (whole rice + brokens) of the single stage huller per 40 kg of paddy milled varies between 22-25 kg of rice. The rest is a mix of bran, husk and powdered rice. The gross output of rice will reduce if the moisture content in the paddy is not maintained properly. If the paddy is also excessively exposed to the sunlight, breakage will increase.

14.3.2. Ownership of Machinery

These small processing units tend to be individually owned and operated by farmers who also provide milling services to the community. These machines also require high operating costs and return on investment is marginal for existing businesses and non-existent for new entrants.

14.3.3. Business Model

These processing centres are only capable of providing milling as a service to the local community at affordable rates. The business owner is also willing to accept alternate means of payment such as the bran and husk mixture or a percentage of the rice produced.

BUSINESS MODEL RICE MILLING SERVICE BASED.

In Jharkhand where many places have yet to get consistent, non-fluctuating electricity, small scale milling of paddy is done by diesel / petrol powered hullers. As the operating cost of the engine is higher, the prices charged to the customer reflects that. The customers in Jharkhand are charged about 2- 2.2 INR per kg. 15 kg edible oil tins are the units of measurement. Each oil tin can hold about 7-8 kg of paddy and customers are charged about 15 INR per ton. In places with electric hullers, the cost per kg of milling is about 1.5 INR.

FINANCIAL MODEL RICE MILLING SERVICE BASED (DIESEL POWERED COMMON IN JHARKHAND)	
Revenue	
i. from Job work towards milling of rice	1,88,000
Tonnes- paddy per year	94
Charge per tonne (in Inr)	2,000
TOTAL REVENUE	1,88,000
Costs	
Manpower Cost	N/A (owner cum operator)
Headcount	-
Cost per month	-
Maintenance Cost mill	6,000
Maintenance diesel engine	21,600
Diesel Cost	81,780
Sur charge on Diesel	15
TOTAL COST	1,09,395
PROFIT	78,605

In Assam electric single stage processing units were seen in places visited. These are singe stage mills powered by a large capacity electric motor with about 10-20 HP. The mills are belt driven. The customers in Assam are charged about 1- 1.5 INR per kg. The paddy is measured in a weighing scale prior to milling. Interestingly emphasis is placed on husk bran mixture as it is an important component of feed for piggeries in the state.

The economics of a small-scale electric mill in Assam is as follows:

- During the peak season about 14000 kg of paddy is milled per month
- During the off season about 8000 kg of paddy is milled per month
- The mill has a milling capacity of about 120 kg per hour.
- Milling charges are about 1.25 INR per kg.
- Revenue varies from 15000-18000 per month.
- To replace frequently worn out parts it costs about 3000 per month in spares. Repairs are done by the owner himself. This also includes the travel and transportation involved in getting the spares
- From 40 kg of paddy the whole rice yield is 24 kg the rest being husk, bran and broken rice mixture. This is only true when the paddy is properly dried and stored. The mill owner has also mentioned he has seen broken rice ratio of up to 80% when the paddy was not handled and stored properly.
- There have been electrical fluctuations/ low voltage in the past. Usually it happens once or twice a month, However much of the mill operations are done via solar.
- This small-scale entrepreneur has an integrated huller cum grinder

Some small-scale rice mill owners have started using an integrated rice hiller cum grinder allowing them to provide more services such as flour production, animal feed production, spice grinding alongside paddy milling

FINANCIAL MODEL RICE MILLING SERVICE BASED (ELECTRICITY POWEREDCOMMON IN ASSAM)	
Revenue	
from Job work towards milling of rice	94,000
Tonnes- paddy per year	94 T
Charge per tonne (in Inr)	1,000
TOTAL REVENUE	94,000
Costs	
Manpower Cost	N/A (owner cum operator)
Headcount	-
Cost per month	-
Maintenance Cost	6,000
Electricity cost	29,400
TOTAL COST	35,400
PROFIT per annum	58,600

Note: In most areas visited it was found that in Jharkhand diesel mills were prevalent and in assam electric mills were prevalent.

- Assumptions as per data collected:
- The capex for the mill and setting up cost has been amortized.
- Cost of diesel is assumed to be 87 inr per litre along with a procurement cost of 13 per liter
- The total quantity of paddy milled per year is 94 Tonnes.
- The duration of the peak milling season is 2 months and it is spread over the year.
- In the peak season 12 tonnes of paddy per month is milled
- The duration of the lean milling season is 10 months.
- In the lean season 7 tonnes of paddy per month is milled.
- Cost of electricity at peak season is 3200 and off season is 2300 per month.

14.3.4. Gaps & Challenges

- High operating expenses due to inefficiency of the machine..
- Due to the low head rice count it is not commercially viable.
- Marginal income from the business. This business in its current state is only viable because the capital expenditure has been amortized. Due to the high capex it does not make sense to upgrade the equipment with the same financials.
    - Ex. A 40-year-old milling unit in Kamrup Rural using a 40 year old machinery can only barely sustain itself, if the unit was burdened with loans / capex any other related expenses it would run out of business.

- High drudgery involved in constantly lifting weight over the head from the ground daily.
- The cost of electricity and diesel for running the machinery is very high when compared to other technologies.
- The supply of electricity in rural areas is unstable in Assam. In Jharkhand large areas are yet to relate to reliable electricity.

14.4. Commercial Mills

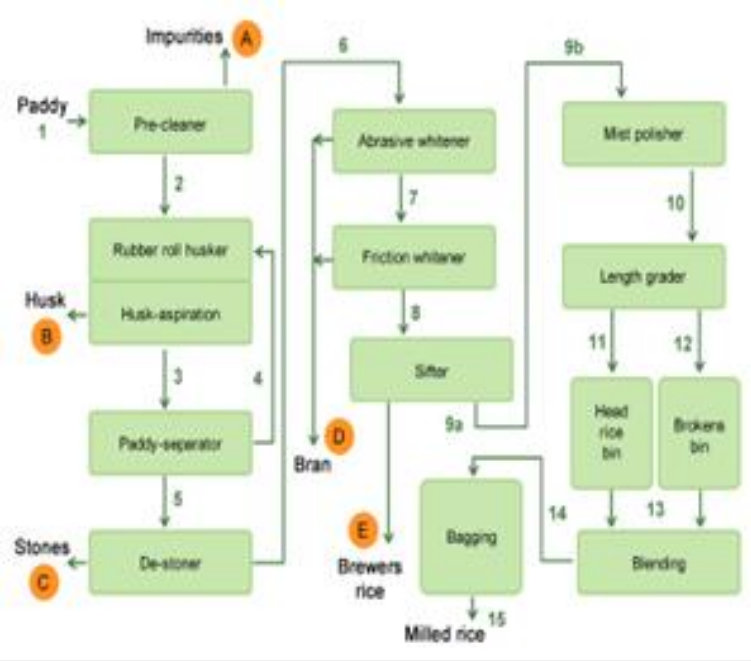
Commercial mills are large scale multistage mills that are designed to process paddy and as fast as possible. These mills carry out the following machines processes:

Precleaning • De-husking • Paddy separation• Abrasive whitening • Polishing •Grading • Mist polishing • Colour sorting • Storage • Weighing and packing • Final storage.

Certain parts of the country prefer consuming parboiled rice and therefore additional setup is required to carry out the parboiling process which is described as below.

Precleaning • Soaking • Steaming • Drying • De-husking / Hulling • Abrasive whitening • Polishing • Shaking • Length grading • Mist polishing • Colour sorting • Storage • Weighing and packing • Final storage.

14.4.1. Description of Flow of Materials and Processes



1 Paddy is dumped in the intake pit feeding the pre-cleaner

A straw, chaff and empty grains are removed

2 pre-cleaned paddy moves to the rubber roll husker:

B husk removed by the aspirator

3 mixture of brown rice and unhusked paddy moves to the separator

4 unhusked paddy is separated and returned to the rubber roll husker

5 brown rice moves to the destoner

C small stones, mud balls etc. removed by de stoner

6 de-stoned, brown rice moves to the 1st stage (abrasive) whitener
7 partially milled rice moves to the 2nd stage (friction) whitener
D Coarse (from 1st whitener) and fine (from 2nd whitener) bran removed from the rice grain during the whitening process
8 milled rice moves to the sifter
E Small brokens/brewer's rice removed by the sifter
9a (for simple rice mill) ungraded, milled rice moves to bagging station
9b (for more sophisticated mill) milled rice moves to the polisher1
10 Polished rice, will move to length grader
11 Head rice moves to head rice bin
12 Brokens moves to brokens bin
13 pre-selected amount of head rice and brokens move to blending station
14 Custom-made blend of head rice and brokens moves to bagging station
15 Bagged Rice moves to the market

14.4.2. Commercial Milling in Jharkhand & Assam

Jharkhand and Assam do not have the required large processing mills to serve population for varying reasons which are described as follows.

In Jharkhand

Hilly terrain and poor transport connectivity makes it difficult for paddy mills to procure the grain required. The policies and the environment for the same are not enticing / conducive enough for investors when compared to nearby states. The neighbouring state of Bengal with whom Jharkhand shares a long border with, has more factors going for it when it comes to establishing a paddy mill. The state is the largest paddy producing region in the country and the terrain is relatively flat. This makes it easy to establish rice mills. According to the participants in the value chain study much of the paddy produced in the state is transported to Bengal and milled there the end product is then brought back to Jharkhand for distribution.

In Assam The geography of Assam makes it difficult to establish effective modes of transportation in the state. This makes procurement, milling and distribution difficult. The mighty Brahmaputra splits the Assam plains in half and the southern and eastern part of the state is hilly terrain. There is a lack of large-scale milling infrastructure. However, the state government in tandem with the central government is vigorously promoting milling infrastructure through subsidies, tax benefits and other means. In this regard Assam is well on its way to attain self sufficiency in both production and processing of paddy.

14.5. Government Contracted Mill

The paddy procured by the government is milled by the large millers who are contracted by the government to provide milling services. The government pays the mill and milling service fee. In Assam it is about 15 INR per 100 kg of paddy. This charge also concludes the transportation charge to and for from the mill to the go down up till 8 km each way.

As part of the agreement the mill must provide the government gross output of 68 kg of rice for every 100 kg of paddy milled. The rice output can have a maximum of 25% brokens. The transportation of paddy from the procurement centre to the mill and to the godown is the responsibility of the mill owner. The use of bran and husk produced is at the discretion of the mill owner.

14.6. Gaps & Challenges Commercial Milling

14.6.1. Commercial Mill

- Razor thin margins as it acts on a high-volume low margin business.
- High capex between 1.5-5 crores
- High pollution and particulate matter emissions due to the use of boilers for steam production
- High energy consumption in terms of electricity and fuels for powering the boiler.
- The commercial mill requires a high-capacity electrical connection (100kW) to the grid for day-to-day operations without which it cannot run.

14.6.2. Government Contracted Mill

- Difficulties in getting a government contract
- Delay in government payments

14.6.3. Need for Commercial Milling Infrastructure in Jharkhand & Assam

Jharkhand and Assam farmers contribute about 6% of India's paddy. Most of the milling done in private commercial mills is done in the neighbouring states. The milling process adds the most amount of value in the rice value chain and the advantage of this goes to West-Bengal to other states leading to income lost for the local farmers/ entrepreneurs and the state.

The FCI alone sets a target of buying – tonnes of paddy in the two states. the paddy produced in both the states is send to neighbouring states like West Bengal for milling and then brought back for PDS distribution. This creates a further net outflow problem and loss of income for these states.

However, it should be noted that both the states are energy deficient states where basic energy need have not been met state-wide. Establishment of these large commercial mill without adding additional power generation and transmission capacity would only further exacerbate the problem. Establishment and propagation of small capacity commercial mills designed keeping in mind the production capacity of village or block level would go a long way in improving the food security of the area. It can also create employment opportunities for the local youth. The smaller mills also make it easy to integrate locally generated renewable energy to the mills.

14.7. Paddy Dealers

The farmers usually sell their paddy to middlemen who buy and sell paddy. When the farmers want to sell they call the local paddy dealer / middlemen. There are multiple vendors operating in the area and whoever offers the highest price , the paddy is sold to them. Once a deal is made the middleman arrives at the farmer's house to pick up the grain.

The quality of the paddy is checked and his staff pack the paddy in the gunny bags and weigh them before it is packed. In Assam the price offered by the dealers varies from 1400-1600 per quintal of paddy. The price of paddy is at the lowest just after harvest and it rises after depending on the time of the year and quantity purchased. In Jharkhand it is even lower. Swarna and Lolat are the most popular varieties grown. Lolat fetches 1200 INR per 100 kg and Swarna varies about 1300-1400 INR per 100 kg.

The paddy dealer is responsible for packing and transporting of paddy from the farm.
The middleman immediately pays the farmer the amount once the transaction is done. Whereas the other means of sales for paddy takes time, especially the APMC procurement system based on the minimum support price. Paddy dealers also visit villages on a regular basis to buy paddy from whomever is willing to sell.

14.8. Machinery Service Provider

In Assam and Jharkhand, mechanisation of paddy cultivation has not spread widely nor is it uniform. Only land preparation and levelling of the soil using tractors is more or less widespread. The rest of the activities are still manually done or heavily dependent on manual input.

In Assam, the only machines used for paddy cultivation are the tractors, water pumps and power tiller. Whereas in Jharkhand traditional threshers are also used if they are available. Based on the interviews held with farmers each village tends to have 3 to four tractors owned by farmers. These farmers act as the backbone for the machinery-based services provided. The farmers who own machinery rent theirs to other farmers who do not. Most small and marginal farmers do not own a tractor. Usually in the village there is one individual who owns a tractor but lives elsewhere. A driver is hired to maintain the tractor and accept hiring requests. The driver operates the tractor on behalf of the owner and collects money. It costs about 900-1050 to rent the tractor to plough one acre of land. Usually, to hire the tractors a request needs to be placed 2-3 days in advance. In Jharkhand tractor rentals cost about 1400-1600 to plough one acre of land. The other equipment rented to farmers by other farmers include water pumps, power tillers, traditional threshing machinery, sprayers etc. the rentals to which are covered below.

MACHINERY NAME	INCOME FROM RENTALS	INCOME CHARGES IN JHARKHAND
Water pump	150 per hour	NA
Tractor	1050 per hour	1400-1600 per hour
Power tiller for ploughing	1200 per acre	NA
Power tiller for threshing	1800 per acre	NA

14.8.1. Capital Investment By Individual Farmers As Observed

Most of the machinery observed at the site was bought preowned and dated. This is especially true of the more expensive machines such as the power tiller and tractor. However in cases of FPOs and SHGs, CHCs new machinery was purchased under the encouragement and financial assistance from the government.

MACHINERY NAME	COST IN ASSAM	COST IN JHARKHAND
Water pump	5500 (PRE-OWNED)	NA
Tractor	12,00,000-14,00,000	12,00,00-14,00,000
Power Tiller	50000	NA
Sprayer	Provided under scheme	Provided under scheme

14.8.2. Ownership

In Jharkhand there are multiple farmer groups and self-help groups which are encouraged to have tool and machinery rental setup where farmers can borrow machinery and return when they are done. Even central and state government policies of providing subsidies for ago machinery prioritise farmer producer groups and SHGs over individuals. For example, the CMSGUY (Chief Ministers samara Garima Unna yan Yojana) scheme aims to ensure all round development of the villages by doubling farm income in five years. Under this scheme subsidies are available for tractors.

In Assam in partnership with NABARD and World Bank have prioritised setting up of SHGs, FPOs and PGs for benefitting farmers in the states. A good example of the same is the Uttara Krishi Producer Company based in Kamrul Rural District, Assam. The producer group has purchased a list of machinery such as tractors, tractor powered threshers, reapers and other farm equipment meant for rent for their members.

14.8.3. Gaps & Challenges - Machinery Suppliers

1. FOR INDIVIDUAL FARMERS

- The lending of machinery is largely dependent on the individual machinery owner in the village. For example, farmers interviewed in Assam say the tractor owners often renege on previously made rental agreements in favour of farmers / other customers who are willing to pay more. This needless delay severely hampers productivity.
- Most of the machinery used for agriculture is specialised in nature. This results in the machinery being used for a few days to a week and remaining idle for the rest of the year. This makes upkeep very difficult as disuse results in faster degradation. It is also very difficult to justify its purchase.

2. FOR FPOS $ FPCS

- There are multiple complications in the ownership of machinery under FPOs and FPCs. there are multiple questions that need to be answered first such as
- Who gets to use the machinery first?
- How should the machine be rented so that it can be used equitably?
- The FPOs and FPCs are very prone to local politics. Infighting and lack of consensus is the fastest way the institutions break down.
- The experts from the promoting agencies such as State Livelihood Mission acknowledge the fact that the healthy working of a FPC is very much dependent on dynamic leadership and management. It is very difficult to convince skilled workers to work in remote and rural areas when they have better opportunities elsewhere.

- Oftentimes there is a mismatch between the machinery needed and machinery available at hand. Also due to the generalised certifications provided for machinery there is a mismatch between the capabilities of the machinery and the requirements in the village.
- The list of machinery that can be purchased under subsidy is limited.

Tractor Thresher Rental Breakup in Assam:

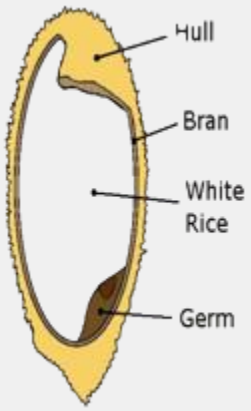
Number of bundles threshed in one round of threshing	480-600 bundles
Time taken to thresh one round of paddy	3-4 hours
Average yield per bigha (acre) in bundles harvested	80 (240)
Rental charges for threshing	300 per bigha (0.3301 acre) 900 per acre

15. Technology & Vendor Mapping For Rice Value Chain

Cultivation of paddy started off as primarily a labour-intensive process. However, overtime technologies to improve yield, minimise labour and reduce drudgery has been developed. The document below covers the list of technologies that would be useful at a small farmer level (2-6 acres) and at a farmer group level where machinery is offered as a rental service for users. With this in mind very large technologies or technologies with very high automation and scale have not been included below.

16. Post Harvest Value Addition of Paddy

16.1. Milling of Paddy



Rice milling is the process of removing the husk and bran layer to produce white rice. There are primarily two ways to mill rice using machinery which are:

A single step milling process where the husk and the bran are removed in one pass and white rice is produced directly from the paddy.

A two-step process where the husk and the bran are removed separately, and brown rice is produced as an intermediate product.

An evolution to the above process would be the **multistage milling process**. A multistage process where paddy passes through a number of different operations and machines to produce white rice.

16.1.1. One Pass Milling or Single Pass Huller

The single pass rice mill is an adaptation of the "Engberg" coffee huller. This type of mill is still very popular in many of the poorer rice-growing countries and is widely used for custom milling of household rice. It is also still popular for milling parboiled rice in Bangladesh and many African countries. This mill is a steel friction type mill and uses very high pressure to remove the hull and polish the grain. This results in many broken kernels, a low white rice recovery of 50-55% and head rice yields of less than 30% of the total milled rice.

Working Principle: The single stage huller uses steel friction polishing to hull and polish the grain. The internals of the huller consists of a rotating screw enclosed in a cylindrical chamber which pushes the paddy against the walls of the cylinder. This results in friction between grain which chips away the husk and bran. Two metal plates attached to the longitudinal axis of the chamber on the perimeter of the chamber disturb the flow of grain increasing friction. When the grains reach the end of the chamber, the husk and bran has already been chipped away leaving polished rice amount for about 55 percent of paddy by weight. 15% of the polished rice is whole grain rice and the remaining is brokens.

16.1.1.1. Ownership & Business Model

Due to the low capital cost, this single stage huller has become a favourite for small scale millers to offer milling services to local farmers and customers. the local farmers are not bothered by the high breakage rate as the paddy that is milled is for self-consumption and not for sale. The cost of milling per kg varies about 1-2.5 INR per kg in both Assam and Jharkhand. A small scale entrepreneur can get a revenue of about about 12000 INR per month based on this business model.

16.1.1.1.2. Gaps & Challenges

The rate of breakage of paddy in single stage hullers is extremely high when compared to other technologies. This makes it only viable for milling as a service and that too only if customers are okay with the high breakage rate. The produce from the single stage mills cannot be sold in the market as it is not competitive enough.

For farmers trying to make their mark in organic farming which is a rising trend these days, the high rate of breakage is not acceptable. They also cannot let their paddy be contaminated with paddy from other sources which would void their certification.

SL.NO	ORGANISATION NAME	MODEL NAME	CAPACITY	COST [EXW]	HORSEPOWER
1	Satake Group	CBS22000B	Brown Rice :30 Kg Paddy Rice: 20kg	Rs - 2,83,936/-	Three Phase 200 V 2.27
2	Dawn Agro	6N70 Pro	450-600 kg/hour	Rs - 35,000/-	7.5 Kw [11 HP]

INDIAN MARKET FOR SINGLE PASS RICE HULLER MACHINE						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	Vridhi Rice Screens and Co [Howrah,West Bengal]	Mr.AmritPal [9804180448/983 103860] E-mail: virdhiricehuller@gmail.com Web:www.vridhi.in	Model No : 4	300-350 kg/hr	Rs.8300 plus 18% GST	5/7HP
2	Kumar Enterprises [Dealer inBokaro,Jharkhand] purchased from Heavy Tech [Raipur, Chattisgarh]	Mr.AmarjeetSingh [PROPRIETORSHIP] [+91-8986615579; +91- 8049472187]	Semi-Automatic Rice Huller	400 kg/hr	Rs.25,100+GST	3 HP
3	Archana Machinery Works [They won't sell outside Assam]	Mr. Archana -9706040943 [Guwahati, Assam]	Single Pass Rice Huller Machine	700-800 kg/hr	Rs 21,000/- GST	3HP
4	M/S Central Machinery Spares [Guwahati, Assam]	Mr. Hakim Jabrot [CEO] [080-48978245] [+91-97060 52000]	Semi-Automatic Rice Huller	150 kg/hr	Rs. 9,900/- +GST	5 HP
5	Alto Precision	Mr. Asaad Jaffer precisionalto@gmail.com	ST100	120 kg/hr	Rs. 65,000/- +GST	3 HP
6	Thomas International [Chennai]	+91-9840765341; -9840104617 nans@thomasexi mp.com	SB-5-D	400-500 kg/hr	Rs. 1,22,035/- +GST	7.5HP
7	Lakshmi Machineries [Nagasandra,Bangalore]	Mr.Sandeep -7022784289 Nagasandra,Bengaluru sales.lakshmimachineries@gmail.com	NO 7	25kg/hr	Rs 2,25,000/- +GST [Premium quality] Rs1,80,000/- +GST	10 HP

16.1.2. Two Stage Mills or Two Pass Huller

Two Stage Compact Mills are often called compact rice mills and, in many countries, have superseded the Engleberg mill. The two-stage mill has separate hulling and polishing processes. Rubber rollers remove the husk and the brown rice is then polished with a steel friction whitener similar to the Engleberg. These mills have a capacity of between 0.5 to 1 ton per hour paddy input and are often used for custom milling in the rural areas. The milling performance of the compact rice mill is superior to the single pass Engleberg huller with milling recoveries normally above 60%.

Working principle: Two stage mills work on different principles. The counter rotating rubber rollers use shearing force to split the husk and separate the rice from the husk. Fast moving air from a blower separates the husk from the rice-husk mixture and the husk is ejected out of the machine via the airstream. The rice then falls into a steel friction polisher. The steel friction polisher is similar in construction to that of the single stage huller. However it only consists of a rotating screw placed in a cylindrical mesh. The rice is fed into the mesh.The steel friction polisher forces the grains to rub against each other and against the walls. This chips away the bran from the grain leaving polished rice.

16.1.2.1. Business Model

The two-stage mill works best as a milling as a service provider. Used in areas where Rice is the primary product The two-stage milling process minimises breakage and maximises whole yield gain. Purely based on the higher whole grain recovery rate , the two stage mill can command a premium for its milling services. Both the customer and the miller stand to gain from this.

16.1.2.2. Gaps & Challenges

When compared to single stage hullers the capital cost and maintenance of two stage mill is higher.More spares are also required over time as the two stage mill has more components when compared to the single stage huller.

GLOBAL MARKET FOR TWO PASS RICE HULLER MACHINE					
S.NO	ORGANISATION NAME	MODEL NAME	CAPACITY	COST [EXW]	HORSE POWER
1	Satake	SB 10 D	750 kg/hr	Rs- 11,38,650/-	15 HP
2	Jiaozuo newest machinery Co	Integrated mill	200-300 kg/hr	Rs- 78,779/-	4 HP

INDIAN MARKET FOR TWO PASS RICE HULLER MACHINE						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	VridhiRice Screens and Co [Howrah, West Bengal]	Mr.AmritPal [9804180448/9831038600] E-mail : virdhiricehuller@gmail.com Web:www.vridhi.in	RiceHuller Machine No : 4 [1208]	300 - 350 kg/hr	Rs 9,600 +24% discount	5-7HP
2	Kumar Enterprises [Dealer in Bokaro, Jharkhand] purchased from Heavy Tech [Raipur, Chattisgarh]	Mr. Amarjeet Singh [PROPRIETORSHIP] [+91-8986615579; [+91- 8049472187]	Semi-Automatic Rice Huller	400 kg/hr	Rs - 24,000/	3 HP
3	M/S Central Machinery Spares [Guwahati,Assam]	Mr. Hakim Jabrot [CEO][080-48978245] [+91-97060 52000]	Semi-Automatic	150 Ton/Day	Rs - 9,500/-	5 HP
4	Sakthi Mill Tools [Coimbatore]	Mr. Jai Sakthi [Proprietor] [+91-7867880804]	Rubber Roller Sheller with Polisher	350 Kg/Hr	Rs 1,03,000/-	4 HP
5	Alto Precision	Asaad Jaffer precisionalto@gmail.com	IFB 100	120 Ton/day	Rs- 1,65,000/-	3 HP
6	Green Agritech Equipment [Pune]	Ms. Neha +91-70567 88567 agritechgreen04@gmail.com	GA-221A	40 kg/hr	Rs 34,000/-	0.5 HP

16.1.3. Multistage Mill

Multipstage mills are prevalent around the world. Most of the paddy around the world is milled in large scale paddy multistage mills. The capability of the mills varies from 1 ton per hour to 3 tons per hour. If higher processing capacity is required then additional processing lines are added. However, the limiting factor on the size of a mill is largely dependent on the amount of paddy that can be supplied to the mill consistently. The design and capacity of the mill is dependent on the customer requirements.

Rice mills are required for commercial production and sale of rice. The rice needs to be graded to separate the whole and broken rice. Whole and broken rice have their own prices and markets.

A typical rice mill consists of the following

- Pre-cleaner
- De-husker
- Paddy separator
- Destoner
- Polisher 1 (abrasive based)
- Polisher 2 (friction based)
- Grader
- Elevators to carry grain from one machine to the next.

16.1.3.1. Business Model

A small capacity multistage mill can produce market ready rice that can be packaged and sold. It can also act as the backbone for a small farmer producer company which sells locally farmed and processed rice. The small scale mill is capable of providing full time employment for 3-4 workers and an additional part time work for another 2-3 workers during the peak season. The small-scale mill can work both a milling as a service provider as well as a commercial rice supplier to local and nearby urban markets.

For states plagued with terrain and geography constraints a small capacity multistage mill is a blessing for all stakeholders. The small-scale mills can be distributed more evenly across towns and villages with each small scale mill serving only the areas in its vicinity.

16.1.3.2. Gaps & Challenges

As the capacity of the mill is higher, adequate land and infrastructure is required for the milling and storage of paddy. This increases the requirement for upfront capital. The multistage mini mill contains many components for which service and spares may not be easily available locally which requires additional earmarked capital and labour to attend any needs that may arise.

GLOBAL MARKET FOR MULTISTAGE MACHINES [MINI RICE PLANT]						
S.NO	ORGANISATION NAME	MODEL NAME	MODEL NAME	CAPACITY	COST [EXW]	HORSE POWER
1	EmtexMachinery supplier private limited	1 ton mill	1000	1 ton per hour	Rs-6,87,61,824/-	35 HP
2	Yongcheng Oddly machinery Co	1 ton per hour	Complete setup for mini plant	1 ton per hour	Rs-3,57,90,645/-	20 HP
3	Satake small lot Mill	CMS 05C	Complete setup for mini plant	500 kg per hour	Rs-27,53,12,660/-	13 HP

INDIAN MARKET FOR MULTISTAGE MACHINES [MINI RICE PLANT]						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	Alto Precision	Saran Babu +91 724767545	Complete setup for mini plant	180-200 kg/hr	Rs-7,072/-	7.5 HP
2	V V Grain Care Solutions [Bengaluru,Karnataka]	Mr. Sharanu [+91-97396 81789] Mr.Vijayakumar [+91-99866 86544]	Complete setup for mini plant	2 Ton/hour	Rs-39,95,000/-	7.5 HP; 5HP;
3	Food Grain Machineries [Bengaluru, Karnataka]	YATHEESHA N L +91 97415 91838 foodgrainmachineries@gmail.com	Complete setup for mini plant	2 Ton/hour	Rs-42,24,400/-	7.5 HP; 5HP;
4	Perfect Equipments [Chennai]	+91 94443 95035 info@perfecteq uipments.in	Complete setup for mini plant	2 Ton/hour	Rs-30,68,590/-	7.5 HP; 5HP;
5	India Mahabachat Services [Guwahati,Assam]	Mr. Ravindra Navghare [89995 86797] indiamahabachatservice@gmail.com	Complete setup for mini plant	1 Ton/hour	Rs-15,39,015/-	5-7.5 HP
6	Green Agritech Equipment [Pune]	Ms. Neha +91- 70567 88567 agritechgreen04@gmail.com	Seed Cleaner, Rice Husker & Whitener Tester	40 kg/hr	Rs-3,46,500/-	Varies
7	Millsys technology [Sunkadakatta,Bengaluru]	Mrs. Prashanthini [+91-80737 61359] prashanthini.technospark@gmail.com	Complete setup	1 Ton/hr	Rs-27,14,000/-	Varies
8	Vinspire Agrotech I private Limited [Ahmedabad]	Er Mr.Manan patel +91 76007 73096 Vinspireagrotech@gmail.com	Complete Rice Mill Mini Plant	1 Ton/hr	Rs-9,44,000/	35HP
9	India Mahabachat Services [Nagpur Maharastra]	Mr. Ravindra Navghare [89995 86797] indiamahabachatservice@gmail.com	Complete Rice Mill Mini Plant	1 Ton/hr	Rs-15,39,015/-	35 HP
10	Vinglobe [Ahmedabad]	Mr Vivek Bhansali +91 79840 30141 vinglobgreentech@gmail.com	Complete Rice Mill Mini Plant	700 kg/hr	Rs-7,39,999/-	Varies

16.1.4. Paddy Thresher

The paddy thresher is used to separate the paddy from the paddy stalks. The working principle of the paddy thresher is to dislodge the paddy from the stalk through inertia.the first method is to force the paddy bundles in contact with a rotating cylinder with protrusions on its surface. The paddy from the stalks are then knocked off the stalks.

The second method is to agitate the paddy bundles against a stationary sieve. The paddy falls off the stalks and falls through the sieve. The small scale paddy threshers follow the first method while the large ones follow the second. There are multiple types of machinery depending on how it is powered and operated. Which are listed as follows.

16.1.4.1. Types of Paddy Threshers

- Tractor Mounted Paddy Thresher
- Engine Mounted Paddy Thresher
- Manually operated Paddy Thresher

16.1.4.2. Tractor Mounted Paddy Thresher

The tractor powered thresher like the name suggests is a thresher capable of threshing and cleaning the paddy. In the first stage the paddy is threshed and in the subsequent stages the paddy is cleaned using blowers. The thresher draws its power from the Power take-off point (PTO) from the tractor. This gives the thresher the flexibility to operate from where the tractor can be driven if the terrain allows for it.

16.1.4.2.1. Business Model

For FPCs and SHGs other farmer organisations it is a useful tool to offer threshing services to other consumers. The threshing price can be determined on a per unit of land basis.

16.1.4.2.2. Gaps & Challenges

- The only way for a tractor trailer thresher to be a viable business is to provide doorstep threshing or threshing in the field itself. Due to the fragmented nature of farming and guaranteed road access to the fields it may be difficult for the thresher to reach all their possible customers.
- The machine also always requires a use of a tractor increasing the upfront cost.
- For small scale farmers, a thresher like this is a very expensive investment especially if it is going to be used only once a year.

INDIAN MARKET FOR TRACTOR MOUNTED PADDY THRESHER MACHINE						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	M/SHI-Tech Tractors [Ranchi, Jharkhand]	Mr.RabindraKumar [+91-07942552960]	Super Delux [Paddy Thresher - 6 Fans]	500 to 600 kg/hr	Rs-2.60 Lakhs +GST	35 HP
2	Korai Classic Industries [Coimbatore]	Mr. B Kumar [+91-08046045527]	KCI	2000-3000 kg/hr	Rs-2.40 Lakhs	35 HP
3	Argo Industries [Jaipur]	Mr. Ratan -9771750238 jaipuragroindustries67@gmail.com	Jai Ambalal [6Feet Drum 4 Fans	1000-1200 kg/hr	Rs 2,20,000/-	35 HP
4	Ving lobe Greentech (I) Private Limited [Ahmedabad, Gujarat]	Mr. Vivek Bansal +91 79840 30141 vinglobgreentech@gmail.com	8433	1500-2000 kg/hr	Rs 2,80,000/-	35 HP
5	V Raj Agro [Bilaspur]	Mr. Mustafa 88718 22944 v.rajagencies@gmail.com	V Raj T-1	1Acre/hour	Rs 1,80,000/-	25HP

16.1.4.3. Engine Mounted Paddy Thresher

An engine mounted thresher is a small-scale thresher whose mobility is very limited. The rate of threshing when compared to the tractor powered thresher is also lesser as the power input is lower when compared to a tractor.

16.1.4.3.1. Business Model

An engine powered thresher is more suitable for individual ownership by small and medium farmers who do not have access to a combine harvester.

This can also be used by FPOs and FPCs s rental services where farmers can come and borrow the machinery , use at home and return it when they are done.

The machine also makes more sense for farmers who cultivate paddy for two seasons as the machine can be used twice a year.

16.1.4.3.2. Gaps & Challenges

For a machine that would be used only once a year / twice a year for only a few days it is a difficult machine to justify purchasing especially when it is aimed at small scale farmers.

INDIAN MARKET FOR ENGINE OPERATED PADDY THRESHER MACHINE						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	Venus Industries [Chennai]	Mr. S Ravi Sankaran [+91-08047677712] [+91-9003498368-rekha mam] venusin7@gmail.com	VIS-5TW-40	0.5 to 1 ton/hr	Rs 32,000/- +GST	3-7.5 HP
2	India Mahabachat Services [Assam]	Mr. Ravindra Navghare [89995 86797] indiamahabachatservice@gmail.com	Motor mounted	600 kg/hr	1.65 Lakh +GST	5-7.5 HP
3	Xenon Farm Tech Private Limited [Jorhat, Assam]	Mr. Lutfur Rahman [+91-07942611724] [+91-6003409765]	Motor mounted	400 kg/hr	1.60 Lakh +GST	6 HP[Diesel]
4	Agricultural Solutions [Nadia, West Bengal]	Mr.Deepak Saxena [+91-08047693803] [+91-9007190495] info@agriculturesolution.in	Motor OperatedASPT-045	300 kg/hr	Rs - 19,000/- +GST	2.5 HP
5	Jashoda Agrp Works [Gujarat]	Mr. Achyut Patel +91-9427643303 mitaagrosales@gmail.com	JT-19	3000 bundles/hr	Rs 3,10,000/-	14HP

16.1.4.4. Manual Operated Paddy Thresher & Electric Upgraded Threshers

A manually operated paddy thresher is a simple machine used to thresh paddy. Workers press bundles of paddy stalks against the rotating cylindrical cage. The rotating cage knocks off the paddy seeds from the paddy bundles. The rotating cage is powered via a pedal with human power similar to that of a bicycle.

A manually operated paddy thresher is a simple machine used to thresh paddy. Workers press bundles of paddy stalks against the rotating cylindrical cage. The rotating cage knocks off the paddy seeds from the paddy bundles. The rotating cage is powered via a pedal with human power similar to that of a bicycle.

This is very suitable for small and marginal farmers as the capital expense is very low and it does not have a high skill requirement. The machine can also be modified to run on electricity by replacing the pedal with an electric motor. For farmers who carry the paddy bundles home after harvesting this machine in its both pedal and electric avatar is suitable as it allows the farmers to thresh on their terms.

16.1.4.4.1. Business Model

Due to the low cost of machinery, it is a very useful machine for small and marginal farmers. Due to its simplicity it does not require much maintenance. Due to the small size and low weight it can be easily shared among farmers. It has also been observed that these machines are being rented out to farmers who do not have them. The rates observed for 100 inr per day for the manually operated machines and 200 inr per day for the electrically powered ones.

16.1.4.4.2. Gaps & Challenges

While the machine is simple in design it does require 2-3 full time workers to operate the machine as long as there is paddy to be threshed.

Small scale threshers like the pedal operated ones and electrically assisted traditional threshers have found acceptance in the farming communities due to their low cost. However their efficiency and drudgery caused to workers leaves much to be desired.

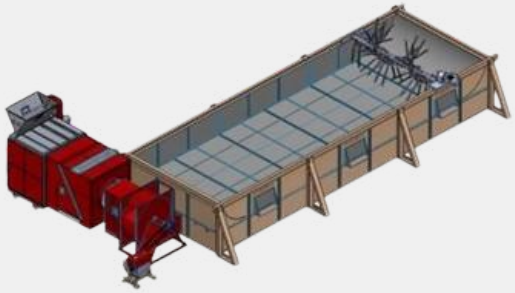
INDIAN MARKET FOR MANUAL OPERATED PADDY THRESHER MACHINE						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	Xenon Farm Tech Private Limited [Jorhat, Assam]	Mr. Lutfur Rahman [+91-07942611724]	Manual	60-100 kg/hr	Rs - 12,000/- +GST	No Power
2	Agricultural Solutions [Nadia, West Bengal]	Mr.Deepak Saxena [+91-08047693803] info@agriculturesolution.in	Pedal Operated ASPT-045	60-100 kg/hr	Rs - 6,500/- 12 %GST	No Power
3	Thomas International [Chennai]	Mr. Rajeev Pinherio [+91-07942794766] [9840104708] artp_international@nans.co.in	Pedal Operated With Motor	200 kg/hr	Rs - 18,001/- +GST	2HP
4	KSS Enterprises [Raichur, Karnataka]	Mr. KSS Chowdary [+91-08048965749] [+91-9482990305] kssagro@gmail.com	Benson	7.5 ton/day	Rs - 13,000/- +GST	1.5 and 2 HP

16.1.5. Paddy Dryers

The harvested and threshed paddy needs to be dried below 17% for long term storage and sales. There are multiple ways of drying. The least expensive way to do so is by sun drying. The paddy is laid out in the sun in a thin layer for 2-3 days. However, this method is very much dependent on the vagaries of the weather. Unexpected rain can spoil the entire crop and cloudy days can delay drying.

To eliminate dependency on the sun many mechanical drying technologies have been developed. The drying of paddy can be hastened by forcibly passing air through the grains which results in moisture from the grains evaporating. This process can also be made faster if the air is heated to 55 °C. It is also important to have uniform drying. If drying is not uniform then the rate of grain breaking during milling will increase. There are many sources of fuel to provide the heat like paddy husk, electricity, biomass etc. depending on the source of fuel used , the design of the heating mechanism changes.

16.1.5.1. Flat Bed Dryers



The flat bed dryers consist of a large bed like structure made of steel. The horizontal bed is made of a large sieve / mesh. The holes are large enough so allow air to pass through but prevent paddy from falling through. Two workers are required to evenly spread and turn the paddy during drying. There is a fan set up at one end of the dryer which sucks up the air and pushes it through the mesh bed which then interacts with the paddy. It is possible to increase the speed of drying through application of heat to the input air which in terms heats up the grain making it lose moisture faster. The exact design of the heating setup depends on the customer requirements and local fuel availability.

The flat bed dryers can also be designed to be portable by mounting it on flatbed trucks and tractor trailers.

16.1.5.2. Port Dryers / Rotary Dryers

A port dryer consists of a tower onto which the grains are loaded. The dryer has ports for hot air entry and exit. These ports are present on 2 opposite sides of the tower. One end of the port is connected to a long duct. The other end of the duct is connected to a centrifugal blower. The motor attached to the centrifugal blower pulls air from the outside and into the tower via the duct. There is a heat exchanger present in the duct. Steam from the boiler is fed into the heat exchanger. The air from the centrifugal blower absorbs the heat before going into the tower.

The air can also be directly heated using a fuel source such as biomass or gas. And pumped against the flow of grain. There are also mobile tractor driven systems that are capable of drying paddy.

INDIAN MARKET FOR PADDY DRYERS						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	N.N.Engineering Products [Coimbatore]	99439 91031;9943991036 nnepindiasales@gmail.com	Dual Batch Paddy Dryer	2 tons/day	Rs6,80,000/- +GST	1-5 HP
2	MSK Engineering Equipments [Coimbatore]	Mr. Mohanraj Senthil Kumar[CEO] [+91-86829 94999]	Bed Dryer	2 tons/day [8hours]	Rs.9,85,000/-+ GST	9HP
3	MSK Engineering Equipments [Coimbatore]	Mr. Mohanraj Senthil Kumar[CEO] -8682994908	Bed Cooler	2 tons/day [8hours]	Rs.3,25,000/+GST	9HP
4	Kardi Dryers [Chennai] [Mobile Dryers]	Mr. Dilipan Sales Manager +91-9094013375;+91-9791664050	Mobile DualMode Bed Dryer	2 tons/day [8Hours]	Rs. 7,50,000 + GST	20-25 HP
5	Steamtech Engineers [Rajkot, Gujarat]	+91 85111 46144	Paddy dryer LPG gas fired Hot air generator	200kg/hr	Rs 3,00,000/-	7.5 HP
6	Avneet Hi Tech [Ferzepur,Punjab]	+91 99142 09008	Dryer Plant	24 ton/day	Rs 24 Lakhs	200 HP
7	Mysore Drier Tech	+91 98868 93467 mysoredrier@yahoo.co.in	Dryer Plant	24 ton/day	Rs 45Lakhs	200HP
8	Sagar Industries [Haryana]	Mr.SAGAR RANA +91 81999 91012 SAGARINDUSTRIES517@gmail.com	Mild Steel Dryer	24 Ton/ Day [Raw Paddy	Rs 19,50,000/- [GST]	7.5 HP;2 HP and 12.5 HP
	Sagar Industries [Haryana]	Mr.SAGAR RANA +91 81999 91012 SAGARINDUSTRIES517@gmail.com	Stainless Steel Dryer	24 Ton/ Day [Raw Paddy	Rs 25,50,000/- [GST]	7.5 HP;2 HP and 12.5 HP

16.1.6. Puffed Rice and Poha Making Process

Poha: is a value-added product made from paddy. Poha is a traditional meal made from paddy that has been soaked, roasted and beaten into flakes. It is a popular dish all across India. However its consumption is much more pronounced in northern and eastern India.

The production of poha is dependent on many processes. The paddy is cleaned using the pre-cleaner to remove sticks, stones and other debris. It is then soaked in water. The local tastes, flavours determine duration of soaking and temperature of the water as well. Generally once the soaking of paddy is done the moisture content in the paddy measures about 24-28%.Once the paddy is soaked it is roasted in a rotary oven along with fine sand in batches. The fine sand helps in heat conduction and uniform cooking of paddy. Due to the heat and excess water content in the paddy it starts popping to form puffed rice. For production of puffed rice, the popping process is allowed to continue until all the paddy has been popped.

For production of poha, the paddy is removed from the roaster once it starts popping. The paddy is then sifted to remove the sand. The paddy is then put into a poha chura machine. This machine consists of two counter rotating rollers forming an internal roller setup. The distance between the rollers can be adjusted accurately. The base of the poha making machine is made of a perforated sheet which allows for broken husks to fall through it. The machine is powered by an electric motor.

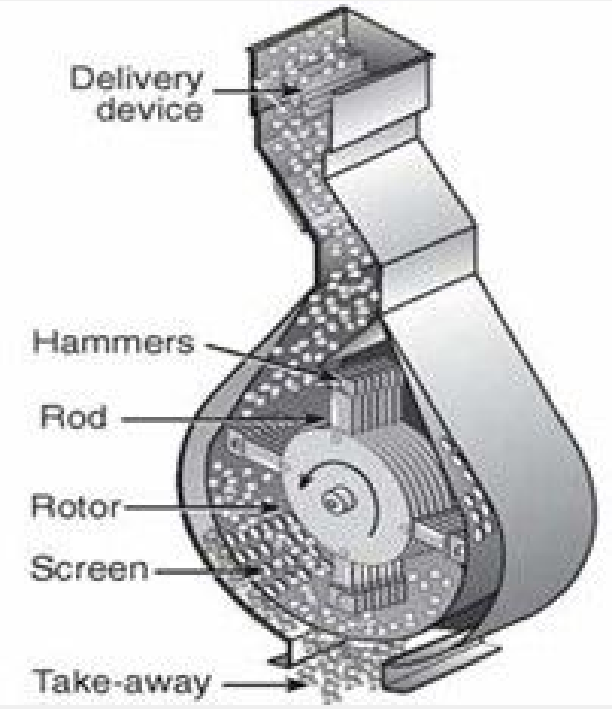
The roasted paddy from the roaster is loaded into the chura / poha making machine. The paddy passes through the rollers and gets flattened. The husk is dislodged and crushed into powder which then falls through the perforated sheet. Due to the high water content the endosperm gets flattened rather than being powdered. However the moisture content in the paddy during the soaking process needs to be monitored. Too little moisture and the paddy will be powdered. Too much and the endosperm will turn to paste. This process takes a few minutes. It is a visually contrasting process as the brown paddy slowly turns into white flattened flakes. Once all the paddy turns into flakes it is removed by hand. Once the poha comes out of the chiura machine it is very soft and flaky.

To improve the shine and look of the poha, the poha is loaded onto the flaker machine. The flaker machine polishes the flakes. The poha that comes out of the flaker machine is smooth, shiny and varying in size. To ensure uniformity in size it is then loaded into a grader which sorts the poha into different sizes. Larger the size of flakes, higher the price it commands in the market. The graded poha is then packed and sent to the market.

The automation in the production system can be increased through the use of elevators and conveyor belts to improve movement between machinery. Packing can also be automated to increase production speed.

INDIAN MARKET FOR POHA & PUFFED RICE MACHINES						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	MaaTaara Engineering Work [West Bengal]	Mr. Golok Banerjee [+91 73191 40991]	RicePuffing Machine	220 kg/hr	Rs.45,000	1 HP
2	ABC Agro Food Machines India Private Limited [Coimbatore,Tamil Nadu]	Mr Vishnu Vardhan -9750902441 salesabcmachines@gmail.com	PohaSnacks Food Extruder	75 to 200 kg/hr	Rs.1,25,000/-	5HP[Varies as Capacity Changes]
3	Sagar Enterprises Agriculture equipment shop [Belgaum Karnataka]	Mr. Sagar [CEO] [+91-8956734898]	Poha Making Complete Setup [Cleaning,Grading,Roasting,Pressing Machine]	200 to 250 kg/hr	Rs.5,50,000/-	Varies as capacity changers
4	PVG Proveg Engineering Food Processing P Ltd [PUNE]	Mr Akshay Sharma +91 83025 26422	Complete Setup	250-500 kg/hr	Rs 14,55,000/-	Varies

16.1.7. Rice Flour



Rice flour is an important component to cuisines across India. With that in mind most of the people prefer to have the means to produce flour at home. For single use production of rice flour is done using mixes. For production of larger quantities, a dedicated pulveriser is required.

For production of rice flour the most common way of doing so is the use of a hammer mill. A hammer mill uses the impact force of the rotating hammer to crush the grain into powder. The grain is fed into the feed hopper. By the means of the pneumatic value the flow of grain into the crushing chamber is controlled. The crushing chamber is simple in construction. It is a cylindrical hollow chamber to which a rotating shaft is attached at its centre. To the rotating shaft there is an impeller attached. The shaft is powered by the electric that is situated behind the crushing chamber. Depending on the nature of the object to be powdered there are different types of impellers.

As the hammer spins the grain is crushed due to the impacts between the hammer and grain. The sieve is placed in the bottom of the mill. Only particles that can pass through the sieve will come out of the mill. Until then it will be crushed by the hammer. For obtaining flour with different particle sizes then the sieve/ mesh needs to be changed.

The mill is controlled by the control panel. The control panel controls the rpm of the motor as well as feed rate.

16.1.7.1. Business Model

Rice flour based dishes are commonly made at home using traditional equipment known as a dheki.it is a laborious task to produce flour using this machine. There is a lot of potential for flour production as a service business models in the north. Also the hammer mills can also be used to produce flour for other grains as well.

16.1.7.2. Case Study

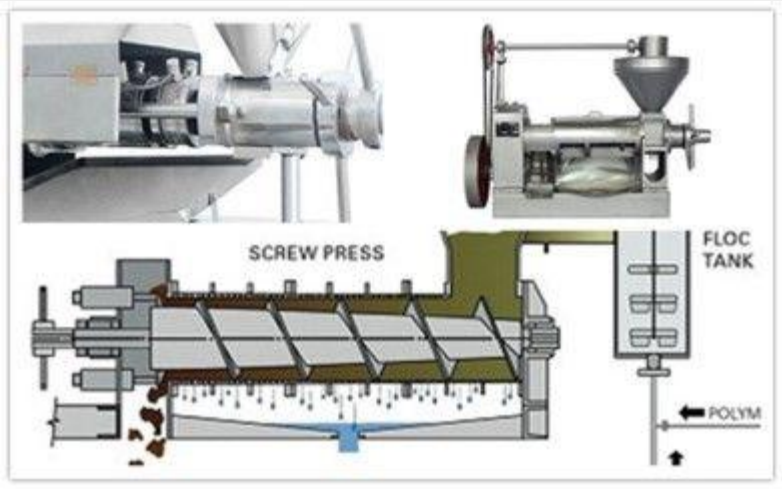
Integrated rice huller- hammer mills have been installed in multiple sites in Assam with support from Selco Foundation and their network of partners. Based on the discussion with the entrepreneurs who received the processing units it is clear that the hammer mill brings in the most of the revenue despite smaller volumes. This to a large extent validates the profitability of a flour production as a service for local customers.

16.1.7.3. Gaps & Challenges

One of the major challenges for hammer is the need for a large amount of electricity required. The design of crushing chamber and hammers is based on the properties of the material to be crushed. However this optimization is not done for small hammer mills sold by local vendors. This results in poor quality ,heat damaged flour if the mill is overloaded which inevitably happens.

INDIAN MARKET						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	Andover Lathe Works [Coimbatore, TN]	Ms Sowndarya -7373785710 andavarlatheworks@gmail.com	MILLER X	12-15 kg/hr	Rs. 19,500+GST	2HP
2	NorthEast Machineries [Sonapur, Assam]	Mr.Rupan Deka [+91-8761096166]	6N100	240 kg/hr	Rs-38,000 [Auto Pulley]	3HP
3	Vinspire Agrotech Private Limited [Ahemedabad,Gujarat]	Mr. Er Manan Patel [+91 76007 73096] Vinspireagrotech@gmail.com	Rice flour machine	150 kg/hr	Rs-85,000/-	10 HP
5	Heavy Tech , Kisan Machinery [Raipur]	Ms. Nikita +91 91096 09807	RiceFlour	240 kg/hr	Rs-42,000/-	3HP

16.1.8. Rice Bran Oil Extraction Unit



The rice bran produced from the milling process is rich in oil content. Edible oil can be extracted from rice bran. An oil expeller uses heat and/or pressure to squeeze the oil out of the bran. The resulting products are oil cakes and rice bran oil.

Industrial edible oil production is done using heat and pressure to maximise oil extraction. Small scale oil extraction units use only pressure to extract oil. This results in lower yield but minimises damage caused to the oil due to heat.

A screw type extruder is the most common oil extractor for small scale rice bran oil production. The extruder consists of an outer shell and an inner rotating screw. The profile of the screw varies with its length. The initial diameter of the screw nearest to the inlet is high. The diameter then gradually reduces to midway of the screw and then suddenly increases such that there is a small gap between the screw and the outer shell. This screw shape allows for the screw to push the bran inside by constantly applying pressure.

As the bran passes through the screw it gets squeezed to such an extent that oil is expelled from it. The bulked up portion of the screw squeezes the bran even further, extracting more oil.

The outer shell of the extruder is perforated allowing for oil to drop through. The holes are not big enough for the bran to pass through; there is some bran in the oil. The oil is further filtered to remove bran and foreign material.

16.1.8.1. Business Model

The small scale rice bran oil extruder can be a great addition to any small scale rice milling unit. The main investment would be the setting up of the machinery , creation of a sales channel for oil and purchase of raw materials. All the farmers interviewed were asked about their opinions and awareness on rice bran oil. Some farmers in Assam have heard about it through training programs conducted by external agencies. Most farmers in Jharkhand were not aware of it. Farmers in Assam were questioned about whether they would be interested in cooking food with rice bran oil. They were willing to try especially if costs were competitive to mustard oil.

In Jharkhand farmers that were interviewed were not aware of the fact that edible oil can be extracted from rice bran. However they were also quick to point out if small scale machinery was available rice bran oil would be easy to source. Even local field workers from NGOs in the region had a positive outlook in this regard.

16.1.8.2. Gaps & Challenges

While rice bran oil is extensively marketed in south India, the same does not seem to be the case in the north. During our search for small scale rice bran oil extraction units, we did find it very difficult to identify vendors for the same especially for the Jharkhand and northeast. While raw materials will not be a problem, purchase installation and servicing might be a problem if not handled properly.

INDIAN MARKET FOR RICE BRAN OIL EXTRACTION UNIT						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST[INR]	HORSE POWER
1	Lakshmi Machineries [Nagasandra,Bengalur]	Mr. Sandeep -7022784289 sales.lakshmimachineries@gmail.com	Oil Rotary Chuck	55-67% average output	Rs 2,20,000/-	5 to 7.5 HP
2	Prosper Choice Import Export [Gautam Buddha Nagar, UP]	Manisha +91 78348 08706 prospergroupofficial@gmail.com	PPR-3MT RICE BRAN OIL PRODUCTION LINE	3000kgs input; 15-18% yield; 500L as outpt	Rs 4,44,000/-	7.5KW
	Prosper Choice Import Export [Gautam Buddha Nagar, UP]	Manisha +91 78348 08706 prospergroupofficial@gmail.com	PPR- OIL FILTER [2QTY]	3000kgs input; 15-18% yield; 500L as output	Rs 4,30,000/-	7.5KW
3	Technocrat Process Engineers [Pune, Maharashtra]	Mr. Prakash Dhake +91 88302 81197 technocrat3@gmail.com	Solvent and Extraction type	200 Ton/Day	Rs 491 Lakhs	Varies

17. On Farms Technology for Paddy Cultivation

Much of the paddy production in India is done in small farms and in fragmented lands. The small size of the plots under cultivation increases the difficulty of using machinery for farming. However, there are a few technologies that are more suitable for small scale farming. This combined with increasing difficulty in availing labour at the right time and place make mechanisation of paddy cultivation more viable.

17.1. Transplanters

For mechanisation of transplanting the following technologies were considered:

- Walk-behind transplanter
- Manual, jury-Rigged and Battery transplanters

17.1.1. Walk-Behind Transplanter

The transplanter of a prime mover, transmission engine, float, lugged wheels, seedling tray shifter, pickup fork, pickup fork cleaner. It uses a mat based nursery to uniformly transplant the paddy with minimal damage to the plant. Once the machine is lowered onto the field, it is changed to transplanting mode. The seedlings are first kept on the seedling tray. The tray shifts the seedlings towards the pick-up fork using gravity and vibration. The pick-up fork is about 2.5 - 3.5 inches long and slightly curved with the spacing between the two tines being slightly more than the thickness of a 30-day paddy seedling. The pickup fork follows a cyclical motion. In the first half of the cycle, the fork moves upward, where 1-3 seedlings are caught between the tines. As the fork moves down to the soil, the seedlings become upright. The fork then inserts the seedlings into the soil. This completes the first half of the cycle. In the second half the pickup fork comes out of the soil and moves up ready to transplant the next set of seedlings. The speed of the transplanting mechanism is controlled by the speed of the transplanter. The gear ratios, the length of the components and points of connection determine the spacing between the plants.

Most transplanters are powered by either a petrol or diesel engine with its capacity determined by the number of rows it can transplant simultaneously. Walk behind transplanters are usually capable of planting 2-6 rows simultaneously with the number of rows usually arranged in even numbers. The most common transplanters are the 2 and 4 row transplanters.

INDIAN MARKET FOR WALK-BEHIND TRANSPLANTER					
SL NO	ORGANISATION NAME	MODEL NAME	CAPACITY ACRES/HR	COST IN INR[EXW]	HORSE POWER
1	Mahindra	MP 461 rice transplanter	0.4	Rs - 2,20,000/-	5 HP
2	Yammer	AP4 rice transplanter	0.45	Rs - 4,20,000/-	3.5 HP
3	Kubota	NSP 4 W rice transplanter	0.4	Rs - 3,50,000/-	3.5 HP

17.1.1.1. Business Model

The walk behind the transplanter and ride on the transplanter will do very well as a transplanting as a service business model. The presence of a transplanter also helps in making up the shortfall of labour during farming. Many villages in Tamil Nadu have adopted transplanters either through renting them or outright purchasing them. The same can be promoted in Assam and Jharkhand by propagating them through FPOs and FPCs.

17.1.1.2. Gaps & Challenges

For walk behind transplanters one of the important points of consideration is the ease of accessibility for the transplanters to reach the field. Road access to the field is important for efficient use of the transplanter. If the time taken to reach the field is comparable to the time taken for the machine to finish transplanting, it almost negates the benefits of using the transplanter through higher operational costs.

17.1.2. Manual, Jury-Rigger & Battery Transplanter

- Manual transplanter
- Jury-rigged engine mounted transplanter
- Battery operated transplanter (R&D stage)

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17.1.2.1. Manual Transplanter

Though the manual transplanters work on the same principle as that of the walk-behind transplanters, they are manually powered and not dependent on fuels like petrol or diesel. Due to its dependence on manual power, these transplanters are limited to planting only 2 rows of paddy at a time. Basic two row transplanters are powered by one hand turning the crankshaft which powers the transplanting mechanism while the other hand pulls the machine along the main field.

It is to be noted that unlike the walk-behind transplanters which are pushed by the operator, the manual ones are pulled across the field with the operator walking backwards. The cost of the transplanters is about 35000 INR and is manufactured by a lot of generic manufacturers in the country.

17.1.2.2. Jury-Rigged Transplanter

Some enterprising individuals and farmers tinker with manual transplanters and improve them to make transplanting easier. The comparatively low cost of the manual transplanter makes it an ideal candidate for tinkering and retrofitting. Since the manual transplanter needs two separate tasks (i.e., turning the crankshaft and pulling the machine) to be performed simultaneously, mistakes and missteps are bound to happen. By trying to power the planting mechanism with an engine and automating either the movement of the transplanter across the field or the turning of the crankshaft, the transplanter becomes easier to use. However, the planting speed and the movement speed must be coordinated to ensure the spacing.

17.1.2.3. Battery Powered Transplanters

With increasing calls for utilisation of green energy and reduction of consumption of fossil fuels, the idea of electrically powered transplanters has become an attractive idea for many entities. With lowering costs of implementing renewable energy technologies into machinery, some have taken the initiative to develop such technologies themselves. While the idea is feasible and functional prototypes have been developed, many challenges such as battery capacity, charging facilities and commercialisation of production remain to be overcome. The difficulty in increasing battery capacity is that it would lead to heavier machines thereby making operations and manoeuvring of the transplanter difficult. Small capacity would become operationally unviable as machines would have to be stopped multiple times to be charged. Using additional standby batteries would be expensive and thereby reducing the cost effectiveness of the machines significantly. However, a ray of hope remains as research is being done by many leading firms (such as Mahindra, Kubota etc.) to implement these technologies into farm machinery. Start-ups too have seen the development of small-scale electric paddy processing machinery as a challenge and have taken it up as well.

17.2. Weeding

Weeding is the process of removing unwanted plants in the field so as to avoid competition for paddy plants. Weed removal is an important activity in paddy cultivation.

17.2.1. Manual Weeder Using Machinery

A manual weeder or more popularly known as a cono-weeder is a simple device that is used to de-weed a field using manual power. A cono weeder consists of a frame with a wheel with cutting edges on the rotating surface. This wheel is pushed along by the worker. As the weeder is pushed along, the sharp edges on the wheels dig up the weeds and cut them into segments before mulching it back into the soil. This kills the weeds as well as providing organic matter to the soil. The width of the wheels is about 25 cm.

The weeder can help save a lot of drudgery and labour as it eliminates the need for repetitive bending over to pluck weeds. Only one labourer is needed to handle each machine and its cheap cost can enable farmers to buy multiple of these machines thereby decreasing the time spent on weeding activities.

17.2.1.1. Business Model

The manual weeder is an excellent example of machinery that can be owned by small and marginal farmers. The use of the manual weeder allows them to significantly reduce the amount of effort spent in deweeding. The cost of manual weeders is very low and the return on investment can be recouped within a few paddy cultivation seasons.

17.2.1.2. Gaps & Challenges

For the manual weeder to be useful in the field, transplanting of paddy needs to be done in an orderly manner. Uniform spacing between the rows and columns paddy needs to be maintained. To transplant paddy in an orderly fashion, additional labour, guidance and effort is required. Based on the interviews with farmers and farm labourers ,workers do not want to put in additional effort or listen to additional instructions. They are more intent on finishing the work as soon as possible by doing the bare minimum. Weeding is also a group activity and usually workers within the group tend to organise among themselves and resist external interference.

17.2.2. Power Weeders

Power weeders are also available in the markets that are especially suited for paddy cultivation. They are essentially a cono weeder whose cutting blades and by extension the locomotive mechanism has been powered by a small capacity engine. These powered weeders excel in weeding flooded fields due to the presence of a float attached to the machine.

17.2.2.1. Business Model

In the sites visited, weeding was largely done by hand. Power weeders are present but are not well known. However the use of power weeders by rentals via CHCs and FPOs and individual entrepreneurs presents an opportunity. The productivity of a power weeder is much higher than that of manual weeding. The costs of deweeding using a power weeder would prove to be less than that of weeding manually. Due to the comparatively low capex , the return on investment is also much faster.

17.2.2.2. Gaps & Challenges

The effectiveness of the power weeder is largely dependent on how well it can perform in the field. One of the biggest determinants of the same is the degree of orderly spacing and arrangement of transplanted paddy. For the power weeder to work effectively, there needs to be adequate spacing between the plants. However when paddy is manually transplanted the uniformity in spacing and orderly arrangement is not maintained. When this is not done the use of machinery for subsequent operations becomes more difficult. This is especially true for weeding.

INDIAN MARKET FOR POWER WEEDERS				
S NO	ORGANIZATION NAME	MAKE AND MODEL	HORSE POWER	COST IN INR [EXW]
1	Delta Weeders	HD2R	2 HP	Rs-80,000/-
2	Sharp garuda farm equipments private limited	Paddy weeder	1.75 HP	Rs-42,000/-
3	Vijay Villers	Single row wetland paddy weeder	2 HP	Rs-21,000/-
Power weeders have not made their mark in the fields due to their prerequisites for operating, namely even and an adequate spacing between the paddy plants.				

17.2.3. Battery Weeder: (R&D Stage)

Battery operated electric weeders are being researched and tested upon. Multiple government agencies and private entities who have recognised the need for these machines have begun prototyping them as well. However much of this is still in its developmental stage and is yet to be commercially available in the market.

17.3. Power Tiller

A Power tiller is a scaled down version of a tractor. It retains many characteristics of a tractor such as high torque and low horsepower. Due to their narrow profile they are ideal for small plots of land and navigating stretches that are difficult or impassable for tractors. Power tillers are much more common in Assam due to their low cost and ease of use. They can also be purchased with multiple attachments that makes them versatile equipment.

If proper spacing between the paddy is applied during transplanting, then power tillers can be used to till the soil to uproot weeds and other foreign matter. However, the field needs to be dry and firm to carry that out.

In Assam power tillers are used for tilling of the land, weed removal, threshing and winnowing. A power tiller is a social status in Assam due to its sheer versatility and use.

17.3.1. Business Model

A power tiller is more suitable to be an individually owned and operated machinery. However rental services using power tillers have proven to be capable of generating revenue as a secondary income. This has been seen in Assam where power tillers were more frequently used.

17.3.2. Gaps & Challenges

Like most agricultural machines, power tillers available in the market use petrol or diesel to run. This can be a challenge. ease of availability of parts and timely service would be difficult in difficult terrain present in Jharkhand and Assam.

INDIAN POWER TILTERS				
S NO	ORGANISATION NAME	MAKE AND MODEL	HORSE POWER	COST IN INR (EXW)
1	Kubota	PEM 140 Ti	13 HP	Rs-1,68,75,339.25/-
2	Generic local models	Generic local models	18 HP	Rs-61,94,534.85/-
3	VST	Sakthi 135 Di	13 HP	Rs-1,63,67,337.64/-
Power tillers are an integral part of Assamese agriculture. This is due to their high versatility and low capital investment. They are available at all price ranges and are easily accessible to even small holder farmers.				

17.4. Tractor with Rotavator & Cultivator

Tractors used by small scale farmers and rental services usually fall in the 15-25 hp category with suitable attachment for land preparation. A tractor can fully plough one acre of land in about 45 – 90 minutes depending on the conditions. A well-trained driver in a suitable terrain with minimal incline can plough the land in about 45-55 minutes. A rotavator is a tool used to smoothen the soil making it conducive for planting. In Assam and Jharkhand wide use of rotavator was not observed. Rotavators were present in the FPOs visited.

LOCALLY AVAILABLE TRACTORS				
S NO.	ORGANISATION NAME	MAKE AND MODEL	HORSEPOWER	COST IN INR [EXW]
1	Kubota	L 3408	35 HP	Rs-6,63,000/-
2	John Deere	5105	40 HP	Rs-6,06,000
3	Mahindra	275 DI TU Sp plus	39 HP	Rs-6,06,000/-

17.5. Harvesters for Paddy

Once the paddy is ready to be harvested, combine harvesters are used to harvest the paddy. As the name suggests, combine harvesters can cut, threshing, and separating the paddy from the paddy stems all in one go. The harvested paddy is stored in the machine until it is full and then discharged in a suitable location near the field. While harvesting large fields, there is a tractor with a trailer driving alongside the harvester. As the grain is being harvested, it gets unloaded into the trailer. The tractor then takes the paddy to be dried. Combine harvesters are the most used harvesting machinery in India Both track driven and wheel driven harvesters are present. The harvesters are almost always operated as a harvesting-as-a-service model.

INDIAN COMBINE HARVESTERS				
SI NO	ORGANISATION NAME	MODEL AND MAKE	HORSEPOWER	COST IN INR (EXW)
1	Kubota	DC 68G HK	68	Rs-27,51,468.09/-
2	John Deere	W 50	75	Rs-18,70,799.28/-
3	Mahindra swaraj	8100 ex	101	Rs-20,98,346.85/-

While combine harvesters can harvest the paddy very quickly, there is one major constraint to the functionality of combine harvesters which is their size. Combine harvesters are very large and for them to reach the field needs to be accessible. The fragmented landholdings make this more difficult

17.5.1. Business Model

Large scale combine harvesters are very expensive pieces of equipment. It is impossible for farmers to buy for personal use. This kind of machinery is something whose upfront costs need to be provided by the government. The machinery would then be used for providing harvesting services. To a large extent the government has taken initiatives in this direction by providing subsidies to Farmer groups and like.

17.5.2. Gaps & Challenges

The huge upfront costs make it difficult to purchase this machinery.

These combine harvesters have multiple prerequisites on where it can operate. Undulating rocky terrain where paddy is grown, and lack of roads are the biggest determining factors on where harvester can and cannot operate.

17.6. Other Harvesting Implements

A combine harvester like the name suggests combines activities to do its job. The activities can be listed as follows. Cutting of paddy stalks, threshing, and winnowing and lastly discharge of paddy stalks in the field. The combine harvester is a very big piece of machinery. Its size makes it difficult to use universally especially keeping in mind the fragmented nature of farming in India. To mechanise agriculture and minimise labour requirements. The functions of the combine harvesters can be separated and each of the processes can be mechanised. Each of the above mentioned processes can be done by a specialised machine which is simpler, smaller and easily operated when compared to a combine harvester.

17.6.1. Reapers

Reapers are mechanised cutters which are used to cut the stalks and move them to one side of the machine. This consists of a prime mover attached to a chassis with wheels via a transmission. The prime mover also powers the cutting mechanism. The cutting mechanism can cut the stalks and pushing them to one side. The cutting mechanism consists of two sawtooth blades of which one is stationary and the other slides over the stationary blade to create the cutting action. There is a conveyor chain which rotates clockwise behind the cutting blades. Guiding wheels on a conveyor chain push the cut stalks onto the right side of the machine. Which then falls neatly onto the ground. A worker can then collect the stalks and bundle them. The reapers are available in both petrol and diesel configurations.

17.6.1.1. Business Model

Unlike the reaper cum bundler or a combine harvester, a reaper is much more affordable for a farmer since its cost is comparable to that of a power tiller which a higher percentage of farmers have especially in Assam. The reaper is capable of minimising labour requirements for cutting of paddy by a large extent; what required 12+ labours hours to cut one acre of paddy can be done by one person operating the machine and an additional one or two workers for support. These workers would only be required to cut paddy in the hard to reach places for the reaper.

17.6.1.2. Gaps & Challenges

- The reaper has its own constraints on what terrain it can operate in. The shape of the field on which the crop is grown is also important. The ideal field for a reaper would be square or a rectangular shaped field whose length of the field is a multiple of the cutting width of the field with paved road access. It is based on the observations, the terrain and the fields follow the contours in the topography in Jharkhand. The Assam fields observed were largely flat and uniform in shape; however the land was fragmented, most of the plots did not have road access.
- All the reapers on sale are petrol or diesel powered. The lack of consistent, reliable electricity also makes it almost impossible to promote electric alternatives at a competitive cost.

INDIAN MARKET FOR REAPERS					
SL NO	ORGANISATION NAME	MODEL NAME	CAPACITY ACRE/HR	COST [INR]	HORSEPOWER
1	Kisan kraft	KK-SPR 1202D	0.33 acres / hour	170000 (mrp)	Est 5 HP
2	Vinspire power	Self propeller reaper	1 acre / hour	135000	7HP
3	Vardhaman power reaper	Vardhaman 2FD	1 acre / hour	120000	5 HP
4	Krishitek industries private limited	Krishitek paddy reaper	1 acre / hour	135000	5 HP
5	Kamco	Kamco power reaper 120 B	0.5 acre / hour	142000	5.25 HP
Remarks: 1) Kisankraft and Kamco sells multiple models of reapers at multiple price points and for multiple crops.					

17.6.2. Reaper cum Bundler

The next level to the reapers are the reaper cum bundler. The machine does all the functions of the reapers. At the end of the cutting cycle, the machine bundles the stalks using specially made strings. Depending on the scale of operations there are both walk behind and ride on variants as well. The reaper binder can also be bought as an independently operated machine as well as a tractor attachment.

17.6.2.1. Business Model

The cost of the reaper cum bundler is comparable to that of a small tractor and it is very specialised in function. Despite this, these reaper cum bundlers would be a great addition to FPOs and SHGs provided the terrain in the location is favourable. The inclusion of a reaper cum bundler would have to be determined on a case by case basis keeping in mind the terrain and road network.

17.6.2.2. Gaps & Challenges

Since the reaper cum bundler is a specialised piece of equipment, its top speed is very much limited. This makes it economically viable to move the reaper on its own from the CHC to the field. It requires its own transport. These increases operations cost of the machinery

The string used to tie the bundles together in the machinery usually tends to be the proprietary kind of string which can only be purchased from the manufacturer. Ease of availability and cost must be checked prior to purchase. While there are workarounds to this the efficiency of the same cannot match the original.

INDIAN MARKET FOR REAPER CUM BUNDLER					
S.NO	ORGANISATION NAME	MODEL NAME	CAPACITY	COST [INR]	HORSEPOWER
1	Osaka International Inc	4 K 90	0.6 acre / hour	Rs-3,80,000/-	10HP
2	Green land	Reaper-binder	0.8 acres/ hour	Rs-5,05,000/-	10 HP

17.7. Water Pump

Water pumps were mostly seen in Assam. These water pumps are used to irrigate the nursery after sowing of seeds. They are also used if the rains are delayed beyond expectations. All the pumps that are being used are of the portable type. They are taken to the field when required and brought back when the use is complete.

In both Jharkhand and Assam portable water pumps are being heavily promoted with subsidies and proactive action from the government. In both the states officials from the ATMA (agricultural technology management agency) mentioned that subsurface and surface through water infrastructure projects are widely available however the lack of awareness, interest in machinery, know-how and high costs have prevented better use of water for irrigation.

17.7.1. Business Model

Not all the farmers have their own water pumps. The farmers who don't have these pumps rent them from other farmers. The rental for these pumps is charged at and per hour basis. Usually, these charges are about 150 per hour. The renter is responsible for carrying it from the farmer's house and bringing it back once the job is done. The fuel is the responsibility of the pump owner. After considering fuel expenses the net profit the pump owner gets on a per hour basis is about 40-50 INR per hour. There is no intent to generate profit from the rentals.

17.7.2. Gaps & Challenges

The portable pump's biggest advantage is also its disadvantage. It is a heavy piece of equipment that needs to be transported several hundred metres on uneven ground in the field. Most of the pumps observed in the sites weighed about 40-60 Kgs. this weight does not include the large unwieldy pipes. To transport the pump and its accessories to the field it requires 6 men. To ensure even watering to all the fields its position needs to be changed multiple times. For example, one of the farmers mentioned he needs to change the location of the pump 3 times to fully irrigate his 4 acres of land.

Farmers would rather wait and hope the rains arrive before using the water pump in case of delayed rains this delay leads to unnecessary loss in yield due to water stress.

These pumps are also run-on fuel. In both the states, consistent electrification in rural areas is still a work in progress making promotion of electric motor pumps moot. As such the even the local agricultural department agencies are placing more emphasis on the portable diesel / petrol water pumps for sharing to farmers.

INDIAN MARKET FOR WATER PUMP						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	Ving lobe [Gujarat]	Mr Vivek Bhansali +91 79840 30141 vinglobgreentech@gmail.com	3*3 Water Pump	750L/Minute	Rs-8,500/- [GST]	6.5HP
	Ving lobe [Gujarat]	Mr Vivek Bhansali +91 79840 30141 vinglobgreentech@gmail.com	Diesel Water Pump Type 1 WP30	32 L/Minute	Rs-26,000/- [GST]	7HP
	Ving lobe [Gujarat]	Mr Vivek Bhansali +91 79840 30141 vinglobgreentech@gmail.com	Diesel Water Pump Type 2	32 L/Minute	Rs-24,000/- [GST]	5HP
2	Digital Agro Solutions [Bhopal, Madhya Pradesh]	Mr. Rajkumar Ahi +91 99818 17652 dasc.bpl@gmail.com	EAC-WP-120 Petrol 3600rpm	26-28 Litre/minute	Rs-13,000/ [GST]-	5.5HP
3	ACE Power Products [Karnataka]	Mr. Syed Ahamedullah +91 97414 96023 acepowerproducts@gmail.com	Petrol WB30XD	1100l/m Water Discharge	Rs-27,000/- [GST]	5 HP
	ACE Power Products [Karnataka]	Mr. Syed Ahamedullah +91 97414 96023 acepowerproducts@gmail.com	Diesel WV30D	900L/m Water Discharge	Rs-33,500/-[GST]	5 HP
4	Sri Ratnagiri Agro Distributor [Tamandu]	Ms Rani +91 80562 75733 sapthagirifsc@gmail.com	Petrol Water Pump	600l/minute Water Discharge	Rs-12,000/- +12%GST	1.5 HP
5	MAs and Sprayers Private Limited [Indore, Madhya Pradesh]	Ms. Shobha Bhawsar +91 91118 60666	WPK 30 Masand Water Pump 3"/3"	Petrol and Kerosene Pump	Rs-6,600 + 18% GST	6.5HP

17.8. Manual Sprayer

Manual sprayers were widely observed in both Jharkhand and Assam. Farmers have got them as part of schemes from the government as well as bought them as well. Manual sprayers are one of the machineries that costs the lowest due to its simple construction.

17.8.1. Business Model

For the most part there is no need for rental of these machines as almost every farmer has one. If individual farmers can't get them, then money is pooled, and machinery is purchased.

17.8.2. Gaps & Challenges

- Since the pumping mechanism is powered by human strength it can quickly get tiring to constantly pump, it takes about 3 hours to spray one acre of land. The pumping handle is present on the right side of the body. Farmers have complained of wrist, elbow, shoulder, and back pain in their right side of the body due to constant need to pump.
- The capacity of the manual sprayer is also small, requiring constant refills leading to time and effort wasted in transport and carrying the sprayer. One must keep in mind that once the sprayer is filled it could weigh anywhere between 20 - 22

INDIAN MARKET FOR MANUAL SPRAYERS						
S.NO	ORGANISATION NAME	CONTACT DETAILS	MODEL NAME	CAPACITY	COST [INR]	HORSE POWER
1	Padilla Corporation [Nagpur, Maharashtra]	Mr. Jitu Sir +91 73047 83967 padcorp2007@gmail.com	Spark	18 Litre	Rs-8,000/ + 2,000 GST	12 V x 8 Amp
2	Agri conic Machineries Private Limited [Raipur, Chhattisgarh]	+91 74897 22755 info@agriconic.com	KK-16Ltr	16 Litre	Rs-1,950 per piece	Not required
3	Sri Ratnagiri Agro [Chennai, Tamandu]	Ms Rani +91 80562 75733 sapthagirifsc@gmail.com	Manual Sprayer	16 Litres	Rs-1,500/-	Not Required
4	Masand Sprayers Private Limited [Indore, Madhya Pradesh]	Ms. Shobha Bhawar +91 91118 60666	Masand Marshall Shakti ISI	16 Litres	Rs-1,090+ 12% GST	Not required

18. Conclusion - Technology & Vendor Mapping

Mechanisation of paddy cultivation has come a long way. It has tremendously increased yields and improved quality of life by reducing drudgery. However the benefits of mechanisation have unfortunately concentrated at a certain scale and have not trickled down. This is very evident once a glance is taken at the marginal , small and medium scale farming.

The market study and technology availability deep dive and study has only reinforced this point even further. The scope of machinery identified requires a minimum scale of operations that is usually not found in small and marginal scale farms. The nature of machinery used in agriculture makes it very specialised. It usually ends up such that the machine is required to operate at peak load for a few days to week in a year. The rest of the year the machine is idle. A good example of this would be the paddy thresher and dryer. Both these machines are designed to run continuously and they are at their best efficiency when they do so.
In India it is of utmost importance that machinery for small scale farming is cultivated. One has to keep in mind the small and marginal farmers constitute the majority of farmers in the country and they produce most of the nation's food as well. Currently farming is not profitable enough primarily because of the high cost of inputs and labour requirements. Machinery development and sales for small and marginal farmers must happen at a faster pace to reduce labour requirements as well as alleviate the symptoms of labour shortage as well.

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2. About the farmer
SECTION 2.

Farmer Profile	
Farmer name and age	
Location of the farm	
No of members in family	
No of family members involved in farming as 1) primary work/ job/ employment of men in household 2) Primary work/ job / employment of women in the household	
What family members do (amount earned per activity per session)	Weeding Sowing Harvesting Other agricultural activity Other non agricultural activity
Land holding 1) Land owned a) Nature of owned land (joined or separated) 2) Land cultivated in previous season 3) Leased land for cultivation if any 4) Non cultivated land if any and reason for the same ● Used as pasture ● No water availability ● Difficulty in access to water	

○ If yes how? ● Poor soil fertility ? ● poor soil constitution ○ If yes why ? ● Prior history of crops grown in the barren land ● Prior efforts made to rejuvenate the land and result of the same ● Labour issues limiting productivity of land ?	
Associated farm group / type of farming (contract/non contract/ sustenance)	
1 (single crop/ multi crop / related activities) done by farmer , and family involved in farming. 2 intercropping done by farmers if any Agricultural and non agricultural activities	Done by interviewee Done by family of interviewee
Awareness of government programs for farmers / paddy /	
Beneficiary ? if yes benefits and learnings obtained If no. why not ? reason for not applying	
1) Received any training / guidance from external parties like ngos, institute , govt etc 2) Duration of same If multiple trainings done name them Has other family members attended any Usefulness of attended program	
Source of knowledge / guidance for day to day farming activities.	
Part of any government employment schemes Mgregs ,	

SECTION 3: Crop calendar and activities carried out throughout the year.

Name of local seasons and duration of same (starting and ending)

Crops grown in each season

Quantum of land cultivated in each season

Crop grown for sale/self consumption (only in the field backyard/ kitchen cultivations not considered)

Paddy variety cultivated and reason for selection of same and why not others

SECTION 4

Machinery owned.

Machinery owned Local name (quantity owned)	**Make and model**	**Month and year of purchase**	**Purchase cost**	**Fuel consumption rate / running charges**	**Dealer and location of purchase**	**Frequency of maintenance**	**Cost per service**	**Frequently replaced parts**

Subsidy availed for machinery purchased if any

Machinery rented

Name of machinery	Cost per session Cost per hour	Method of hiring	Terms and conditions	Time taken for machinery availability

MACHINERY USED	
Machinery aspired	
awareness of machinery used in rice cultivation (mention different types of machinery used and whether farmer is aware of it or not)	
Scope for improvement in machinery used	
Pain points / issues in machinery used (issues faced by farmers in using machinery leading to drop in efficiency eg difficulty in sourcing fuel / serviceability etc)	
Current Mechanisms to addressing machinery issues and pain points	

Description of how the machinery are used

Considerations for usage

Constraints / things to keep in mind for usage.

SECTION 5.

FARMER ECONOMICS	
Total income per annum (income from farming and other activities break up)	
Income from sale of previously sold crop and name of crop	
Method and location of sale	
Cost incurred due to sale (transport , loading etc)	
Activities involving additional labour to enable sale of produce eg cleaning	

SECTION 6. ON FARM ACTIVITIES for paddy

Personal account of farm activities as engaged by farmer from land preparation till produce leaves the field on per acre basis and acreage cultivated basis

Land preparation

Tasks done (ploughing / levelling) other :
Time taken to do task
Cost incurred
Number of labourers
Machinery used
Any other activities to be done to the land prior to land preparation

Challenges faced / difficulties if any in doing the task , rating of difficulty in doing the task

Nursery preparation

Time taken to do the task
Cost incurred
Number of labourers required
Machinery used if any
Challenges faced / difficulties in doing task,rating of difficulty in doing the task

Transplanting / sowing

Time taken to do the task
Cost incurred
Machinery used
Number of labourers required
Challenges faced / difficulties in doing task, rating of difficulty in doing the task

Irrigation

Time taken to do the task
Number of times the task is done
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task, rating of difficulty in doing the task
How drainage of excess water is done

Weeding

Time taken to do the task
Number of times the task is done
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task
How women are organised
On what basis pay is split between participants

Spraying of insecticide / weedicide / boosters etc

Time taken to do the task
Number of times the task is done
Machinery used
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

Fertiliser application

Time taken to do the task
Number of times the task is done
Machinery / equipment used
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

Harvesting
How is it done manual / mechanised

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Manual harvesting :

Cutting

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
How labourers are arranged.
Method of pay for each labourer
Challenges faced / difficulties in doing task

Transport

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Threshing

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Winnowing

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task
Role of women

Drying and packing

Time taken to do the task
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task
How it is done
Method of storage of paddy
Materials used for packing of paddy
Role of women

Transportation

Time taken to do the task
Cost incurred
How it is transported
Number of labourers required
Challenges faced / difficulties in doing task

Average crop yields with the above mentioned practice

Previously gained crop

Milling of paddy
Quantum of paddy milled per visit to the mill
Selling paddy vs selling milled rice (reasons for the same)
Cost of milling of paddy
Milling efficiency on average
Factors affecting milling efficiency
Distance and time taken to travel to mill and back on average
Amount of time spent at the mill (productive use of time at mill if any ?)

Other crops grown :

Name

Growing season

Income from same (if any)

SECTION 7

(season 1 activities for (crop grown)(for acreage cultivated by farmer)												
	levelling	Ploughing	Watering	Nursery	Transplanting	weeding	spraying	fertiliser application	harvesting	Drying	Bundling	Loading/ Transportation
Mechanised vs manual												
Level of drudgery as rated by farmer												
Cost per acre												
Labour per acre												
Time taken to do it once / no of times it needs to be done												
Ownership												
Remarks												

SECTION 8 Input materials cost: Per Season (crop 1)(for acreage cultivated by farmer)

Material	Cost per Bag	Quantity used per season kg	Total cost
Total			

Section 9: paddy varieties cultivated and associated costs (in multiple seasons)

Name of paddy variety	Yield per acre	Cost of seed	Selling price of paddy	Reason for cultivating this variety

SECTION 10: Land rental costs, per acre basis

Cost per season	
Cost per year	
General terms and conditions	

SECTION 11 Input machinery cost: Per Season (crop 1) (for acreage cultivated by farmer)acreage

Season 1 acreage cultivated ……

Machine/Equipment	Cost per day / hr	Total hrs. used	Total cost
Total			

SECTION 12 Input materials cost: Per Season (crop 1) (for acreage cultivated by farmer)

Material	Cost per Bag	Quantity used per season kg	Total cost
Total			

SECTION 13 Input machinery cost: Per Season (crop 1) (for acreage cultivated by farmer)

Machine/Equipment	Cost per hr.	Total hrs. used	Total cost
Total			

SECTION 14 Input Labour cost: For crop/ season 1 (for acreage cultivated by farmer)

Farm Task (farm activities)	**No of Labour**	**Cost per labour**	**Duration needed to complete activity**	**Total cost**
Ploughing				
Harrowing				
Levelling				
Sowing				
Irrigating				
Weeding				
Fertiliser application				
Spraying				
Harvesting				
Drying				
De-Shelling				
Total				

SECTION 15 Crop Market & Sales Size of bag =..... kg

Commodity	Market Price per bag	Total Farm Output sold	Total revenue
Crop 1:			
Buyer Price at farm gate for paddy			
Buyer price at apmc			
Buyer price at fpo			
Total			

SECTION 16

Impact of climate change.(weather trends observed by the farmer over the last few years impacting his/ her crop)
Prior experience of loss and coping of same

1) Rains
2) Temperature
3) Unexpected insect / pest attack
4) Humidity observed
5) Storms other weather events observed

6) Flooding

Flood mitigation / prevention measures undertaken.

Paddy processor (small medium large)(local / regional / national)

Section 1 :Paddy processor details

1) Name of the paddy processor company

2) Age of the mill / company

3) Nature of interviewee with mill
    a) Proprietor
    b) Employee , position in the company
    c) Renter of machinery
    d) Other

4) Age of interviewee and duration spent in paddy processing industry

5) Location of the mill (add gps coordinates to calculate distances involved if possible)
    a) Address of mill
    b) Address of head office if any equivalent
    c) Have other mills ? if so address of the same

6)

    - No of people employed

Section 2 : Business operations

- Name of individual, association/group, company / how is it referred to locally
- Range / area of operation (from maximum how far away sourcing and sales are done)
- Duration in the paddy processing industry
- Milling as a service or milling to sell rice ? and reason for selection
- Additional services provided ? in the value chain

- Location(s) of processing
  - Reason for selection

- Processing capacity for paddy
  - Processes undertaken
  - Quantity of paddy processed per day…… / per season…..
  - Storage capability in tons / kg……
  - Cost incurred per unit / batch of paddy processed
  - Products produced and quantity (per batch of paddy) (monthly , yearly basis)

	Quantity	Monthly	Yearly
For rice			

For brokens			
For husk			
For bran			

- **Targeted market. Break up in quantity and percentage**

Export	
Institutional customers	
Urban	
Rural	
Direct to home	

- Factors determining sale of rice

Section 3: power and technology required

- Power requirements
    - Requirements vs availability
    - Constraints due to power mismatch
        - Electricity
        - Diesel / petrol / other
    - Reduction of power consumption possible ?
    - mismatch between requirements and availability of power
    - Sudden requirements
    - Emergency cases if any
        - Machine failure
        - Sudden demand for grain
        - Power surges
    - Critical backup

- Technology used
    - Constraints due to technology mismatch / cuf mismatch
        - Measures for taken / required
    - List of machinery

Name of machinery	Rated power	Brand used	Source of machinery	Reason for selection of machinery used
precleaner				
Huller				
separator				
Destoner				
Polisher 1				
Polisher 2				
Grader				

Packing machine				
Other				

- Capabilities of current machinery

Name of machinery	Cost of machinery	Specifications	Processing capacity	Energy consumption per day/ per month (high/low / average)	Duration machine is operating per day, per month (high/low / average)
Precleaner					
Huller					
Separator					
Destoner					
Polisher 1					
Polisher 2					
Grader					
Packing machine					
Other					

Gaps in current technology

a) Constant breakdown (reasons)

b) Long down time and repairs

c) Unavailability of spares

d) Low processing capacity

e) Certain capabilities are missing

f) Power issues
    i) From grid
    ii) Tendency of machinery to fail due to power fluctuations
    iii) High power requirements of machinery limiting usage
g) Other

Storage

1) Method of storage of paddy and rice

2) Pest management measures

3) Scope for improvement storage methods

- Gaps in current technology
- Scope for improvement
    - Within company
    - External infusion of tech
        - New technology
        - Modification of existing machinery
    - Process change
    - Source of power used and consumption per day / week / month / year

- Power consumption trends

grid	solar
Diesel / petrol generator	other

  - Scope for improvement for machinery used

- Operating costs (add table)
  - Cost per batch of paddy processed size of batch processed / amount of grain processed in one working day …….
  - One month……..
  - One Year ……. (low / high / average)

S/No.	Cost Type	Unit	Quantity	Unit Cost (INR)	Total Cost (INR)
1	Purchase of paddy				
2	Labor cost				
3	Transportation costs				
4	storage				
5	Electricity				
6	Water				
7	Promotion & marketing				
8	Rent				
9	Taxes/fees				
10	Others (Specify)				

- Pricing to buyer (wholesaler / retailer)
  - Cost of rice and paddy by products when sold to retailer
  - Minimum order quantity
  - Discounts offered if any for larger purchases
  - Average quantity sold per sale 0

Wholesaler price	
Retailer price	

  - **Method of transport to buyer**

Section 4 :Challenges observed in rice and paddy by products products

	Buyer and location	T and C / remarks / expectation sof buyer
Markets for bran		
Markets for husk (fuel ?		
Market for broken rice		

- **Packaging and related processes**

Popular packaging methods	
Value addition of packaging (price difference between packed and loose rice)	
Sale price variation and demand with respect to various types of packaging	
Packaging sizes used	

- **Challenges observed in rice and paddy products**

Challenges in transport	
Challenges in market linkages	
Challenges in sourcing	
Challenges processing	
Adequacy of power (energy)	
Gaps in supply and demand and mismatch	

Section 5 : Finance

- **Finance availability and liquidity**

Particulars	Responses	Remarks
Loans and schemes that interviewed individuals have applied for .		
Did they get it If no what was the reasons for rejection		
Presence of a micro lending / informal lending network / individual easily accessible for the individual		
Acceptable collaterals for informal and formal lending institutions / lenders		
Differences in interest rates, terms and other ToC as observed by interviewee between formal and informal lending institutions		

First buyer / aggregator of paddy / government procurer

- Aggregator details (general information)
    - Name (individual / company / institution)
    - Age
    - Location
    - No of people employed
    - Range / area of operation
    - Final customer (s) sold to in general
    - Duration in the industry and years of experience actively working in the sector

- Description of business model

- From whom and where do you regularly buy paddy from for trade
    1) Farmers
    2) Other traders

    3) At what price do you buy paddy
        a) Average price

        b) Highest price (in season / year / highest ever (when))

        c) Lowest price (in season / year / lowest ever (when))

    4) Quantity purchased
        a) Per transaction (average / lowest / highest)

        b) Per season / cycle (average / lowest / highest)

        c) Per year (average / lowest / highest)

- Purchase of paddy / paddy products

    - Method of purchase of paddy
        - Cash and carry
        - Credit
        - Advance payments
        - Loans
        - Contracted
        - Other

    - location of purchase of paddy
        - At the farmgate
        - At a common point
        - At the office of aggregator
        - other

- Method of transport
  - Hired / own Truck
  - Bus / public transport
  - Bike
  - Other

- Other by-products of paddy purchased ?

  - If yes what are the they and quantity of purchase

- Characteristics of quality of the acceptable paddy for purchase.

- Quantity purchased in one season and from how many farmers

- Buyer requirements

  - Targeted buyers and who are they ?
    - Large Private mills
    - APMC affiliated mills
    - Small scale speciality rice milling units

  - Method of sale of paddy
    - Cash and carry
    - Credit
    - Advance payments
    - Loans
    - Contracted
    - Other

    - location of sale of paddy
    - expected quality of paddy / rice
    - Quantity involved
    - Mode of transport / delivery etc
- Selling price
- Issues / gaps in aggregation
    - Distance
    - Quality of product
    - Limitations in increasing purchases
    - Other
- Area covered in paddy purchase (area of operations)
- Issues / gaps in sale of paddy and paddy by products to the next client

- Transport of paddy and paddy products
    - Method of transport
    - Costs incurred for transport
        - Per unit
        - Per trip - amount of paddy / paddy products transported per trip
    - Storage capacity
        - Capacity for storage of paddy/ paddy products
        - Willingness to storage paddy/ paddy products
        - Opportunities identified by entrepreneur
        - Target market / buyer
- Challenges observed in paddy and paddy products
    - Challenges in transport
        - For aggregation
        - For selling
    - Challenges in market linkages

- Issues faced in sourcing and selling of paddy

Tick all that apply

Market linkages	Description of the same
transport	
pricing	
Availability and consistency of the product	
Consistency of purchases	
Contract problems	
storage	
other	

- How it is resolved

- Technology currently used in the paddy aggregation process
  - Storage tech used

        - Storage capacity
        - Cost per batch for storage

    - Processing tech used if any
        - Processing capacity
        - Cost per batch processed

    - Technology used in trading of paddy (mention model as well)
        - Moisture meters
        - Weighing equipment
        - Tags / trackers
        - Other if any

    - Limitations of existing technology used if any
    - Ownership model
        - Own
        - Rental
        - Lease

    - Current tech capabilities
        - Cost
        - Capacity
        - Functioning
        - Limitations of existing technologies used

- Treatment / processing of paddy if any
    - Process carried out .
    - Scope / scale

- labour costs
    - Employees contracted
    - Wages paid
    - Self employed / unpaid worker and paid workers count (table)

- Finance availability and liquidity
    - Credit availability
        - From banks / financial institutions
        - From buyers and sellers
        - Most valued creditor
- Loans and schemes that interviewed individuals have applied for .
- Did they get it
    i) If no what was the reasons for rejection
- Presence of a micro lending / informal lending network / individual
- Acceptable collaterals for informal and formal lending institutions / lenders
- Differences in interest rates, terms and other ToC as observed by interviewee.

- Guild / association / co-operative membership ?
    - If yes who
    - Benefits obtained
    - Fees / other costs incurred

- Availment of services

- Duration of membership till date

- Entry requirements

FARMER DECK/ ON FARM DATA COLLECTION FRAMEWORK

SECTION 1. Village background and context (to ask the field co ordinator or local expert / equivalent)

1. To have the following information

- Location of village (gps tag).....

Jaji Village Kamrup Rural

- nearest town / marketplace

Loharghat and Bijoy nagar

- water situation of the locality of the farmer
    - For irrigation

Rainfed and

    - For drinking (source)

Tubewell for drinking water

    - Indigenous methods of water / land conservation practices.

NA

- Name of the cropping seasons in the area and dates and duration of the same,

Sali Paddy (Jun to Nov)

- name of crops grown per year.

Only Paddy

    - For irrigation purposes
        - Methods / technologies used by farmers in area

Engine water pumps

        - Method / tech used by farmer in question

Engine water pump

- a brief description of the employment opportunities / trends/ economic activities in village.
    - Employment schemes farmers are part off. Select as applied

mgnrega	day-nlrm	ddu-gky	pmgsy	other

Other :

- crops cultivated in the village / area

  Only paddy

- average land holding of farmers(estimated) in local unit and acres

    - Nature of land owned (centralised or scattered)

Scattered plots

    - Average size of each plot (if scattered)

0.5-2.0 bigha (0.165 - 0.66 acres)

    - distribution of the plots (on average how far are they spread out)

The land is scattered in within a 500-600 meter range

Local units used:

- 1 bigha = 0.3301
- acres = 14400 sq ft (approximation)
- 1 mun = 40 kg

- activities engaged by inhabitants in non farming season (select as applicable)

Construction Labour work in nearby city	Selling of vegetables	Tradesman (like plumber / electrician) other	Sericulture
Other crops cultivated	Business owner / employee (mention name)	Driver	Other

- Average yields of paddy in the area

18 Mun (720 kg) Per bigha

- How and where paddy is milled (based on the location visited)
  Local mills (Single stage)

2. About the farmer
SECTION 2.

Farmer Profile	
Farmer name and age	Jothin das 55-60
Location of the farm	Jaji Village
No of members in family	4
No of family members involved in farming as 1) primary work/ job/ employment of men in household 2) Primary work/ job / employment of women in the household	
What family members do (amount earned per activity per session)	Weeding Sowing Harvesting Other agricultural activity Other non agricultural activity
Land holding 1) Land owned a) Nature of owned land (joined or separated) 2) Land cultivated in previous season 3) Leased land for cultivation if any 4) Non cultivated land if any and reason for the same	5 bigha 5 bighas 12 bighas NA

● Used as pasture ● No water availability ● Difficulty in access to water ○ If yes how? ● Poor soil fertility ? ● poor soil constitution ○ If yes why ? ● Prior history of crops grown in the barren land ● Prior efforts made to rejuvenate the land and result of the same ● Labour issues limiting productivity of land ?	
Associated farm group / type of farming (contract/non contract/ sustenance)	Sustenance
1 (single crop/ multi crop / related activities) done by farmer , and family involved in farming. 2 intercropping done by farmers if any Agricultural and non agricultural activities	Done by interviewee Paddy cultivation only Done by family of interviewee NA
Awareness of government programs for farmers / paddy /	Not aware
Beneficiary ? if yes benefits and learnings obtained If no. why not ? reason for not applying	NA
1) Received any training / guidance from external parties like ngos, institute , govt etc 2) Duration of same If multiple trainings done name them Has other family members attended any Usefulness of attended program	NA
Source of knowledge / guidance for day to day farming activities.	NA

Part of any government employment schemes Mgrega , day-nlrm	Yes has job card

SECTION 3: Crop calendar and activities carried out throughout the year.

1) Name of local seasons and duration of same (starting and ending)

Sali paddy - winter paddy from Jun-Nov

2) Crops grown in each season

paddy

3) Quantum of land cultivated in each season

17 bigha

4) Crop grown for sale/self consumption (only in the field backyard/ kitchen cultivations not considered)

Crop grown for self consumption

5) Paddy variety cultivated and reason for selection of same and why not others

Izong and Joha are grown as they require less water. The land cultivated is more suitable for izong and Joha.

SECTION 4

Machinery owned.

Machinery owned Local name (quantity owned)	Make and model	Month and year of purchase	Purchase cost	Fuel consumption rate / running charges	Dealer and location of purchase	Frequency of maintenance	Cost per service	Frequently replaced parts
Power tiller	Walk behind	2018	100000	1.5 ltr/ 1 bigha (ploughing) 1 ltr / 50 bundles (threshing)	Bought 2nd hand in baganpada	Once per year	7000	Main bearing -5000 per year per piece
Kerosene water pump	Local make	NA	NA	1ltr/ hour	Bought 2nd hand	NA	NA	NA
sprayer	Local make	NA	1400	0.5 hr / 1 bigha	2nd hand	NA	NA	NA

Subsidy availed for machinery purchased if any

NA

Machinery rented

Name of machinery	Cost per session Cost per hour	Method of hiring	Terms and conditions	Time taken for machinery

				availability

MACHINERY USED	
Machinery aspired	NA
awareness of machinery used in rice cultivation (mention different types of machinery used and whether farmer is aware of it or not)	Aware of harvesters and paddy threshers but cost is a constraint
Scope for improvement in machinery used	NA
Pain points / issues in machinery used (issues faced by farmers in using machinery leading to drop in efficiency eg difficulty in sourcing fuel / serviceability etc)	Powertiller has issues with connections to control mechanisms requiring more effort and energy to properly operate the machine
Current Mechanisms to addressing machinery issues and pain points	NA

Description of how the machinery are used

Power tillers are used for ploughing and threshing of paddy . the power tiller has a tillering attachment that is used to plough the fields. While threshing this attachment is removed.

During threshing , the paddy bundles are placed on a clean surface (about 50 at a time) the powertiller is driven over the bundles multiple times till the paddy falls out of the stalks.

Considerations for usage

Constraints / things to keep in mind for usage.

SECTION 5.

FARMER ECONOMICS	
Total income per annum (income from farming and other activities break up)	Farming is only source of income
Income from sale of previously sold crop and name of crop	144000
Method and location of sale	Farmgate sale
Cost incurred due to sale (transport , loading etc)	NA
Activities involving additional labour to enable sale of produce eg cleaning	Cleaning and winnowing is done at home at spare time. Additional labor not required as the women from the household do it

SECTION 6. ON FARM ACTIVITIES for paddy

Personal account of farm activities as engaged by farmer from land preparation till produce leaves the field on per acre basis and acreage cultivated basis

Land preparation

The power tiller is used for ploughing of land. Ploughing of all the land is done over 10-15 days as takes one day to plough one bigha of land. 1-2 labourers are hired for about 20 days over 3 months . They cut the canals , dig drainage ditches and build and maintain embankments between fields.

Tasks done (ploughing / levelling) other : Digging of canals, maintenance of embankments etc
Time taken to do task: 10+ days
Cost incurred : 3000 for labour and 15 litres for fuel
Number of labourers : 2
Machinery used: Power tiller
Any other activities to be done to the land prior to land preparation

Challenges faced / difficulties if any in doing the task , rating of difficulty in doing the task

Difficulty in hiring labour as there are not enough people at the time
Nursery preparation

The nursery preparation requires preparation of 2500 sq ft of land for every 3 bighas. The land is ploughed and watered until the moisture has soaked well. Then 20 kg seed is broadcast into land. For izong paddy 0.5 kg of fertiliser is applied and for other varieties 1 kg is required.

Time taken to do the task
Cost incurred
Number of labourers required
Machinery used if any
Challenges faced / difficulties in doing task,rating of difficulty in doing the task

Transplanting / sowing

Transplanting is done after 30 days . it takes about 7-8 days to transplant one bigha . 2 labourers are hired for this work. DAP, potash and Urea in the ratio of 8:3:3 are mixed by hand and scattered in the field. After this the paddy seedlings are transplanted

Time taken to do the task
Cost incurred
Machinery used
Number of labourers required
Challenges faced / difficulties in doing task, rating of difficulty in doing the task

Irrigation

Irrigation is largely dependent on rain. If there is no rain for an extended period of time then the water

pump is used to pump water into the soil.
Time taken to do the task
Number of times the task is done
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task, rating of difficulty in doing the task
How drainage of excess water is done

Weeding

Time taken to do the task
Number of times the task is done
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task
How women are organised
On what basis pay is split between participants

Spraying of insecticide / weedicide / boosters etc

0.5 kg of booster is applied in dilution with water during the maturing stage. Also vitamin supplements at the rate of 200 g diluted in 32 litres water is sprayed over one bigha.

Insecticides and weedicides are not used as there is no need for it.

Time taken to do the task
Number of times the task is done
Machinery used
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

Fertiliser application

Fertilisers are applied to the field four times during the course of paddy cultivation. First in nursery preparation , then during transplanting. The fertiliser is applied once again at the flowering stage and at the paddy maturing stage.

On a per bigha basis it requires the following

Fertiliser name	Quantity required in kg
DAP	8
Potash	3

Urea	18

The fertilisers are carried to the field. And then mixed at site before being scattered into the fields.it is done personally and does not require additional labor.

Time taken to do the task
Number of times the task is done
Machinery / equipment used
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

Harvesting
How is it done manual / mechanised

Harvesting of paddy is done manually .
Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Manual harvesting :

Cutting

Cutting of paddy is done in a per bigha basis. A fixed amount of money is paid per bigha which is shred between the labourers who take part. This number varies with the availability of people but generally 5-10 people cut and bundle one bigha . this is known as the tikka system.

Time taken to do the task
Cost incurred 1200 per bigha
Machinery used selection of machinery for the job:NA
Number of labourers required 5-10
How labourers are arranged.
Method of pay for each labourer
Challenges faced / difficulties in doing task

Transport

The bundles are then allowed to dry in the field for about 3-7 days after which they are brought back home. A labourer is specifically hired to carry all the paddy stalks from the field to home.

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Threshing

Within a day or two of bringing the paddy stalk bundles from the field , the threshing process begins. This is done gradually over time with about 50 bundles threshed in one session. The powertiller is driven over the bundles multiple times and over a duration of about 4 hours. After 4 hours , the bundled stalks are removed and the grain is gathered in one pile.

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Winnowing

The gathered grain along with its impurities is then gathered in a bucket and slowly dumped in front of a fan. The blows away the lighter elements while the seeds fall straight onto the ground. The fan is powered by the power tiller. This is done by the women's family members.

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task
Role of women

Drying and packing

The cleaned paddy is then dried under the sun for1-3 days. Once it is dry it is stored in the traditionally

build granaries called dule (*bhora*l in assamese). The dule is an elevated granary made of a bamboo frame covered in clay/ fine mud. The structure allows the paddy to be stored a few feet above the ground.

Time taken to do the task
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task
How it is done
Method of storage of paddy
Materials used for packing of paddy
Role of women

Transportation

NA

Time taken to do the task
Cost incurred
How it is transported
Number of labourers required
Challenges faced / difficulties in doing task

Average crop yields with the above mentioned practice

18 mun (40kg per mun) per Bigha

306(12240 kg) mun in total

Previously gained crop

Milling of paddy
Quantum of paddy milled per visit to the mill
Selling paddy vs selling milled rice (reasons for the same)
Cost of milling of paddy
Milling efficiency on average
Factors affecting milling efficiency
Distance and time taken to travel to mill and back on average
Amount of time spent at the mill (productive use of time at mill if any ?)

Other crops grown :NA

Name

Growing season

NA

Income from same (if any)

SECTION 7

Impact of climate change.(weather trends observed by the farmer over the last few years impacting his/ her crop) Prior experience of loss and coping of same
1) Rains 2) Temperature 3) Unexpected insect / pest attack 4) Humidity observed 5) Storms other weather events observed 6) Flooding Flood mitigation / prevention measures undertaken. Soil fertility is reducing, requiring more fertilisers overtime. There are also unexpected rains during the paddy maturing season leading to rot and spoilage. For every rain that occurs untimely during the tillering and paddy maturing season 0.5- 1.5 mun of paddy per bigha loss can be expected.

FARMER DECK/ ON FARM DATA COLLECTION FRAMEWORK

SECTION 1. Village background and context (to ask the field co ordinator or local expert / equivalent)

1. To have the following information

- Location of village (gps tag).....

Khamar Village

- nearest town / marketplace

The small market is in loharghat
For large quantities and other purchases farmers go to Bijoynagar which falls in Chaya and Rampur block

- water situation of the locality of the farmer
    - For irrigation

Irrigation of crops is only required during the nursery growth stage. After which it is entirely rain dependant.

    - For drinking (source)

Tubewells are the source of water for drinking

- Indigenous methods of water / land conservation practices.

There are small scale depressions / ponds in the area that collect water. If there are no rains then the water is pumped from the ponds into the fields.

- Name of the cropping seasons in the area and dates and duration of the same,

There is only one season of paddy grown between April and November. The paddy cultivated is a 6 month long crop.

- name of crops grown per year.

Paddy

- For irrigation purposes

Petrol powered pumps are used for irrigation during the nursery preparation season.

- Methods / technologies used by farmers in area

Ploughing is mechanised through the use of power tillers and tractors.

- Method / tech used by farmer in question

- brief description of the employment opportunities / trends/ economic activities in village.
  - Employment schemes farmers are part off. Select as applied

mnregs	day-nlrm	ddu-gky	pmgsy	other

Other :

- crops cultivated in the village / area

  Only paddy is cultivated

- average land holding of farmers(estimated) in local unit and acres

4-5 bighas

- Nature of land owned (centralised or scattered)

scattered in a 500-1000 m diameter

- Average size of each plot (if scattered)

They are split into small plots ranging from 0.5 bigha to 2 bigha and

- distribution of the plots (on average how far are they spread out)

Local units used:

- 1 bigha = 0.3301 acres = 14400 sq ft (approximation)
- 1 mun = 40 kg

- activities engaged by inhabitants in non farming season (select as applicable)

Women work with handlooms,raise poultry and pigs

Construction Labour work in nearby city	Selling of vegetables	Tradesman (like plumber / electrician) other	Sericulture
Other crops cultivated	Business owner / employee (mention name)	Driver	Other

- Average yields of paddy in the area

20 mun (800 kg) per bigha

- How and where paddy is milled (based on the location visited)

The paddy is milled at a local single stage mill. There is one mill distributed every 3-4 villages

2. About the farmer
SECTION 2.

Farmer Profile	
Farmer name and age	Jothin Deka
Location of the farm	Khamar
No of members in family	5 . 4 adults and 1 child
No of family members involved in farming as 1) primary work/ job/ employment of men in household 2) Primary work/ job / employment of women in the household	Farming is the primary work for both men and women
What family members do (amount earned per activity per session)	Weeding Sowing Harvesting Other agricultural activity Other non agricultural activity
Land holding 1) Land owned a) Nature of owned land (joined or separated) 2) Land cultivated in previous season 3) Leased land for cultivation if any 4) Non cultivated land if any and reason for the same ● Used as pasture ● No water availability ● Difficulty in access to water	No land holding. Based on data shared by farmer , the top soil is thin and fertility has been reducing over time.

○ If yes how? ● Poor soil fertility ? ● poor soil constitution ○ If yes why ? ● Prior history of crops grown in the barren land ● Prior efforts made to rejuvenate the land and result of the same ● Labour issues limiting productivity of land ?	
Associated farm group / type of farming (contract/non contract/ sustenance)	Contract farming
1 (single crop/ multi crop / related activities) done by farmer , and family involved in farming. 2 intercropping done by farmers if any Agricultural and non agricultural activities	Done by interviewee Only paddy Done by family of interviewee Only paddy
Awareness of government programs for farmers / paddy /	Not aware of government programs
Beneficiary ? if yes benefits and learnings obtained If no. why not ? reason for not applying	None
1) Received any training / guidance from external parties like ngos, institute , govt etc 2) Duration of same If multiple trainings done name them Has other family members attended any Usefulness of attended program	None
Source of knowledge / guidance for day to day farming activities.	none
Part of any government employment schemes Mgregs ,	Has a mgregs job card

SECTION 3: Crop calendar and activities carried out throughout the year.

Name of local seasons and duration of same (starting and ending)

Sali paddy (Apr to Nov)

Crops grown in each season

Paddy

Quantum of land cultivated in each season

10 Bigha

Crop grown for sale/self consumption (only in the field backyard/ kitchen cultivations not considered)

Paddy cultivated for self consumption and excess is sold as and when required

Paddy variety cultivated and reason for selection of same and why not others

Joha

SECTION 4

Machinery owned. (Not applicable) farmer does not own any machinery

Machinery owned Local name (quantity owned)	Make and model	Month and year of purchase	Purchase cost	Fuel consumption rate / running charges	Dealer and location of purchase	Frequency of maintenance	Cost per service	Frequently replaced parts

Subsidy availed for machinery purchased if any

NA

Machinery rented

Name of machinery	Cost per session Cost per hour	Method of hiring	Terms and conditions	Time taken for machinery availability
tractor	300 per bigha	Through phone call 3 days prior requirement		3 days
powertiller	400 per bigha for ploughing 600 per bigha for threshing	Through phone call 3 days prior requirement		2-3 days
Water pump	200 per hour	Through phone call 3 days prior requirement	Transportation of pump from home to field is the responsibility of the leasee	2-3 days

MACHINERY USED	
Machinery aspired	
awareness of machinery used in rice cultivation (mention different types of machinery used and whether farmer is aware of it or not)	Aware of tractors , power tillers, combine harvesters
Scope for improvement in machinery used	NA
Pain points / issues in machinery used (issues faced by farmers in using machinery leading to drop in efficiency eg difficulty in sourcing fuel / serviceability etc)	Too much jerking but habituated to it
Current Mechanisms to addressing machinery issues and pain points	NA

Description of how the machinery are used

Considerations for usage

Constraints / things to keep in mind for usage.

SECTION 5.

FARMER ECONOMICS	
Total income per annum (income from farming and other activities break up)	Total earned is 150 mun of paddy and work from mgrega (12-15 days)
Income from sale of previously sold crop and name of crop	NA-
Method and location of sale	Sold at local market as and when required
Cost incurred due to sale (transport , loading etc)	NA goods carried manually
Activities involving additional labour to enable sale of produce eg cleaning	NA

SECTION 6. ON FARM ACTIVITIES for paddy

Personal account of farm activities as engaged by farmer from land preparation till produce leaves the field on per acre basis and acreage cultivated basis

Land preparation

The land is ploughed once to loosen the soil using a rotavator. Oher land preparation works such as digging of drainage canals, building and maintenance of embankments and other works are done by hand.

Tasks done (ploughing / levelling) other :
Digging of drainage channels, building embankments
Time taken to do task

Cost incurred: For ploughing it costs about 300 per bigha . the farmer has leased 10 bighas for personal cultivation
Number of labourers
Machinery used : Tractors and power tillers
Any other activities to be done to the land prior to land preparation

Challenges faced / difficulties if any in doing the task , rating of difficulty in doing the task

According to the farmer the tractors tend to plough too deeply despite using only a rotavator. This may be attributed to the nature of the soil as other farmers interviewed do not mention this as a problem.

Nursery preparation

The seeds from the previous harvest are used for paddy cultivation. It takes about 30 days to prepare and cultivate the seedlings in the nursery. The total cost of nursery preparation is about 1000 INR

Time taken to do the task: One day to set up nursery and 21-30 days of maintenance
Cost incurred 1000
Number of labourers required : 2 labourers are hired for one day to prepare the land for nursery and plant the seeds.
Machinery used if any : A petrol/ kerosene pump is hired to water the land for the first time.
Challenges faced / difficulties in doing task,rating of difficulty in doing the task
Availability of labour for nursery preparation is a problem due to lack of labour at the right time.

Transplanting / sowing

Transplanting is done manually and requires the work of three labourers. It is done over 10 days. The people are hired on the basis of the tikka system. The labourers are paid on a per bigha basis.

Time taken to do the task: it takes about 10 days to transplant the crop as it takes about a day to transplant one bigha
Cost incurred
Machinery used
Number of labourers required : three people are required to do the task. It is usually two labourers in collaboration with the farmer.
Challenges faced / difficulties in doing task, rating of difficulty in doing the task

Irrigation

Irrigation is not done except for the watering of the nursery.

Time taken to do the task
Number of times the task is done
Cost incurred
Number of labourers required: NA
Challenges faced / difficulties in doing task, rating of difficulty in doing the task
Difficulty in carrying 20+ kg pump to the field and back.
How drainage of excess water is done

Excess water drains on its own overnight.

Weeding

The farmers don't do weeding,

Time taken to do the task
Number of times the task is done
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task
How women are organised
On what basis pay is split between participants

Spraying of insecticide / weedicide / boosters etc

Insecticide is used for prevention of pests. A spraying machine is used to spray the fields of the insecticide to suppress insects.
25-30 ml of insecticide is mixed in 5 litres of water
Time taken to do the task
Number of times the task is done
Machinery used
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

Fertiliser application

Fertiliser is applied three times during the course of cultivation of paddy .

The first time is done during the nursery preparation stage.
The second time during flowering and
Third time during the crop ripening/ maturing stage to ensure adequate nutrition for the maturing paddy

Time taken to do the task: one hour to complete one bigha and 10 hours to do all the 10 bighas.
Number of times the task is done
Machinery / equipment used: No machinery is used. Vessels are used for mixing fertilisers by hand.

Cost incurred
Number of labourers required : None
Challenges faced / difficulties in doing task

Harvesting
How is it done manual / mechanised

Harvesting is done manually.
Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Manual harvesting :

Cutting

Hired labour is used to harvest the paddy in the field. The labourers are only responsible for cutting and bundling the cut paddy in the field.

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
How labourers are arranged.
Method of pay for each labourer
Challenges faced / difficulties in doing task

Transport

The paddy is allowed to dry for 3-7 days. One labourer is hired to carry the paddy from the field to home. They are paid about 300-350 per day.

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Threshing

Threshing is done using a power tiller. 60 bundles are placed on the ground and the power tiller is driven over the bundles for 3-4 hours. After this the paddy straw bundles are removed and the grain is brought together.

Time taken to do the task- 60 bundles per threshing (1 bigha of land consists of around 120 bundles). Can thresh 120 bundles in a day.
Cost incurred: (Rs 600 per threshing). It includes cleaning & diesel charges as well**.**
Machinery used selection of machinery for the job Power tiller
Number of labourers required 1
Challenges faced / difficulties in doing task

Winnowing

The collected grain is mixed with chaff, dirt, small stones and twigs and it has to be cleaned before it can be stored.

Winnowing is done manually and it takes about 30 mins to winnow 1 mun(40 kg) of paddy.

Time taken to do the task: 30 mins for 1 mun
Cost incurred- NA
Machinery used selection of machinery for the job NA
Number of labourers required NA
Challenges faced / difficulties in doing task
Task is time consuming due to the low efficiency of manual winnowing.
Role of women

Drying and packing

The paddy is sun dried once it is dried it is packed in gunny bags and stored in the dules(local name for granary). The paddy is stored for about 1-1.5 years before it is sold.

Time taken to do the task
Cost incurred 2-3 days
Number of labourers required
Challenges faced / difficulties in doing task
How it is done
Method of storage of paddy
Materials used for packing of paddy
Role of women

Transportation

Paddy is sold at farmgate to traders and aggregators

Time taken to do the task
Cost incurred
How it is transported
Number of labourers required
Challenges faced / difficulties in doing task

Average crop yields with the above mentioned practice

Previously gained crop

Milling of paddy
Milling is done at a local single stage electric mill.

Quantum of paddy milled per visit to the mill
The farmer visits the mill once a month to mill 40 kg of paddy
Selling paddy vs selling milled rice (reasons for the same)
The paddy is sold as paddy
Cost of milling of paddy
Milling efficiency on average
Factors affecting milling efficiency
Moisture content at storage time and prior to milling

Amount of time spent at the mill (productive use of time at mill if any ?)
NA.

Other crops grown :

Name

NA

Growing season

NA

Income from same (if any)

SECTION 16

Impact of climate change.(weather trends observed by the farmer over the last few years impacting his/ her crop)
Prior experience of loss and coping of same

1) Rains
2) Temperature
3) Unexpected insect / pest attack
4) Humidity observed
5) Storms other weather events observed
6) Flooding

Land fertility has been decreasing over the last 10 years. This has resulted in the use of increased fertiliser usage during the course of this time.
Groundwater depletion has also increased however water is still easily available at low depths.
Couple of years ago well water was easily available at 3-4 feet now one must dig 15 feet to get water .

For borewells water was available at 50-60 feet prior and now one must dig to 110-115 feet to get water.

There is no problem observed with the timing of rains.

Flood mitigation / prevention measures undertaken.

FARMER DECK/ ON FARM DATA COLLECTION FRAMEWORK

SECTION 1. Village background and context (to ask the field co ordinator or local expert / equivalent)

1. To have the following information

- Location of village (gps tag).....

Mukthapur , Nalbari Dt

- nearest town / marketplace

Baganpada, Mahebosti,

- water situation of the locality of the farmer
    - For irrigation

Rainfed irrigation , when rains are delayed , motor pump is used

    - For drinking (source)

Tubewell for drinking water

    - Indigenous methods of water / land conservation practices.

NA

- Name of the cropping seasons in the area and dates and duration of the same,

Winter paddy crop , sali paddy
Summer mustard

- name of crops grown per year.

Paddy and mustard. Vegetables grown in small scale for self consumption

    - For irrigation purposes
        - Methods / technologies used by farmers in area

Rainfed farming

        - Method / tech used by farmer in question

diesel/ petrol motor pumps

- brief description of the employment opportunities / trends/ economic activities in village.

- Employment schemes farmers are part off. Select as applied

mnregs	day-nlrm	ddu-gky	pmgsy	other

Other :

- crops cultivated in the village / area

Rice, Mustard

- average land holding of farmers(estimated) in local unit and acres

2-20 Bighas

- Nature of land owned (centralised or scattered)

Scattered

- Average size of each plot (if scattered)

1-2 bighas

- distribution of the plots (on average how far are they spread out)

Local units used:

- 1 bigha = 0.28 acres = 12000 sq ft (approximation)
- 1 mun = 40 kg

- activities engaged by inhabitants in non farming season (select as applicable)

Construction Labour work in nearby city	Selling of vegetables	Tradesman (like plumber / electrician) other	Sericulture
Other crops cultivated	Business owner / employee (mention name)	Driver	Other

- Average yields of paddy in the area

18 Mun

- How and where paddy is milled (based on the location visited)

Local electric mill

2. About the farmer
SECTION 2.

Farmer Profile	
Farmer name and age	Lalchit Boro
Location of the farm	Mukthapur , Nalbari Dt
No of members in family	5
No of family members involved in farming as 1) primary work/ job/ employment of men in household 2) Primary work/ job / employment of women in the household	5
What family members do (amount earned per activity per session)	Weeding Sowing Harvesting Other agricultural activity Winnowing , Other non agricultural activity
Land holding 1) Land owned a) Nature of owned land (joined or separated) 2) Land cultivated in previous season 3) Leased land for cultivation if any 4) Non cultivated land if any and reason for the same ● Used as pasture ● No water availability ● Difficulty in access to water	16.5 Bighas And 6 bighas leased

○ If yes how? ● Poor soil fertility ? ● poor soil constitution ○ If yes why ? ● Prior history of crops grown in the barren land ● Prior efforts made to rejuvenate the land and result of the same ● Labour issues limiting productivity of land ?	
Associated farm group / type of farming (contract/non contract/ sustenance)	Sustenance farming
1 (single crop/ multi crop / related activities) done by farmer , and family involved in farming. 2 intercropping done by farmers if any Agricultural and non agricultural activities	Done by interviewee Done by family of interviewee
Awareness of government programs for farmers / paddy /	Training attended in nursery management for horticulture crops
Beneficiary ? if yes benefits and learnings obtained If no. why not ? reason for not applying	Yes Feels the knowledge gained is useful but has not had the opportunity to what was learned.
1) Received any training / guidance from external parties like ngos, institute , govt etc 2) Duration of same If multiple trainings done name them Has other family members attended any Usefulness of attended program	Training received from IICO organisation
Source of knowledge / guidance for day to day farming activities.	Guidance from father and self experimentation
Part of any government employment schemes Mgregs ,	Yes PM kisan and Mgrega

SECTION 3: Crop calendar and activities carried out throughout the year.

1) Name of local seasons and duration of same (starting and ending)

Paddy cultivation season May to August

Horticulture season 1 Oct to Nov

Horticulture season 2 Dec to Mar

2) Crops grown in each season

Paddy

Cabbage , cauliflower, pumpkin , beans , potato and mustard

Potato and chillis

3) Quantum of land cultivated in each season

22.5 bighas for paddy

Fraction of bigha for vegetables

4) Crop grown for sale/self consumption (only in the field backyard/ kitchen cultivations not considered)

Paddy

5) Paddy variety cultivated and reason for selection of same and why not others

Ranjith , masuri , Ranjana , Joha. all these varieties are grown simultaneously in different plots

SECTION 4

Machinery owned.

Machinery owned Local name (quantity owned)	Make and model	Month and year of purchase	Purchase cost	Fuel consumption rate / running charges	Dealer and location of purchase	Frequency of maintenance	Cost per service	Frequently replaced parts
Power tiller	Rhino brand	2107	50000	1.5 litres per bigha	(2nd hand purchase)	Once a year	450-600	Impellor, bearing , lining and pistons
Diesel pump	2nd hand	2002	Does not remember	1.25 Litres per hour	Received as subsidy	Once a year	700	Liner and piston
Diesel pump			Does not remember	1 litre per hour (est)			700	Liners and pistons
sprayer	Not mentioned		Supplied by Govt paid 1400					

Subsidy availed for machinery purchased if any

Subsidy availed for sprayer and diesel pump

Machinery rented(Not applicable as machinery is not rented)

Name of machinery	Cost per session Cost per hour	Method of hiring	Terms and conditions	Time taken for machinery

				availability

MACHINERY USED	
Machinery aspired	
awareness of machinery used in rice cultivation (mention different types of machinery used and whether farmer is aware of it or not)	Aware of large paddy harvesters. Threshers and paddy transplanters
Scope for improvement in machinery used	
Pain points / issues in machinery used (issues faced by farmers in using machinery leading to drop in efficiency eg difficulty in sourcing fuel / serviceability etc)	Inherent jerkyness of the power tiller. Weight of the old diesel pump making it difficult to carry . leading to reluctance to use it.
Current Mechanisms to addressing machinery issues and pain points	

SECTION 5.

FARMER ECONOMICS	
Total income per annum (income from farming and other activities break up)	80000 per year
Income from sale of previously sold crop and name of crop	40000 from paddy 40000 from vegetables 2000 miscellaneous
Method and location of sale	Sold in local markets at baganpada
Cost incurred due to sale (transport , loading etc)	NA (paddy sold at farmgate)
Activities involving additional labour to enable sale of produce eg cleaning	Packing in gunny bags

SECTION 6. ON FARM ACTIVITIES for paddy

Personal account of farm activities as engaged by farmer from land preparation till produce leaves the field on per acre basis and acreage cultivated basis

Land preparation
Land preparation is done by the family with the help of additional 3 labourers. This is done over 15 days
The embankment building, is done by the labourers, the father of the farmer and the farmer himself.

Tractor is hired for ploughing of land . it costs 350 INR per Bigha to plough the land once. The farmer call the tractor driver when there is a need for ploughing. The land is ploughed 5 times. The first time is done by the tractor and the rest are done by the power tiller. t=for the tractor to plough the land it takes about 15-20 minutes to plough and for the powertiller is takes about 30-45 minutes to plough one bigha.

Once the land is ploughed it needs to be irrigated until the land can no longer hold any more water.

If there are a lot of weeds, a power tiller is used.

One bigha is set aside for nursery preparation. The land for the nursery is ploughed first.

Tasks done (ploughing / levelling) other :
Time taken to do the task: 15 days. 1.25-1.5 bigha is prepared per day
Cost incurred : 22000-25000
Number of labourers : 3
Machinery used: power tiller and tractor
Any other activities to be done to the land prior to land preparation

None
Challenges faced / difficulties if any in doing the task , rating of difficulty in doing the task

Tractor driver / owner reneging on previous agreements is a big problem. The tractor driver goes to the filed who pays him the most even if it means not going to field previously agreed upon. The driver also does not listen to the instructions of the farmers regarding ploughing of land as does it as he pleases.

Nursery preparation

Usually seeds from the prior harvest are used. If there is a scarcity then the seeds are bought at the rate of 700-800 INR per 5 kg. 120 kg of seed is required for 20 Bigha.

The seeds are soaked in water overnight. The seeds are then placed in a soaking wet bag till they sprout. The sprouted seeds are then used for planting of the nursery.

One Bigha of land is set aside for land preparation
On day one the is ploughed.
On day two the land flooded
On day three the seeds are sown
One day four fertiliser is applied

Urea, potash and DAP are applied at 2-3 kg , 1 kg and 1 kg respectively

Time taken to do the task: 4 days
Cost incurred: input cost of fertilisers
Number of labourers required : NA
Machinery used if any: NA

Challenges faced / difficulties in doing task,rating of difficulty in doing the task

Transplanting / sowing

The entire family is engaged in transplanting. An additional 6-7 women are hired to take care of the transplanting over 15-20 days. Usually it requires 20-22 days to complete transplanting along with its associated activities.

Even when it rains, transplanting is carried out. If there is no rain after transplanting , motor pumps are used to irrigate the field after one week of no rains.

Time taken to do the task:22 days
Cost incurred: 6000
Machinery used:NA
Number of labourers required: 6-6 women in addition to women of household (2)
Challenges faced / difficulties in doing task, rating of difficulty in doing the task

Constant bending , body pain due to repetitive action and vision related problems occurring over time.

Irrigation

Irrigation is primarily rainfed. However if there is no rain then diesel motor pumps are used . it takes about 2 litres of fuel to irrigate one bigha of land, for irrigation, the farmer has 2 diesel pumps of varying ages. The oldest one is about 18-19 years old. The farmer's father got it with a subsidy.

It takes about 6 men to carry the diesel motor pump and the associated tubing to the field. The pumps needs to be placed in three different locations to fully cover all the fields. However, according to the farmer the pump are rarely except during the nursery preparation stage.

The farmer also bought a 2nd hand diesel motor about 3 years ago.

Time taken to do the task : 1 Day
Number of times the task is done: 1 once (compulsory)
Cost incurred:
Number of labourers required : 6
Challenges faced / difficulties in doing task, rating of difficulty in doing the task
How drainage of excess water is done

Water drains overnight.

Weeding

According to the farmers , weeds do not grow in the area, they are naturally suppressed. Therefore neither weeding nor weedicide application is done

Time taken to do the task
Number of times the task is done
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

How women are organised
On what basis pay is split between participants

Spraying of insecticide / weedicide / boosters etc

To prevent insect infestation , a weedicide know as proflex is sprayed in the field.

Time taken to do the task
Number of times the task is done
Machinery used
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

Fertiliser application

Only during the nursery stage are fertilisers applied to promote growth of seedlings.

Time taken to do the task
Number of times the task is done
Machinery / equipment used
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task

Harvesting
How is it done manual / mechanised

Harvesting is done manually

Manual harvesting :

Cutting

6-7 people are hired on contract to cut all the paddy. The workers cut, bundle and tie the paddy into 30 kg bundles. Each bigha yields about 80 bundles with average yield of about 18 mun. (720 kg)

Payment for the work is usually a daily wage or sometimes the entire group is paid 4 mun per bigha. Regardless of the number of workers who come to cut the paddy, they are collectively paid 4 mun which is distributed amongst themselves.

Once the paddy is cut it is allowed to dry for 4-5 days

Time taken to do the task: 2-4 days
Cost incurred: 3000 per day
Machinery used selection of machinery for the job: none
Number of labourers required : 6-7
How labourers are arranged. Called via phone to confirm availability 2-3 days prior

Method of pay for each labourer : cash along with 2 meals and one tea a day.
Challenges faced / difficulties in doing task

Transport

4-5 days later once the paddy has dried in the field , it is transported back to the home. If tractors are available and the plot is not to far from the main road the paddy is transported and loaded onto the tractor before it is taken to the farmers' house.

if a tractor is not available, paddy bundles are carried manually using bamboo poles. 2 bundles are tied to opposite ends of the bamboo and carried home. Hired labour is used to carry the bundles back home. The number of people hired depends on the availability of labor.

Time taken to do the task
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Threshing

Once the paddy is brought home it is stored for 7-10 days before it is threshed. For threshing , the bundles are laid out onto a clean surface. The power tiller is used to thresh the paddy by driving it over the bundles for several hours before all the paddy falls out of the stalks and onto the cleaned surface below.

To thresh 1600 bundles of paddy , it takes about 2 days. Daily wage labour is hired who take turns to drive the power tiller. Once the paddy stalks are devoid of paddy, then the bundles are removed and the paddy piled to a side . Then the next batch of paddy bundles are threshed.

Time taken to do the task: 2 days
Cost incurred
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Winnowing

A pedestal fan is used to winnow the paddy. The paddy is gathered in vessel and the paddy is gently dropped before a fan, the pedestal fan blows away the chaff and other light weight impurities leaving behind the paddy at the bottom near the pedestal fan.

It takes about one day to fully winnow all the paddy. This work is done by men.

For both winnowing and threshing 2-3 external hired labor is used.

Time taken to do the task: 1 day
Cost incurred: 900-1050
Machinery used selection of machinery for the job
Number of labourers required
Challenges faced / difficulties in doing task

Role of women

Women are not directly involved in threshing and winnowing of paddy.

Drying and packing

Drying of paddy is done by women. The paddy is placed on a clean plastic sheet / mat / cleaned ground. Paddy is distributed evenly over the sheet and allowed to dry for 1-2 days depending on the requirement. Once one batch of paddy is dry, it is then packed and stored in the granary. After packing the next batch of paddy is dried.

Time taken to do the task
Cost incurred
Number of labourers required
Challenges faced / difficulties in doing task
How it is done
Method of storage of paddy
Materials used for packing of paddy
Role of women

Transportation

Paddy is sold at the farmgate. When there is need for money, buyers are called who visit the farm with their own transport to purchase the paddy.

Time taken to do the task
Cost incurred
How it is transported
Number of labourers required
Challenges faced / difficulties in doing task

Average crop yields with the above mentioned practice

20 mun (800 kg) per bigha
Previously gained crop

SECTION 7

Impact of climate change.(weather trends observed by the farmer over the last few years impacting his/ her crop)
Prior experience of loss and coping of same

1) Rains
2) Temperature
3) Unexpected insect / pest attack
4) Humidity observed
5) Storms other weather events observed

6) Flooding

Overtime there is a sense that the rainfall is reducing and the overall temperature seems to be getting hotter. spells also seem to be much more intense.

In 2021 and 2022 the weather patterns for the month of july and august were total opposite. One year it is rainir and the next year it is so sunny that there seems to be no rains at all.

There is a sense of helplessness seeing the climate fluctuate widely like this .
Flood mitigation / prevention measures undertaken.

Over the course of the data collection exercise in Assam in the paddy value chain , efforts were made to convince women to contribute their insights to the discussion. Which has been documented as follows.

Nirodha Basutary (55 yrs old) (Nalbari Dt, mother of one of the farmers in the area)

- 20-30 years ago paddy cultivation was more labour intensive and brought people together. It was like a gathering of the entire village for a single purpose.
- Worked as a daily wage labourer and earned about 50-60 INR per day.
    - If she were to go the field today she would earn about 300-350 INR
- As a daily wage labourer she did transplanting and weeding
- Has stopped working in the fields 3 years ago due to old age.
- When farmers required labour they would visit the houses of their neighbours to ask for their support.
- Now a days to is difficult to get labour
- People of todays day and age have earned more money and have upgraded themselves. They are no longer dependant on agriculture for food. They do not want to work in the fields also
- The formation of groups and contracts for agricultural purposes is a new phenomenon.

Kolami Boro (mother of lalchit boro , one of the farmers interviewed)

- Has been involved in agriculture for the past 30 years
- Was in involved in transplanting of seedlings
    - Would take care of uprooting of seedlings
    - Bundling of seedlings
    - Transplanting of paddy
- Now a days she is responsible for supervision of other labourers who work in her fields
- Usually it is the men who are responsible of cutting and bundling of paddy but sometimes young women also be involved in cutting and bundling of paddy

Wife of Jothin Deka (one of the farmers interviewed for the study)

- Does not have any interest in operating the powertiler and does not want to learn also
- Has never tried to operate the powertiller also
- Operating machinery like powertiller and sprayer is a mans job according to her
- She says she is already responsible for taking care of the household, sowing and weeding.
- Says that getting involved in operating machinery would be perceived as interfering in his husbands work.
- The machinery used in the fields are also not women friendly in terms of ease of use and difficulty of use
- Womens clothing is also not suitable for operating machinery with rotating components
- Feels that the machinery is very heavy and there is a lot of jerkiness and vibrations from it

Sarmoni Raba (one of the small scale mill operators)

- The small scale rice huller cum grinder is operated by her during the day time.
- She uses many 15 kg aluminium oil tins fitted with 2 wooden bars on either side of an edge of the vessel to dump paddy and rice into the machine.
- Says the vessels are a jugaad solution and it is not easy to grip and manipulate the vessel.
- She is constantly having to bend down to lift and hold up 12-13 of paddy / rice while operating the machine.
- She is interested in paper plate and cutlery making machinery having heard from her friends and further looking it up on youtube.

Daily wage labourer in Assam

Name	Soupendranath
Location of labourer	Galpejad Village, Baksa District
Number of members in the family	6 members, himself, wife and 4 daughters 1 is married and the rest 3 are studying
Duration in agriculture	working as a farm labourer since 1984.
Payment and benefits received for work done	While starting as a labourer he did not receive money but got material compensation such shirts, pants, food etc 30 years ago received 5 INR per day as compensation Now receives 350 per day and 2 meals as compensation **He is the sole wage earner in the family**
Nature of work	All year around he is involved in agricultural work From june to november is involved in paddy cultivation, From december to march involved in mustard and winter vegetables cultivation From march to june he is involved in summer vegetable cultivation
Work done in paddy cultivation	● Carrying seedlings ● Preparation of fields for transplanting ● Building and maintenance of embankments ● Cutting and bundling of mature paddy ● Transplanting and carrying fertilisers
Challenges and difficulties in paddy cultivation	● Hoe work is difficult and drudgery ● Carrying the harvested paddy is difficult as each bundle weighs 30 kilograms and they are transported two at a time manually .
Yearly estimated income	40000-50000 INR

Awareness of government schemes and benefits received	He is part of the housing scheme for BPC (below poverty line) category Receives monthly rations from the PDS system. He receives 5 kg grain per head from the PDS system He is a holder of a job card from MGREGA As pert of the scheme he has been involved in road construction , pond and drainage channel digging, etc.
Source of knowledge and awareness regarding schemes	He is registered in the local anganwadi which he visits frequently. He receives his information from there as public information and notices are shared between the local government, PDS system, Bodo council and the anganwadi
Finance and bank accounts	He has a bank account in Assam Gramin Vikash Bank

- One thing to keep in mind is that Mr Soupendranath is an exception rather than the norm as he spends the entire year in the village. He has found an opportunity for work for the entire year. Based on insights from other farmers and stakeholders, agricultural labourers tend to be of the migratory type pursuing work opportunities across districts and states. This is especially true during the harvest season. Between districts there is a 10-15 day variation on when the harvesting starts. Droves of migrant workers travel across districts, work in the fields to harvest and move on to the next village / region once the work is complete.

Focus group discussion in Baksa with SC/ST farmers in Baksa. Discussion on difficulties faced in Paddy cultivation

Participants : Blacius Gari, Abraham Ekka, Anil Ekka , Joneza Ekka, Shankar, Srimathi Ekka

Social issues faced

- Lack of access to technology and access to timely availability of tractor
- Previous year(3rd week dec 2021) planting for mustard was done, now not even half of it is done
- As the participants belong to Aadivasi and tribal communities , there is a lack of support from tractor and machinery owners and a negative bias
- Much of the work is still being done by hand and tools
- Indigenous varieties of paddy are cultivated as it is more resilient and reliable despite giving low yields
- Seeds from prior harvests are used for cultivation and exchanged with neighbors when required
- Lack of access to to tractors and inputs is making it difficult to maintain optimal timelines affecting yield

- Local seeds that are being used are : jaswa , full pakari and bordona . these varieties yield less and are long duration resilient crops .
- These long duration paddy crops are slowly fading away. Open cattle grazing is a major contributor to this as the cattle feed on the paddy that is not yet harvested.

Climate and water related related issues faced

- In 2022 7 days after transplanting there was no rain for about 1.5 months.
- The land dried due to the lack of rain. This affected the yield as the crop was under stress
- It was very hot and was fully unexpected
- In 2021 due to excess rain the seedlings prepared for transplanting were washed away.
- The farmers faced two completely different and opposite climate at the time of the in two different years
- About 4-5 years ago there was abundant water, now old canals and ditches are dry.
- People are filling up the drains in front of their homes to increase habiting area, which is blocking water flow
- Due to overpopulation the stress on the land has increased.
- There is lack of access to easily available water when it is required
- Difficulty in water accessibility at the required time
- Despite receiving a lot of rains there are issues in maintaining access to water when it is required.

Personal issues faced

- Each farmer puts in about 12 hours of work starting from 6 am to 6 pm
    - Work involved cutting embankments
    - Ensuring water availability to crops
    - Farmers cut canals to divert water to their fields. This requires vigilance as other farmers will divert water to their fields if left unattended
- Labour requirements are taken care of internally within the community. However there are issues
    - Younger generation are not interested in agriculture
    - In the villages comparatively lower wages are paid to this community
    - Rural to urban migration takes place.people generally go to kerala, bombay, delhi gujarat etc to work as daily wage labourers
    - People return to the fields during the peak season before harvesting.
    - The members of this community come for christmas , stay for 1-1.5 month and then go back to their jobs in the cities.
    - The number of people who are returning back home are not enough to take care of labour related issues and this becomes a problem.

Focus group discussion on farming practises

Participants: Pranjith patowary , Pranab Patowary , Jothin Deka , Basudeb das

- Cultivation of paddy in the area is for only one season from june-july to Nov
- No crops are planted in the rest of the year except for kitchen gardens for own use.
- Farmers interviewed also work as agri labourers in other fields
- All land for cultivation is leased. Farmers are expected to pay the landowner 5 mun per bigha
- Land is provided for lease only for paddy cultivation not for other crops.
- Tractors are easily available and request for the same must be made 2-3 days prior to requirement
- Once an agreement has been made for tractors is it generally upheld
- Power Tillers are also used for ploughing
- Power Tillers are versatile machines as they are used for multiple operations
- However the vibration and jerkiness of the power tiller leads to body pain and stress. This is something they have gotten used to.
- Ploughs are not used, rather only rotavators are used.
- The land in the village is more suitable for izong and joha
- Joha and izong requires less water
- Ranjith and bahadur require more water
- Nursery preparation and transplantation is done by women of the household.

- Generally irrigation is not required but if water is not available then the diesel pumps are used.
- Excess water if any the field usually drains out overnight
- Weeding is not done as the weeds are naturally suppressed
- Pesticide is used 25-30 ml dissolved in 5 litres of water dissolved sprayed where required.
- Fertiliser application is done three times over the course of the paddy cultivation.
    - Once during nursery development
    - Flowering and
    - Paddy maturing stage
- Harvesting of paddy is done manually.
    - Labourers are hired to cut and tie the paddy together
- The paddy is left in the field for a few days and brought back to the house.
- The farmers have heard of combine harvesters and threshers but prefer to use power tillers for threshing .
    - They say the combine harvesters and the threshers end up chopping the stalks into smaller pieces which the cattle do not eat. The straw also acts as the fodder for animals for the entire year
- The paddy is sun dried for 2-3 days and stored on granaries.
    - Some farmers prefer to store the grain by directly dumping the paddy into the granary while others prefer to pack the grains in a gunny bag before putting it in the granary .
- The average yield in the village is about 20 mun (800 kg) per bigha.
- The landless farmers give 5 mun per bigha to the landowner as rent for the land.
- Usually anywhere between 50-70 mun (2000-2800 kg) of paddy is kept for self consumption and the rest is sold
- Depending on the farmer's location , the paddy is sold at the farm itself or farmers go to the local market to sell the paddy.

Focus group discussion with women farmers in Morigaon

- Access to farm machinery is difficult as the nearest available machinery is located about 10-12 km away.
- Only large scale machinery like harvesters are available. Lack of access for large vehicles to the fields is a huge deterrent to hiring machinery.
- There is no small-scale machinery available. Between handheld tools and harvesters there is nothing available in the middle.
- By tradition, external inorganic fertilisers are not used. Cow dung is very common fertilisers used. Small amounts of urea, DAP and Potash are used during the nursery stage to decrease the mortality rate of the seedlings.
- Transplanting is a drudgery task for the women
- In the short term rashes, itching and boils due to women spending a long time in standing water for transplanting.

- Overtime, cases of persisting back pain , dizziness appear.
- There is no machinery for transplanting available .

- Value addition of paddy and rice is done by the local women.
- Rice flour making for making pita bread is done by women.
    - They use mixies or a traditional dhekis to pound the rice
    - Using dhekis to pound the rice puts tremendous strain on the legs and over time it causes injuries due to the repetitive actions over time

farmer field data collection form

Name	Soupen Kumar Madhev	
Location	Dhusra Village, Patanada Block East Singhbhum	
Water Source	Rainfed	
Family Size	7	
Land Holding	4 acres	
Family Member Migrated	3	
Type		

Remarks
The land owned is in 2-3 plots located around the village. The farmer is aware of machineries for farm cultivation due to exposure and training from TRCSC

SL NO	Activity	Account	Difficulty (0-10)	number of Labour required	Cost per acre
1	seed selection and varieties sown	seeds from the previous harvest are used. The most popular varieties grown are lolat and swarna. This year the farmer choose to grow swarna.	NA	NA	NA
2	land preparation	preparation starts with halponya pooja in may. the pooja is prayer for good yields Ploughing of land starts from may. The land is ploughed twice. The first time needs to be done slowly and the second time it can be done quickly. Ploughing is done using tractors there are about 2-4 tractors in each village. An request for tractor needs to be placed 2-3 days prior to the date fo requirement. The land is ploughed after the first rain. it takes about one hour to plough one acre once. once the ploughing is done, the embankments to keep the water in the field are built.	6	NA	2600
3	nursery preparation	5 per cent of the land is dedicated for preparation of nursery. The land is cleared of foreign matter / weeds to increase the yield. After the 2nd rain , the seeds are sown in the field. small amounts of dap , potash and urea are applied	6	2	2000

farmer field data collection form

4	fertiliser application 1	Once the land prepared, approximately one tractor load of cow dung per acre is spread in the fields. there is a transportation charge involved in transport of cow dung which is about 2500 inr per load. One tractor load contains about 2000 kg of cow dung. This quantity of cow dung is something that is accumulated by farmers throughout the year from the their cattle	6	1	2500
5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. It takes about 4 women to transplant 0.3301 acres. the women work for about 8 hours a day . the renumberation each woman recieve is about 150 per day. this amount can vary depending on the quantum of land the women have worked on . as a tikka system of payment is followed	8	4 per day	1800
6	weeding	Deweeding is done about 20-25 days after transplanting similar to transplanting , the deweeding work is also carried out by women. It takes about 3-4 women to deweed 0.3301 acres of land in one day.	8	4 per day	1800
7	spraying of weedicides and pesticid	the use of pestcicides and weedicides is minimal. There are two pesticides that are used for targeting a specific disease called lahi in the local language. It is a fungal infection that causes a whitish layer to develop on the surface of the leaves. All the pesticide / fungicide application is done as a reaction to an infection rather than a prevention measure. 0.3301 acres of land can be sprayed in about 1 hour	7	1	est 450-500
8	Fertiliser application 2	5 kg of urea is applied per 0.3301 acre of land during the flowering stage of the paddy.	7	1	350
9	cutting	.All the paddy harvesting is done by hand as there are no mechanical harvesting means in the nearby regions. 12-14 people are required per acre per day.	8	10-12 per day	1800
10	bundling	the workers who cut the paddy also tie it into bundles of about 1.5 kg each. If the harvest is good then there would be about 500 gram of paddy and 1000 grams of stalk. If the harvest is poor then the quantum of stalk increases.	8	6	900

farmer field data collection form

11	transport	The bundles are carried from the field using labour and tractors. It costs 2000 to hire the tractor for one day to carry out transport work.	7	2	2300
12	threshing	The farmer threshes the paddy at home using logs on which the bundles of paddy are contantly smashed againast to dislodge the paddy from the stalks.	9	2	NA done by farmer themsleves
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy.	9	5	750
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women.	7	1	NA
15	packing	once the paddy is dried , it is packed in gunny bags and put in storage	6	1	NA

pain points in farm activities
lack of labour availability is a big problem. Since irrigation is highly dependant on rains, it makes it difficult to maintain a set schedule during paddy cultivation .
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields at best and complete loss at worst for some farmers
key take aways and learnings
in general paddy cultiavtion by small scale farmers in Jharkahand had minimal fertiliser and pesticide input when compared to other states. Efforts have been made to incorporate modern / advanced paddy cultivation practises such as line sowing , proper seed selection etc. compared to other farmers access to land preparation machinery is better due to the blocks proximity ot the rice bowl of jharkhand in chalukiya and baragodha block.

tikka system of payment
In this system of payment, a set amount of money is fixed per activity per unit of land. Any number of workers can join to complete the activity but the group as a whole will only be paid as per the amount fixed prior. Usually this amount decided upon is slightly more than mojney required to complete the task if daily wage labourers were hired. For example: to complete cutting of mature of one acre of land it 0requires 10-12 workers to complete the job in one day. each worker is paid anywhere between 100-250 (depending on the area).Assuming workrers are paid 150 per day then the total sum of money spent is 1800. In the tikka system the fee fixed for cutting one acre of paddy would be about 1850-1900. this payment is method is very useful for workers who want to finish the job quickly and move one to the next job. it also makes negociating with groups of workers easier. how money is split between the workers is something that is decided amongst themselves

farmer field data collection form

DATA COLLECTION FORM		
Name	Gobind Sara	
Location	Dhusra Village, Patanada Block East Singbhum	
Water Source	Rainfed	
Family Size	5	
Land Holding	7 acres	
Family Member Migrator	not applicable	
Type	rainfed farmer	

remarks
The farmer is aware of machineries for farm cultivation due to exposure and training from TRCSC. Labour availability is a big issue

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	seeds from the previous harvest are used. The most popular varieties grown are lolat and swarna. This year the farmer choose to grow swarna.	NA	NA	NA
2	land preparation	preparation starts with halponya pooja in may. the pooja is prayer for good yields Ploughing of land starts from may. The land is ploughed twice. The first time needs to be done slowly and the second time it can be done quickly. Ploughing is done using tractors there are about 2-4 tractors in each village. An request for tractor needs to be placed 2-3 days prior to the date fo requirement. The land is ploughed after the first rain. it takes about one hour to plough one acre once. once the ploughing is done, the embankments to keep the water in the field are built.	6	NA	2600

farmer field data collection form

3	nursery preparation	5 per cent of the land is dedicated for preparation of nursery. The land is cleared of foreign matter / weeds to increase the yield. After the 2nd rain , the seeds are sown in the field. small amounts of dap , potash and urea are applied	6	2	2000
4	fertiliser application 1	Once the land prepared, approximately one tractor load of cow dung per acre is spread in the fields. there is a transportation charge involved in transport of cow dung which is about 2500 inr per load. One tractor load contains about 2000 kg of cow dung. This quantity of cow dung is something that is acculated by farmers throughout the year from the their cattle	6	1	2500
5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. It takes about 4 women to transplant 0.3301 acres. the women work for about 8 hours a day . the renumberation each woman recieve is about 150 per day. this amount can vary depending on the quantum of land the women have worked on . as a tikka system of payment is followed	8	4 per day	1800
6	weeding	Deweeding is done about 20-25 days after transplanting similar to transplanting , the deweeding work is also carried out by women. It takes about 3-4 women to deweed 0.3301 acres of land in one day.	8	4 per day	1800

farmer field data collection form

7	spraying of weedicides and pesticides	the use of pestcicides and weedicides is minimal. There are two pesticides that are used for targeting a specific disease called lahi in the local language. It is a fungal infection that causes a whitish layer to develop on the surface of the leaves. All the pesticide / fungicide application is done as a reaction to an infection rather than a prevention measure. 0.3301 acres of land can be sprayed in about 1 hour	7	1	est 450-500
8	Fertiliser application 2	5 kg of urea is applied per 0.3301 acre of land during the flowering stage of the paddy.	7	1	350
9	cutting	.All the paddy harvesting is done by hand as there are no mechanical harvesting means in the nearby regions. 12-14 people are required per acre per day.	8	10-12 per	1800
10	bundling	the workers who cut the paddy also tie it into bundles of about 1.5 kg each. If the harvest is good then there would be about 500 gram of paddy and 1000 grams of stalk. If the harvest is poor then the quantum of stalk increases.	8	6	900
11	transport	The bundles are carried from the field using labour and tractors. It costs 2000 to hire the tractor for one day to carry out transport work.	7	2	2300
12	threshing	The farmer threshes the paddy at home using logs on which the bundles of paddy are contantly smashed againast to dislodge the paddy from the stalks.	9	2	NA done by farmer themsleves
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy.	9	5	750
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women.	7	1	NA

15	packing	once the paddy is dried , it is packed in gunny bags and put in storage	6	1	NA

pain points in farm activities
of labour availability is a big problem. Since irrigation is highly dependant on rains, it makes it difficult to maintain a set schedule during paddy cultiv
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields at best and complete loss at worst for some farmers
key take aways and learnings
and had minimal fertiliser and pesticide input when compared to other states. Efforts have been made to incorporate modern / advanced paddy cul

farmer field data collection form

Name	Rashid Mandi	
Location	Dhusra Village, Patanada Block East Singbhum	
Water Source	Rainfed	
Family Size	5	
Land Holding	4.5 acres	
Family Member Migrator	2	
Type	rainfed sustenance farmer	
remarks		
The farmer is aware of machineries for farm cultivation due to exposure and training from TRCSC. Labour availability is a big issue.		

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	seeds from the previous harvest are used. The most popular varieties grown are lolat and swarna. This year the farmer choose to grow swarna.	NA	NA	NA

farmer field data collection form

2	land preparation	preparation starts with halponya pooja in may. the pooja is prayer for good yields Ploughing of land starts from may. The land is ploughed twice. The first time needs to be done slowly and the second time it can be done quickly. Ploughing is done using tractors there are about 2-4 tractors in each village. An request for tractor needs to be placed 2-3 days prior to the date fo requirement. The land is ploughed after the first rain. it takes about one hour to plough one acre once. once the ploughing is done, the embankments to keep the water in the field are built.	6	NA	2600
3	nursery preparation	5 per cent of the land is dedicated for preparation of nursery. The land is cleared of foreign matter / weeds to increase the yield. After the 2nd rain , the seeds are sown in the field. small amounts of dap , potash and urea are applied	6	2	2000
4	fertiliser application 1	Once the land prepared, approximately one tractor load of cow dung per acre is spread in the fields. there is a transportation charge involved in transport of cow dung which is about 2500 inr per load. One tractor load contains about 2000 kg of cow dung. This quantity of cow dung is something that is acculated by farmers throughout the year from the their cattle	6	1	2500

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. It takes about 4 women to transplant 0.3301 acres. the women work for about 8 hours a day . the renumberation each woman recieve is about 150 per day. this amount can vary depending on the quantum of land the women have worked on . as a tikka system of payment is followed	8	4 per day	1800
6	weeding	Deweeding is done about 20-25 days after transplanting similar to transplanting , the deweeding work is also carried out by women. It takes about 3-4 women to deweed 0.3301 acres of land in one day.	8	4 per day	1800
7	spraying of weedicides and pesticides	the use of pestcicides and weedicides is minimal. There are two pesticides that are used for targeting a specific disease called lahi in the local language. It is a fungal infection that causes a whitish layer to develop on the surface of the leaves. All the pesticide / fungicide application is done as a reaction to an infection rather than a prevention measure. 0.3301 acres of land can be sprayed in about 1 hour	7	1	est 450-500
8	Fertiliser application 2	5 kg of urea is applied per 0.3301 acre of land during the flowering stage of the paddy.	7	1	350
9	cutting	.All the paddy harvesting is done by hand as there are no mechanical harvesting means in the nearby regions. 12-14 people are required per acre per day.	8	10-12 per	1800

farmer field data collection form

10	bundling	the workers who cut the paddy also tie it into bundles of about 1.5 kg each. If the harvest is good then there would be about 500 gram of paddy and 1000 grams of stalk. If the harvest is poor then the quantum of stalk increases.	8	6	900
11	transport	The bundles are carried from the field using labour and tractors. It costs 2000 to hire the tractor for one day to carry out transport work.	7	2	2300
12	threshing	The farmer threshes the paddy at home using logs on which the bundles of paddy are contantly smashed againast to dislodge the paddy from the stalks.	9	2	NA done by farmer themsleves
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy.	9	5	750
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women.	7	1	NA
15	packing	once the paddy is dried , it is packed in gunny bags and put in storage	6	1	NA

pain points in farm activities
lack of labour availability is a big problem. Since irrigation is highly dependant on rains, it makes it difficult to maintain a set schedule during paddy cultivation
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields at best and complete loss at worst for some farmers
key take aways and learnings
machinery usage and awareness of the same is higher than usual due to the awareness programs carried out by state and non state actors.Efforts have been made to incorporate modern / advanced paddy cultivation practises such as line sowing , proper seed selection etc

farmer field data collection form

Name	Gayadar singh	
Location	Dhusra Village, Patanada Block East Singbhum	
Water Source	Rainfed	
Family Size	7	
Land Holding	7 acres	
Family Member Migrated	3	
Type		
remarks		
lack of machinery in the for transplanting and weeding is hindering productivity. The nature of land and fragmentation makes it difficult for farm machinery to enter the field.		

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	seeds from the previous harvest are used. The most popular varieties grown are lolat and swarna. This year the farmer choose to grow swarna.	NA	NA	NA

farmer field data collection form

2	land preparation	preparation starts with halponya pooja in may. the pooja is prayer for good yields Ploughing of land starts from may. The land is ploughed twice. The first time needs to be done slowly and the second time it can be done quickly. Ploughing is done using tractors there are about 2-4 tractors in each village. An request for tractor needs to be placed 2-3 days prior to the date fo requirement. The land is ploughed after the first rain. it takes about one hour to plough one acre once. once the ploughing is done, the embankments to keep the water in the field are built.	6	NA	2600
3	nursery preparation	5 per cent of the land is dedicated for preparation of nursery. The land is cleared of foreign matter / weeds to increase the yield. After the 2nd rain , the seeds are sown in the field. small amounts of dap , potash and urea are applied	6	2	2000
4	fertiliser application 1	Once the land prepared, approximately one tractor load of cow dung per acre is spread in the fields. there is a transportation charge involved in transport of cow dung which is about 2500 inr per load. One tractor load contains about 2000 kg of cow dung. This quantity of cow dung is something that is acculated by farmers throughout the year from the their cattle	6	1	2500

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. It takes about 4 women to transplant 0.3301 acres. the women work for about 8 hours a day . the renumberation each woman recieve is about 150 per day. this amount can vary depending on the quantum of land the women have worked on . as a tikka system of payment is followed	8	4 per day	1800
6	weeding	Deweeding is done about 20-25 days after transplanting similar to transplanting , the deweeding work is also carried out by women. It takes about 3-4 women to deweed 0.3301 acres of land in one day.	8	4 per day	1800
7	spraying of weedicides and pesticides	the use of pestcicides and weedicides is minimal. There are two pesticides that are used for targeting a specific disease called lahi in the local language. It is a fungal infection that causes a whitish layer to develop on the surface of the leaves. All the pesticide / fungicide application is done as a reaction to an infection rather than a prevention measure. 0.3301 acres of land can be sprayed in about 1 hour	7	1	est 450-500
8	Fertiliser application 2	5 kg of urea is applied per 0.3301 acre of land during the flowering stage of the paddy.	7	1	350

farmer field data collection form

9	cutting	.All the paddy harvesting is done by hand as there are no mechanical harvesting means in the nearby regions. 12-14 people are required per acre per day.	8	10-12 per day	1800
10	bundling	the workers who cut the paddy also tie it into bundles of about 1.5 kg each. If the harvest is good then there would be about 500 gram of paddy and 1000 grams of stalk. If the harvest is poor then the quantum of stalk increases.	8	6	900
11	transport	The bundles are carried from the field using labour and tractors. It costs 2000 to hire the tractor for one day to carry out transport work.	7	2	2300
12	threshing	The farmer threshes the paddy at home using logs on which the bundles of paddy are contantly smashed againast to dislodge the paddy from the stalks.	9	2	NA done by farmer themsleves
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy.	9	5	750
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women.	7	1	NA
15	packing	once the paddy is dried , it is packed in gunny bags and put in storage	6	1	NA

farmer field data collection form

pain points in farm activities
lack of labour availability is a big problem. Since irrigation is highly dependant on rains, it makes it difficult to maintain a set schedule during paddy cultivation
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields at best and complete loss at worst for some farmers
key take aways and learnings
SRI practises was done but discarded due to high labour requirements. However best practices from the SRI have been incorporated such as line sowning and single seedling transplanting per hill

farmer field data collection form

Name	Kumar tudu, 36 years old.	
Location	Mora takura Village, Godha Bandha Block, East Singhbum	
Water Source	Rainfed	
Family Size	7	
Land Holding	13 Bigha (5 acres)	
Family Member Migrated	3	
Type	rain fed farmer	
remarks		
the village by nature is remote and is difficult to reach without private transport. This makes hiring machinery for farm operation much more expensive than usual		

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	Swarna is the preferred paddy variety to be cultivated as it provides higher yield when compared to other available varieties.	NA	NA	NA
2	land preparation	The land preparation begins in may .A tractor from other farmers is hired.. The land needs to be ploughed twice with a gap of 4-5 days between each ploughing. It costs about 1400 per hour to plough one acre once. A 2-3 day prior notice is to be given for booking the tractor for rent.	3	NA	2800
3	nursery preparation	5-6 kg of seed is used per acre. The seeds are filled in a jute bag which is soaked in water for about 12 hours before it is sown in the nursery.	NA	NA	NA
4	fertiliser application 1	prior to transplanting 14 kg of DAP per acre is applied in the main fields.	6	1	390

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. It takes about 6-7 women to transplant 0.3301 acres per day. the women work for about 8 hours a day . the renumberation each woman recieve is about 100-120 per day. it takes about 6-7 days to complete the transplanting	8	21	3150
6	weeding	Deweeding is done about 20-25 days after transplanting similar to transplanting , the deweeding work is also carried out by women. It takes about 3-4 women to deweed 0.3301 acres of land in one day.	6	1	210
7	spraying of weedicides and pesticides	the use of pestcicides and weedicides is minimal. There are two pesticides that are used for targeting a specific disease called lahi in the local language. It is a fungal infection that causes a whitish layer to develop on the surface of the leaves. All the pesticide / fungicide application is done as a reaction to an infection rather than a prevention measure. 0.3301 acres of land can be sprayed in about 1 hour	7	1	300
8	Fertiliser application 2	twenty one days after the transplanting and immediately after weeding a second round of fertilisers is applied. 15-16 kg urea is applied . 70 days after transplanting dueing the paddy maturing phase 5 kg of urea per acre is applied.	7	1	540

farmer field data collection form

9	mechanised harvesting	2 of the 5 acres is harvested using a combine harvester. To hire the combine harvester a 7 day notice is required. It costs about 4000 per hour and it can harvest about 1 acre per hour. Due to the land geography and inaccessibilty only 2 of the 5 acres can be harvested by machinery, the rest needs to be harvested by hand.	NA	NA	4000
9	cutting	Paddy harvesting is doen by a mix of mechanised harvesting and manual harvesting. Wherever the harvester cannot reach it is done by manual labout. It takes 6 workers to cut one bigha per day. It takes about 20 days to complete the entire harvesting process by hand.	8	6 per day for 3 days	4320
10	bundling and transport	the workers only cut the paddy and lay it on it its side. It is allowed to dry for one day. 6 workers are hired to bundle and transport the paddy bundles back home.	8	6 workers perday	4320
12	threshing	A traditional paddy threshing device consisting of a horizontally rotating cylinder powered by a 0.5 hp electric motor to thresh the paddy. The cylinder is fixed with with steel loops which catch onto the paddy as the bundles are pressed onto the cylinder while it is rotating. it takes about 7 days to thresh the paddy from 3 acres. using the machinery and it requires 4 workers per day.	7	7 workers	1000
13	winnowing	An electric fan is used to winnow the paddy . It takes about 3 days to winnow the paddy and an additional 2 labourers working over 3 days to complete the winnowing.	8	2	240
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dried for about 2 3 days. This task is generally done by women.	NA	2	NA

farmer field data collection form

15	transportation and storage	the paddy needs to be transported to the storage from where it dried. 2 labourers over 2 days work to pack and store the paddy in the designated storage room . It is usually stored for a minimum of 6 months before it is sold. Sometimes the paddy maybe sold earlier if the market price is good. 20 quintal of paddy is kept aside for self consumption and the remainder is sold in phases.	7	2	240

pain points in farm activities
hidden conditions in subsidies schemes and lack of communication of the entire scheme makes farmers feel cheated when they try to avail the schemes and their applications are rejected for not meeting parameters
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields at best and complete loss at worst for some farmers.
key take aways and learnings
despite being dependant on rain for irrigation , the soil and climatic condition allow for good yields in the region.

farmer field data collection form

Name	Rani besera
Location	Mora takura Village, Godha Bandha Block, East Singbhum
Water Source	Rainfed
Family Size	5
Land Holding	7 Bigha
Family Member Migrator	not applicable
Type	

remarks

through the efforts of NGOs in the area, awareness has been raised regarding other climate and land appropriate crops. Farmers have started cultivating flaxseed under their guindance and have seen encouraging results

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	Swarna is the preferred paddy variety to be cultivated as it provides higher yield when compared to other available varieties.	NA	NA	NA
2	land preparation	The land preparation begins in may .A tractor from other farmers is hired.. The land needs to be ploughed twice with a gap of 4-5 days between each ploughing. It costs about 1400 per hour to plough one acre once. A 2-3 day prior notice is to be given for booking the tractor for rent.	3	NA	2800
3	nursery preparation	5-6 kg of seed is used per acre. The seeds are filled in a jute bag which is soaked in water for about 12 hours before it is sown in the nursery.	NA	NA	NA
4	fertiliser application 1	prior to transplanting 14 kg of DAP per acre is applied in the main fields.	6	1	390

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. It takes about 6-7 women to transplant 0.3301 acres per day. the women work for about 8 hours a day . the renumberation each woman recieve is about 100-120 per day. it takes about 6-7 days to complete the transplanting	8	21	3150
6	weeding	Deweeding is done about 20-25 days after transplanting similar to transplanting , the deweeding work is also carried out by women. It takes about 3-4 women to deweed 0.3301 acres of land in one day.	6	1	210
7	spraying of weedicides and pesticides	the use of pestcicides and weedicides is minimal. There are two pesticides that are used for targeting a specific disease called lahi in the local language. It is a fungal infection that causes a whitish layer to develop on the surface of the leaves. All the pesticide / fungicide application is done as a reaction to an infection rather than a prevention measure. 0.3301 acres of land can be sprayed in about 1 hour	7	1	300
8	Fertiliser application 2	twenty one days after the transplanting and immediately after weeding a second round of fertilisers is applied. 15-16 kg urea is applied . 70 days after transplanting dueing the paddy maturing phase 5 kg of urea per acre is applied.	7	1	540
9	cutting	It takes 6 workers to cut one bigha per day. One acre is done in in about 3 days	8	6 per day for 3 days	4320
10	bundling	the workers only cut the paddy and lay it on it its side. It is allowed to dry for one day. 6 workers are hired to bundle and transport the paddy bundles back home.	8	6 workers perday	4320

farmer field data collection form

12	threshing	A traditional paddy threshing device consisting of a horizontally rotating cylinder powered by a 0.5 hp electric motor to thresh the paddy. The cylinder is fixed with with steel loops which catch onto the paddy as the bundles are pressed onto the cylinder while it is rotating. it takes about half a day to thresh the paddy from 1 acre. To use the machinery and it requires 4 workers per day.	7	7 workers	1000
13	winnowing	An electric fan is used to winnow the paddy . It takes about 3 days to winnow the paddy and an additional 2 labourers working over 3 days to complete the winnowing.	8	2	240
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dried for about 2-3 days. This task is generally done by women.	NA	2	NA
15	transportation and storage	the paddy needs to be transported to the storage from where it dried. 2 labourers over 2 days work to pack and store the paddy in the designated storage room . It is usually stored for a minimum of 6 months before it is sold. Sometimes the paddy maybe sold earlier if the market price is good. 20 quintal of paddy is kept aside for self consumption and the remainder is sold in phases.	7	2	240

pain points in farm activities
lack of labour availability is a big problem. Since irrigation is highly dependant on rains, it makes it difficult to maintain a set schedule during paddy cultivation
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields at best and complete loss at worst for some farmers
key take aways and learnings

farmer field data collection form

The drudgery due to transplanting, deweeding and harvesting is very high and incidence of injury is very frequent. This work is also done mainly by women Injuries also happen on the hands. Excessive exposure to standing water also increases the incidence of rashes and other skin diseases.

farmer field data collection form

Name	Guru Prasad Soren	
Location	Village, aswa block Rajanagar, District Sarai Kela Kharsawan	
Water Source	Rainfed	
Family Size	5	
Land Holding	100 acres	
Family Member Migrated	not applicable	
Type	rainfed farmers	
remarks		
although the farmer owns a lot of land he only cultivates about 25 acres and the rest is rented to other farmers.irrigation is not carried out in any form. Farmers are completely dependant in the rain		

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	New seeds are bought every year at the cost of 400 inr per packet which contains about 3 kg of seed. The farmer buys about 6 kg of seed per acre . Locally the seeds are known as kaveri.	3	NA	800
2	land preparation	the land is ploughed 3 times with one week gap between each ploughing . The ploughing starts in May. It takes about 1.5 hours to plough one acre of land once	NA	NA	4800
3	nursery preparation	once the land is ploughed , farmers wait for the rain. Once 2-3 showers with adequate rains arrive then farmers mix about 2-3 baskets of dung into the nursery. The area of the nursery is about 40*60 feet per acre. The seeds are planted directly into the field without any seed selection or prior preparation.	4	1	150-200
4	fertiliser application 1	fertilisers are not applied at all. Except for in the nursery where cow dung is applied.	NA	NA	NA

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. It takes about 30 women to transplant one acre of paddy. The women work for about 5 hours per day . They work from 10am to 1 pm and from 3 pm to 5 pm. The women are paid about 100 INR per day	8	30	3000
6	weeding	Weeding is done one month after transplatation. The quantum of deweeding depends on the amount of water in the field. if there is more water and more effort and labour is required to do the deweeding. The previous year had inadequate rains which resulted in more labout being hired 30 workers per acre.	8	30	3000
7	spraying of weedicides and pesticides	NO pesticides and weedicides are applied	NA	NA	NA
8	Fertiliser application 2	fertilisers are not used at all.	NA	NA	NA
9	cutting	.All the paddy harvesting is done by hand. 30 workers are capable of harvesting one acre of paddy in one day. The workers are only responsible for cutting the paddy and placing it on the ground. The workers only work from 10 am to 5 pm with a lunvh break in between which is fulfilled by the lnad owner. the costs about 30 INR per head	9	30	3300
10	bundling	the paddy is allowed to dry for about 4-5 days before it is bundled. To bundle the paddy 5-6 workers are required. Who are each paid 100 per head per day.	8	6	660
11	transport	The bundles are carried from the field using labour and tractors. It costs 1000 to hire the tractor per trip and it requires 3 trips to transport the paddy from the field to the house. This 1000 inr paid also includes the loading and unloading of paddy bundles onto the tractors. additionally an additional worker is required to cut the embankments in the fields to make way for the tractor.	7	7	3000

farmer field data collection form

12	threshing	threshing of paddy is done using traditional paddy threshing machinery which is powered by electricity. The machine was bought by the farmer 10 years ago at a cost of 3500 Inr	7	4	1000
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy. It requries four workers to winnow one acre of paddy in one day	7	4	600
14	drying and packing	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women.once the paddy is dried and tis moisture content is brought below 17% then it is stored .	NA	NA	NA

pain points in farm activities
lack of labour availability is a big problem. Since irrigation is highly dependant on rains, it makes it difficult to maintain a set schedule during paddy cultivation . Lack of machinery for farm processes hinder productivity.
climate related problems
untimely arrival of rains and the lack of rains during critical times affect crop yields.
key take aways and learnings
the farmer does not use fertilisers and pesticides. He also focuses on traditional varieties and local varieties which get a much higher price in the market however only small quantities are grown.

farmer field data collection form

Name	Qoren Soren	
Location	Bankati block Rajanagar, District Sarai Kela Kharsawan	
Water Source	Rainfed	
Family Size	7	
Land Holding	12 Acres Cultivated only 6	
Family Member Migrated	3	
Type		
remarks		
the total landholding is 12 acres but only six is cultivated as he is not bale to get enough workers to cultivate all the land.there are no tractors in the village and it needs to be hired from other villages		

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	New seeds are bought every year at the cost of 400 inr per packet which contains about 3 kg of seed. The farmer buys about 6 kg of seed per acre. Which is a total of 4800 inr. Locally the seeds are known as kaveri.	NA	NA	800
2	land preparation	the land is ploughed 3 times with one week gap between each ploughing . The ploughing starts in May. It takes about 1.5 hours to plough one acre of land once	NA	NA	4800
3	nursery preparation	once the land is ploughed , farmers wait for the rain. Once 2-3 showers with adequate rains arrive then farmers mix about 2-3 baskets of dung into the nursery. The area of the nursery is about 40*60 feet per acre. The seeds are planted directly into the field without any seed selection or prior preparation.	4	1	150-200
4	fertiliser application 1	fertilisers are not applied at all. Except for in the nursery where cow dung is applied.	NA	NA	NA

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. It takes about 30 women to transplant one acre of paddy. The women work for about 5 hours per day . They work from 10am to 1 pm and from 3 pm to 5 pm. The women are paid about 100 INR per day	8	30	3000
6	weeding	Weeding is done one month after transplatation. The quantum of deweeding depends on the amount of water in the field. if there is more water and more effort and labour is required to do the deweeding. The previous year had inadequate rains which resulted in more labout being hired 30 workers per acre.	8	30	3000
7	spraying of weedicides and pesticides	manual sprayers are used to spray weedicides in the field. Spraying is done as a reaction to a symptom rather than as a prevention measure . If there is no symptoms spraying is not done. 4 bottles of medicines are bought from rajnagarwhich cost about 150 each with about 100 ml in each bottle.	7	1	550
8	Fertiliser application 2	fertilisers are not used at all.	NA	NA	NA
9	harvesting	combine harvesters are hired to harvest the field . It takes about 5 hours to harvest 6 acres and it costs 1400 per hour	NA	NA	1400
10	drying and packing	the harvested paddy is dried at home for 2-3 days before it is packed and stored.	NA	NA	NA

pain points in farm activities
lack of labour availability is a big problem. Since irrigation is highly dependant on rains, it makes it difficult to maintain a set schedule during paddy cultivation . Lack of machinery for farm processes hinder productivity.
climate related problems
untimely arrival of rains and the lack of rains during critical times affect crop yields.

farmer field data collection form

key take aways and learnings
In this village machinery awareness and usage has increased as evidenced by the presence of the combine harvester.

farmer field data collection form

Name	Bandi hari tudu
Location	Village, Badapur,block Rajanagar, District Sarai Kela Kharsawan
Water Source	Rainfed
Family Size	5
Land Holding	As 5 Acres cultivation only 3
Family Member Migrated	not applicable
Type	rainfed farmer

remarks
irrigation is wholely dependant on rain. Ground water is not used and easily accessible surface water is not available.

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	thefarmer cultivates a variety known as bali bhojana	NA	NA	NA
2	land preparation	the land is ploughed 3 times with one week gap between each ploughing . The ploughing starts in May. It takes about 1.5 hours to plough one acre of land once	NA	NA	4800
3	nursery preparation	once the land is ploughed , farmers wait for the rain. Once 2-3 showers with adequate rains arrive then farmers mix about 2-3 baskets of dung into the nursery. The area of the nursery is about 40*60 feet per acre. The seeds are planted directly into the field without any seed selection or prior preparation.	4	1	150-200
4	fertiliser application 1	In the nursery where cow dung is applied. In the field 15-20 kg of DAP per acre is applied.	7	1	750

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. It takes about 30 women to transplant one acre of paddy. The women work for about 5 hours per day . They work from 10am to 1 pm and from 3 pm to 5 pm. The women are paid about 100 INR per day	8	30	3300
6	weeding	Weeding is done one month after transplatation. The quantum of deweeding depends on the amount of water in the field. if there is more water and more effort and labour is required to do the deweeding. The previous year had inadequate rains which resulted in more labout being hired 30 workers per acre.	8	30	3300
7	spraying of weedicides and pesticides	manual sprayers are used to spray weedicides in the field. Spraying is done as a reaction to a symptom rather than as a prevention measure . If there is no symptoms spraying is not done. 4 bottles of medicines are bought from rajnagar which cost about 150 each with about 100 ml in each bottle.	7	1	650
8	Fertiliser application 2	15 days after transplanting 30 kg of urea per acre is applied	7	1	350
9	cutting	.All the paddy harvesting is done by hand. 30 workers are capable of harvesting one acre of paddy in one day. The workers are only responsible for cutting the paddy and placing it on the ground. The workers only work from 10 am to 5 pm with a lunvh break in between which is fulfilled by the land owner. the costs about 30 INR per head. the workers are paid about 120 inr per day.	9	30	4000
10	bundling	the paddy is allowed to dry for about 4-5 days before it is bundled. To bundle the paddy 5-6 workers are required. Who are each paid 100 per head per day.	8	6	780

farmer field data collection form

11	transport	The bundles are carried from the field using labour and tractors. It costs 1000 to hire the tractor per trip and it requires 3 trips to transport the paddy from the field to the house. This 1000 inr paid also includes the loading and unloading of paddy bundles onto the tractors. additionally an additional worker is required to cut the embankments in the fields to make way for the tractor.	7	7	3000
12	threshing	threshing of paddy is done using traditional paddy threshing machinery which is powered by electricity. A small paddy thresher is rented. There are two types of paddy threshers avaible for rent which are manual paddy thresher which costs about 100 per day to rent and an electric thresher which costs about 2000 inr per day.	7	4	1000
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy. It requries four workers to winnow one acre of paddy in 4-5 hours	7	4	600
14	drying and packing	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women.once the paddy is dried and tis moisture content is brought below 17% then it is stored .			

pain points in farm activities
lack of labour has resticted the farmer from cultivating all his land. As he is only able to cultivate about 60% of his land. S
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields.

farmer field data collection form

key take aways and learnings
the fragmented nature of land and the lack of accessibilty to the same makes it difficult to introduce large machinery. Hand held powered machienry that can be easily carried by one person must be explored.

farmer field data collection form

Name	Karthik mahato	
Location	Village Madarasai, block Rajanagar, District Sarai Kela Kharsawan	
Water Source	rainfed	
Family Size	7	
Land Holding	5 Acre	
Family Member Migrated	NA	
Remarks		
the farmer does cultivation of paddy in a smallscale		

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	New seeds are bought every year at the cost of 400 inr per packet which contains about 3 kg of seed. The farmer buys about 6 kg of seed per acre. Which is a total of 4800 inr. Locally the seeds are known as kaveri.	NA	NA	NA
2	land preparation	the land is ploughed 3 times with one week gap between each ploughing . The ploughing starts in May. It takes about 1.5 hours to plough one acre of land once	NA	NA	4800
3	nursery preparation	once the land is ploughed , farmers wait for the rain. Once 2-3 showers with adequate rains arrive then farmers mix about 2-3 baskets of dung into the nursery. The area of the nursery is about 40*60 feet per acre. The seeds are planted directly into the field without any seed selection or prior preparation.	4	1	150-200
4	fertiliser application 1	In the nursery where cow dung is applied. In the field 15-20 kg of DAP per acre is applied.	7	1	750

farmer field data collection form

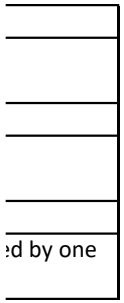
5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. It takes about 30 women to transplant one acre of paddy. The women work for about 5 hours per day . They work from 10am to 1 pm and from 3 pm to 5 pm. The women are paid about 100 INR per day	8	30	3300
6	weeding	Weeding is done one month after transplatation. The quantum of deweeding depends on the amount of water in the field. if there is more water and more effort and labour is required to do the deweeding. The previous year had inadequate rains which resulted in more labout being hired 30 workers per acre.	8	30	3300
7	spraying of weedicides and pesticides	manual sprayers are used to spray weedicides in the field. Spraying is done as a reaction to a symptom rather than as a prevention measure . If there is no symptoms spraying is not done. 4 bottles of medicines are bought from rajnagarwhich cost about 150 each with about 100 ml in each bottle.	7	1	650
8	Fertiliser application 2	fertilisers are not used at all.	7	1	350
9	cutting	.All the paddy harvesting is done by hand. 30 workers are capable of harvesting one acre of paddy in one day. The workers are only responsible for cutting the paddy and placing it on the ground. The workers only work from 10 am to 5 pm with a lunvh break in between which is fulfilled by the lnad owner. the costs about 30 INR per head	9	30	4000
10	bundling	the paddy is allowed to dry for about 4-5 days before it is bundled. To bundle the paddy 5-6 workers are required. Who are each paid 100 per head per day.	8	6	780

farmer field data collection form

11	transport	The bundles are carried from the field using labour and tractors. It costs 1000 to hire the tractor per trip and it requires 3 trips to transport the paddy from the field to the house. This 1000 inr paid also includes the loading and unloading of paddy bundles onto the tractors. additionally an additional worker is required to cut the embankments in the fields to make way for the tractor.	7	7	3000
12	threshing	threshing of paddy is done using traditional paddy threshing machinery which is powered by electricity. The machine was bought by the farmer 10 years ago at a cost of 3500 Inr	7	4	1000
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy. It requries four workers to winnow one acre of paddy in one day	7	4	600
14	drying and packing	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women.once the paddy is dried and tis moisture content is brought below 17% then it is stored .	NA	NA	NA

pain points in farm activities
the difficulty in organising labour and getting the work done is increasing. Migration of the yoounger generation to urban areas is making it difficult.
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields.
key take aways and learnings
the fragmented nature of land and the lack of accessibilty to the same makes it difficult to introduce large machinery. Hand held powered machienry that can be easily carrie person must be explored.

farmer field data collection form



farmer field data collection form

Name	Panu Murmu
Location	Village Aswa, block Rajanagar, District Sarai Kela Kharsawan
Water Source	rainfed
Family Size	7
Land Holding	6 acre
Family Member Migrator	1
Type	

remarks

there is a lack of machinery in the village and it needs to be hired from other villages that re several kilometers away. This makes it very expensive to rent machinery. Irrigation is completely dependant on god. (god wills it)

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	New seeds are bought every year at the cost of 400 inr per packet which contains about 3 kg of seed. The farmer buys about 6 kg of seed per acre. Which is a total of 4800 inr. Locally the seeds are known as kaveri.	NA	NA	800
2	land preparation	the land is ploughed 3 times with one week gap between each ploughing . The ploughing starts in May. It takes about 1.5 hours to plough one acre of land once. It costs about 1600 per hour	NA	NA	3200
3	nursery preparation	once the land is ploughed , farmers wait for the rain. Once 2-3 showers with adequate rains arrive then farmers mix about 2-3 baskets of dung into the nursery. The area of the nursery is about 40*60 feet per acre. The seeds are planted directly into the field without any seed selection or prior preparation.	4	1	150-200
4	fertiliser application 1	DAP at the rate of 15 kg per acre is applied just prior to transplanting	6	1	600

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. It takes about 30 women to transplant one acre of paddy. The women work for about 5 hours per day . They work from 10am to 1 pm and from 3 pm to 5 pm. The women are paid about 100 INR per day	8	30	3000
6	weeding	Weeding is done one month after transplatation. The quantum of deweeding depends on the amount of water in the field. if there is more water and more effort and labour is required to do the deweeding. The previous year had inadequate rains which resulted in more labout being hired 30 workers per acre.	8	30	3000
7	spraying of weedicides and pesticides	manual sprayers are used to spray weedicides in the field. Spraying is done as a reaction to a symptom rather than as a prevention measure . If there is no symptoms spraying is not done. 4 bottles of medicines are bought from rajnagarwhich cost about 150 each with about 100 ml in each bottle.	7	1	350
8	Fertiliser application 2	Urea at the rate of 35 kg per acre is applied applied 30-35 days after transplanting . Application of fertiliser coincides with the completion of weeding	6	1	450
9	cutting	.All the paddy harvesting is done by hand. 30 workers are capable of harvesting one acre of paddy in one day. The workers are only responsible for cutting the paddy and placing it on the ground. The workers only work from 10 am to 5 pm with a lunvh break in between which is fulfilled by the lnad owner. the costs about 30 INR per head	9	30	3300

farmer field data collection form

10	bundling	the paddy is allowed to dry for about 4-5 days before it is bundled. To bundle the paddy 5-6 workers are required. Who are each paid 100 per head per day.	8	6	600
11	transport	The bundles are carried from the field using labour and tractors. It costs 1000 to hire the tractor per trip and it requires 3 trips to transport the paddy from the field to the house. This 1000 inr paid also includes the loading and unloading of paddy bundles onto the tractors. additionally an additional worker is required to cut the embankments in the fields to make way for the tractor.	6	2	3000
12	threshing	threshing of paddy is done using traditional paddy threshing machinery which is powered by electricity. The machine is rented . The manual one costs about 100 per day and the electric one about 200 per day	7	1	200
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy. It requries four workers to winnow one acre of paddy in one day	7	4	550
14	drying and packing	the paddy is laid out onto the ground over a clean surface or mat and is dired for about 2-3 days. This task is generally done by women. once the paddy is dried and tis moisture content is brought below 17% then it is stored .	7	1	NA

pain points in farm activities
accessibilty to te nearest town is difficult without personal/ hired transport as the roads are in very poor condition.
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields. The temperature has also been increasing the summer months and it was much hotter than usual .
key take aways and learnings

the fragmented nature of land and the lack of accessibilty to the same makes it difficult to introduce large machinery. Hand held powered machinery that can be easily carried by one person must be explored.

farmer field data collection form

Name	Bodheshwara tava Bhagath	
Location	Thapkara, Block palkot Gomla District	
Water Source	rainfed	
Family Size	7	
Land Holding	5 Acres 1 acres land no. 2, 1.5 acres is land no. 1, land no. 3 is 3 acres	
Family Member Migrated	3	
Type	rainfed farmer	

Remarks

the land owned by the farmer is very fragmented and the topography and the geography of the land also varies widely. The land in Jharkhand can be broadly classified in three ways:low land , midland and uplands. Locally known as land type 1,2,3 respectively. the farmer owns land in all the three topographies

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	swarna and lolat varieties are preferred in the village. Farmers also grow local paddy varieties. The farmer was earlier dependant on the seeds provided by the kvk and other govt institutions but made his own arrangements as the seeds supply was coming to late. he got seeds from the previous harvest made by other farmers	NA	NA	NA
2	land preparation	Bullocks are used to plough the land. It takes about 5-7 hours to plough one acreof land with bullocks. If the bullocks need to be rented then it costs about 350 per day.	10	2	500
3	nursery preparation	the nursery bed is ploughed and raised 6 inches above the surrounding land and allo for easy drainage of water from the soil. the seeds are soaked in water overnight and sown in the nursery. It requires about 10 kg of seed per acre.	5	1	

farmer field data collection form

4	fertiliser application 1	Once the land is ploughed , cow dung accumulated over the year is applied. onto the land. about one tractor load of cow dung which weighs about 2.5 tons is used per acre. this also requires hired help and one worker is hired	6	1	2300	
8	Fertiliser application 2	just prior to transplanting , 15kg of urea per acre is scattered in the field	6	1	250	
5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usually 1-3 days after the rains falls transplanting is done. The transplanting is done by women. Line sowing of paddy is followed and one seedling per hill is done two if the seedlings are a bit wilted. it takes about 22-25 labourers to plant one acre of paddy per day and a tikka system of payment is follwed as it gets the work doen quicker. it costs about 200-225 per per worker per day including food. the women work from 9am to 5pm with a break in between.	8	22-25	4950	
7	weeding	Deweeding is done about 20-25 days after transplanting . If line sowing is followed then a conoweeder is used to deweed the field. if line sowing is not done, then women are hired. 2 women working for 7 hours a day can deweeding one acre in one day.	8	1	200/400	conoweeder cost / labour cost
8	spraying of weedicides and pesticides	only organic pesticides and weedicides are used. Extracts from plants that have a bitter taste profile like neem, bamboo are dissolved in water and sprayed in the field. ythese are pkants that are not consumed by animals.	7	1	NA	

farmer field data collection form

9	cutting	. It takes 15 workers to cut one acre per day. To cut all the land it takes about 5 days to complete the job. The workers only cut and place the paddy stalks on the ground. The stalks are allowed to dry for about 3 days before they are bundled.	8	15	3000
10	bundling	the paddy straws are gathered into bundles, the bundles are then evely tied to ends of a rod called as a ahanti. The rod is then carried back home. The farmer's plots are located about 1.5 km away from his home. The plots are also not accessible by tractor, forcing the farmer to carry the bundles back home manually.	9	15	3000
11	threshing	threshing of paddy is done using cattle. The cattle constantly walk over the paddy bundles till the paddy is dislodged. It takes about 15 hours to thresh one acre of paddy with 5 head of cattle. The farmer his own cattle . Additional 2 workers are hired to help with the threshing	8	2	400
12	winnowing		8	3	450-500
13	drying	the paddy is laid out onto the ground over a clean surface or mat and is dried for about 2-3 days. This task is generally done by women.	7	2	NA
14	transportation and storage	the paddy needs to be transported to the storage from where it dried. 2 labourers over 2 days work to pack and store the paddy in the designated storage room . The produced paddy is not sold and the entirety of the paddy cultivated is kept for self consumption	7	2	NA

pain points in farm activities
Lack of machinery for all activities make it difficult to progress beyond sustenance farming. The plots of land owned are also very small and make it difficult to use machinery . Lack of ease of access to the land owned by the farmer by road is a major factor. Each plot of the farmer's land is
climate related problems

farmer field data collection form

the rains in the previous year (2022) was very delayed and this resulted in a drop in yields. The temperature has also been increasing the summer months and it was much hotter than usual .
key take aways and learnings
lack of access to water other than rainfall make it difficult to follow schedules and things need to be done as the rainfall. Ensuring water availibility even when there is a gap in the rains will go a long way in protecting crops .

farmer field data collection form

Name	James kriketa	
Location	Thapkara, Block palkot Gomla District	
Water Source	rainfed	
Family Size	5	
Land Holding	2 acres land no.2	
Family Member Migrated	not applicable	
Type		

Remarks

the primary source of income for the farmer is from cultivation of vegetables.. All the paddy that is grown is kept aside for self consumption. The quantum of land holding is very small. The farmer has also received a lot of support and guindance from the local kvks and pradan that has provided him with exposure visits in Bengal, demonstrated best cultiavation practises etc.

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	swarna and lolat varieties are preferred in the village. Farmers also grow local paddy varieties. The farmer was earlier dependant on the seeds provided by the kvk and other govt institutions but made his own arrangements as the seeds supply was coming to late.	NA	NA	NA
2	land preparation	Bullocks are used to plough the land. It takes about 5-7 hours to plough one acreof land with bullocks. If the bullocks need to be rented then it costs about 350 per day. The land is ploughed 5 times during may and june after the first shower.	10	2	500
3	nursery preparation	the nursery bed is ploughed and raised 6 inches above the surrounding land and allo for easy drainage of water from the soil. the seeds are soaked in water overnight and sown in the nursery. It requires about 10 kg of seed per acre.	5	1	

farmer field data collection form

4	fertiliser application 1	Once the land is ploughed , cow dung accumulated over the year is applied. onto the land. about one tractor load of cow dung which weighs about 2.5 tons is used per acre. this also requires hired help and one worker is hired	6	1	2300
8	Fertiliser application 2	just prior to transplanting , 5kg of urea and DAP are scattered in the field	6	1	250
5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. Line sowing of paddy is followed and one seedling per hill is done two if the seedlings are a bit wilted. it takes about 22-25 labourers to plant one acre of paddy per day and a tikka system of payment is follwed as it gets the work doen quicker. it costs about 120 per per worker per day including food. the women work from 9am to 5pm with a break in between.	8	22-25	4950
6	weeding	Deweeding is done about 20-25 days after transplanting . If line sowing is followed then a conoweeder is used to deweed the field. if line sowing is not done, then women are hired. 2 women working for 7 hours a day can deweeding one acre in one day.	8	1	200/400
7	spraying of weedicides and pesticides	only organic pesticides and weedicides are used. Extracts from plants that have a bitter taste profile like neem, bamboo are dissolved in water and sprayed in the field. the farmer has noticed the plants that are n	7	1	NA

farmer field data collection form

9	cutting	. It takes 15 workers to cut one acre per day. To cut all the land it takes about 5 days to complete the job. The workers only cut and place the paddy stalks on the ground. The stalks are allowed to dry for about 3 days before they are bundled.	8	15	3000
10	bundling	the paddy straws are gathered into bundles, the bundles are then evely tied to ends of a rod called as a ahanti. The rod is then carried back home. The farmer's plots are located about 1.5 km away from his home. The plots are also not accessible by tractor, forcing the farmer to carry the bundles back home manually.	6	3	450
12	threshing	threshing of paddy is done using cattle. The cattle constantly walk over the paddy bundles till the paddy is dislodged.	8	3	450-500
13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy. It requries four workers to winnow one acre of paddy in one day	8	3	450-500
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dried for about 2-3 days. This task is generally done by women.	7	2	NA
15	transportation and storage	the paddy needs to be transported to the storage from where it dried. 2 labourers over 2 days work to pack and store the paddy in the designated storage room . It is usually stored for a minimum of 6 months before it is sold. Sometimes the paddy maybe sold earlier if the market price is good. 20 quintal of paddy is kept aside for self consumption and the remainder is sold in phases.	7	2	NA
pain points in farm activities					
the amount of land owned by the farmer is very small and whatever paddy is cultiavtion is only enough for self consumption. The lack of					

access from the road to his field make it very difficult is get machinery to his field. it does not benefit him even if there is machinery readily
climate related problems
the rains in the previous year (2022) was very delayed and this resulted in a drop in yields. The temperature has also been increasing the summer months and it was much hotter than usual .
key take aways and learnings
the farmer is also involved in cultivation of vegetables and this provides him with most of the disposable income.

farmer field data collection form

Name	Prabal Kriketa
Location	Orbenga, Block palkot Gomla District
Water Source	rainfed
Family Size	4
Land Holding	2 acres land No. 02
Family Member Migrator	1
Type	

remarks

The quantum of land owned by the farmer is very small and it is of type 2. however the land is very close to his house.

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	swarna and lolat varieties are preferred in the village. Farmers also grow local paddy varieties. The farmer was earlier dependant on the seeds provided by the kvk and other govt institutions but made his own arrangements as the seeds supply was coming to late.	NA	NA	NA
2	land preparation	Bullocks are used to plough the land. It takes about 5-7 hours to plough one acreof land with bullocks. If the bullocks need to be rented then it costs about 350 per day. The land is ploughed 5 times during may and june after the first shower.	10	2	500
3	nursery preparation	the nursery bed is ploughed and raised 6 inches above the surrounding land and allo for easy drainage of water from the soil. the seeds are soaked in water overnight and sown in the nursery. It requires about 10 kg of seed per acre.	5	1	
4	fertiliser application 1	Once the land is ploughed , cow dung accumulated over the year is applied. onto the land. about one tractor load of cow dung which weighs about 2.5 tons is used per acre. this also requires hired help and one worker is hired	6	1	2300
8	Fertiliser application 2	just prior to transplanting , 5kg of urea and DAP are scattered in the field	6	1	250

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. Line sowing of paddy is followed and one seedling per hill is done two if the seedlings are a bit wilted. it takes about 22-25 labourers to plant one acre of paddy per day and a tikka system of payment is follwed as it gets the work doen quicker. it costs about 120 per per worker per day including food. the women work from 9am to 5pm with a break in between.	8	22-25	4950
6	weeding	Deweeding is done about 20-25 days after transplanting . If line sowing is followed then a conoweeder is used to deweed the field. if line sowing is not done, then women are hired. 2 women working for 7 hours a day can deweeding one acre in one day.	8	1	200/400
7	spraying of weedicides and pesticides	only organic pesticides and weedicides are used. Extracts from plants that have a bitter taste profile like neem, bamboo are dissolved in water and sprayed in the field. the farmer has noticed the plants that are n	7	1	NA
9	cutting	. It takes 15 workers to cut one acre per day. To cut all the land it takes about 5 days to complete the job. The workers only cut and place the paddy stalks on the ground. The stalks are allowed to dry for about 3 days before they are bundled.	8	15	3000
10	bundling	the paddy straws are gathered into bundles, the bundles are then evely tied to ends of a rod called as a ahanti. The rod is then carried back home. The farmer's plots are located about 1.5 km away from his home. The plots are also not accessible by tractor, forcing the farmer to carry the bundles back home manually.	9	15	3000
12	threshing	threshing of paddy is done using cattle. The cattle constantly walk over the paddy bundles till the paddy is dislodged.	8	3	450-500

farmer field data collection form

13	winnowing	winnowing is done by pouring the grain and chaff mixture gently onto the ground while the air pushes the chaff away from the grain. It takes about 30-40 minutes to clean about 40 kg of paddy. It requries four workers to winnow one acre of paddy in one day	8	3	450-500
14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dried for about 2-3 days. This task is generally done by women.	7	2	NA
15	transportation and storage	the paddy needs to be transported to the storage from where it dried. 2 labourers over 2 days work to pack and store the paddy in the designated storage room . It is usually stored for a minimum of 6 months before it is sold. Sometimes the paddy maybe sold earlier if the market price is good. 20 quintal of paddy is kept aside for self consumption and the remainder is sold in phases.	7	2	NA

pain points in farm activities

there is a dearth of machinery , the processes are all labout dependant. While there are many options for purchase of inputs, it is very difficult to go the markets w

climate related problems

the rains in the previous year (2022) was very delayed and this resulted in a drop in yields. The temperature has also been increasing the summer months and it was much hotter than usual .

key take aways and learnings

The yield per acre for cultivation is very low when compared to other places. The farmer reported about 16 quintals of yield per acre. This maybe can be attibuted to the dependant nature of cultivation and soil type which is a laterite soil. However deeper investigation needs to be done to identify the reason for the same.

farmer field data collection form

Name	Karlina Kaaka
Location	Village, Sipringa Raidi Block, Gomla District
Water Source	rainfed
Family Size	5
Land Holding	9 acres own land, cultvated land 4.5 acres
Family Member Migrator	2
Type	susistance farming

remarks

except for handheld tools , no machinery is used in cultivation of paddy. Even operations such as land preparation is done with the aid of bullocks. The money paid per person for labour is mouch lower than the money paid in other places. Only the farmer and the husband are there at home in the village. Their children have migrated to cities in search of work.

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	the farmer cultivates local varieties such as jeeraful, red rice and black rice. Seeds from the prior harvest are used for cultivation of paddy. The local varieties are kept for self consumption and the hybrid seeds such as lolat and swarna are cultivated for sale.	NA	NA	NA
2	land preparation	the land preparation is done over the course of 2 days per acre. Bullocks are used to plough the land. Ploughing is done 3 hours per day. The farmer has her own bullocks and does not pay anything.	NA	NA	NA
3	nursery preparation	for each acre two raised beds of 40*50 ft is made. Depending on the variety cultivated the quantity of seeds sown differs. For local scented variety of rice 2-3 kg of seed is sown and for hybrid variety of rice 5-6 kg of rice is sown.	5	1	100
4	fertiliser application 1	Once the land is ploughed , cow dung accumulated over the year is applied. onto the land. about two bullock cart load of cow dung which weighs about 2.5 tons is used per acre. this also requires hired help and one worker is hired. This cow dung is accumulated over the year and used just after land preparation	6	1	2300

farmer field data collection form

5	transplanting	transplanting is done about 2-3 weeks after the nursery has been prepared. The exact date of transplanting depends on the when the rain occurs. Usuaaly 1-3 days after the rains falls transplanting is done. The transplanting is done by women. Line sowing of paddy is followed and one seedling per hill is done two if the seedlings are a bit wilted. it takes about 22-25 labourers to plant one acre of paddy per day and a tikka system of payment is follwed as it gets the work doen quicker. it costs about 120 per per worker per day including food. the women work from 9am to 5pm with a break in between.	8	22-25	4950
8	Fertiliser application 2	15 kg of urea is applied per acre 15 days after tansplanting	6	1	250
6	weeding	Deweeding begins 15 days after transplanting. It is done manually. It is done over 10-15 days in on month. As and when the weeds appear they are uprooted. The activity of weeding is done by the farmer and workers are not hired. This saves money but the down side is that the it takes a long time to complete deweeding	10	1	NA
7	spraying of weedicides and pesticides	pesticides and weedicides are not used	NA	NA	NA
9	cutting	cutting of paddy is done alone and by hiring workers. If one person does it, it takes 5-6 days to complete harvesting. To finish harvesting in one day it requires about 14-16 workers who are paid about 200 per month. The paddy is allowed to dry for about 8 days.	8	15	3000
10	bundling	the paddy stalks are gathered into bundles each weighing about 30-35 kgs and brought home. Each acre yields about 70-80 bundles. To complete the cutting and bundling process it requires 40 workers to complete it in 2 days.	9	15	3000
12	threshing	threshing of paddy is done using cattle. The cattle constantly walk over the paddy bundles till the paddy is dislodged. To thresh 10 bundles it takes about 4 hours.	8	2	300
13	winnowing	the farmer has a electric fan which is used for winnowing. External labour is not hired. The farmer and her husband do the winnowing at their pace. It takes about 1 hour to winnow 20 bundles of paddy and they only do 20 per day.	NA	NA	NA

farmer field data collection form

14	drying	the paddy is laid out onto the ground over a clean surface or mat and is dried for about 2-3 days. Both the husband and wife take part in drying the paddy.	7	2	NA
15	transportation and storage	the paddy needs to be transported to the storage from where it dried. The paddy from local varieties is kept separate from the paddy from hybrid varieties. The paddy from the hybrid variety is sold at the lamps procurement system (APMC)	7	2	NA

pain points in farm activities
Since there is a dearth of machinery , the processes are all labout dependant. it is very difficult to go the markets without personal transportation as the road infrastructure is very poor. The village is very far away from the main road. This makes it difficult to
climate related problems
the rains in 2022 was 2 month late. Rain that sould have arrived in june arrived in august.
key take aways and learnings
The yield per acre for cultivation is very low when compared to other places. The farmer reported about 16 quintals of yield per acre. There is a lack of stable electricity in the village despite a high voltage transmission line passing through the village. since the cultivation is fully done by hand , there is a lot of repetitive stress related injuries and self inflicted injuries while harvesting. farmers have complained of back, elbow and knee pain due to repetitive motions.

farmer field data collection form

Name	Sarita Devi, 28 years old	
Location	sipringi Village	
Water Source	rain fed agriculture	
Family Size	2	
Land Holding	5 acres owned, 1 acre suitable for cultivation	
Family Member at home	2	
Family Members migrated	NA	

remarks
the farmer has 5 acres of land but only one acre is suitable for cultivation. The rest of the land is hard land and it is difficult to plough it.

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	the farmer cultivates two varieties of paddy namely jeeraful and lolat. Half acre of each is cultivated . To cultivate jeeraful it requires 15 kg of seeds and for lolat 5 kg. Both these varieties are 120 days each	NA	NA	NA
2	land preparation	the land preparation is done over the course of 2 days per acre. Bullocks are used to plough the land. Ploughing is done 3 hours per day. The farmer has her own bullocks and does not pay anything. The ploughing done after the 1st rains.	NA	NA	NA
3	nursery preparation	for each acre two raised beds of 40*50 ft is made. Depending on the variety cultivated the quantity of seeds sown differs. For local scented variety of rice 2-3 kg of seed is sown and for hybrid variety of rice 5-6 kg of rice is sown.	5	1	100

farmer field data collection form

4	fertiliser application 1	Once the land is ploughed , cow dung accumulated over the year is applied. onto the land. about two bullock cart load of cow dung which weighs about 6 tons is used per acre. this also requires hired help and one worker is hired. This cow dung is accumulated over the year and used just after land preparation. it costs 700 per trip to hire the tractor trolley and it requires 3 trips. cow dung is also bought at the rate of 1 inr per kg	6	1	8200
5	transplanting	to transplant one acre of land it requires 40 labourers. They work 8 hours per day. This can be completed in one day.	8	40	8000
8	Fertiliser application 2	15 kg of urea is applied per acre 20 days after transplanting	6	1	250
6	weeding	Deweeding begins 15 days after transplanting. It is done manually. One labourer is hired for 20-25 days and is paid 200 per day.	10	1	4400
7	spraying of weedicides and pesticides	pesticides are only used when there is a pest problem . It was not used previous time	NA	NA	NA
9	cutting	to harvest one acre of paddy 12 labourers are required. They work for 6 hours per day and each of them are paid about 200 inr	8	12	2400
10	bundling	The paddy is bundled after 8 days of drying. However the exact number of days of drying varies depending on the sun.the paddy stalks are gathered into bundles each weighing about 30-35 kgs and brought home. Each acre yields about 70-80 bundles. 15 workers are hired to bundle the paddy.	9	15	3000
11	transport	once the harvesting is completed, it requires 10 workers to transport paddy bundles from one acre to the house. Each worker is paid about 200	8	10	2000

farmer field data collection form

12	threshing	threshing of paddy is done using cattle. The cattle constantly walk over the paddy bundles till the paddy is dislodged. To complete the threshing process it requires 24 bulls and 12 labourers and it is completed in 4 hours. The farmer owns 15 bulls and the rest are borrowed from other farmers in a quid pro quo agreement	8	12	2400
13	winnowing	the farmer does winnowing at her pace. It is done for 4 hours a day and completed in 4 days. The dirty paddy is tossed in the air and the air currents separate the paddy from the chaff.	NA	NA	NA
15	transportation and storage	the paddy from the local variety is kept for self consumption and the lolat variety is sold at the lamps procurement system (apmc).	NA	NA	NA
pain points in farm activities					
Since there is a dearth of machinery , the processes are all labout dependant. it is very difficult to go the markets without personal transportation as the road infrastructure is very poor. The village is very far away from the main road. This makes it difficult to access any facility that is not in the village.					
climate related problems					
the rains in 2022 was 2 month late. Rain that sould have arrived in june arrived in august.					
key take aways and learnings					
two different varieties of paddy are cultivated side by side in the same plot. Bullocks and labour play a big role in farming process. Interestingly importance of cattle as draught work is higher than milk production. All the farmers have more bullocks than cows.					

farmer field data collection form

Name	sabitha devi
Location	beltongiri tola Sipringi village , Riadi Block
Water Source	fully dependant on rain for irrigation
Family Size	7
Land Holding	14 acres , 1 acre paddy farming
Family Member at home	3
Family Members migrated	4

remarks

the farmer has 14 acres of land but only one acre is suitable for cultivation. The rest of the land is hard land and it is difficult to plough it.

SL NO	Activity	Account	Difficulty	Labour	Cost per acre
1	seed selection and varieties sown	the farmer cultivates two varieties of paddy namely jeeraful and lolat. Half acre of each is cultivated . To cultivate jeeraful it requires 15 kg of seeds and for gopalbhoj 5 kg. Both these varieties are 120 days each	NA	NA	NA
2	land preparation	the land preparation is done over the course of 2 days per acre. Bullocks are used to plough the land. Ploughing is done 3 hours per day. The farmer has her own bullocks and does not pay anything. The ploughing done after the 1st rains.	NA	NA	NA
3	nursery preparation	for each acre two raised beds of 40*50 ft is made. Depending on the variety cultivated the quantity of seeds sown differs. For local scented variety of rice 2-3 kg of seed is sown and for hybrid variety of rice 5-6 kg of rice is sown.	5	1	100

farmer field data collection form

4	fertiliser application 1	Once the land is ploughed , cow dung accumulated over the year is applied. onto the land. about two bullock cart load of cow dung which weighs about 6 tons is used per acre. this also requires hired help and one worker is hired. This cow dung is accumulated over the year and used just after land preparation. it costs 700 per trip to hire the tractor trolley and it requires 3 trips. cow dung is also bought at the rate of 1 inr per kg	6	1	8200
5	transplanting	to transplant one acre of land it requires 40 labourers. They work 8 hours per day. This can be completed in one day.	8	40	8000
8	Fertiliser application 2	fertilisers are not used by the farmer	NA	NA	NA
6	weeding	Deweeding begins 20 days after transplanting. It is done manually. One labourer is hired for 20-25 days and is paid 200 per day.	10	1	4400
7	spraying of weedicides and pesticides	weedicides and pesticides are not used at all	NA	NA	NA
9	cutting	to harvest one acre of paddy 12 labourers are required. They work for 6 hours per day and each of them are paid about 200 inr	8	12	2400
10	bundling	The paddy is bundled after 8 days of drying. However the exact number of days of drying varies depending on the sun.the paddy stalks are gathered into bundles each weighing about 30-35 kgs and brought home. Each acre yields about 70-80 bundles. 15 workers are hired to bundle the paddy.	9	15	3000
11	transport	once the harvesting is completed, it requires 10 workers to transport paddy bundles from one acre to the house. Each worker is paid about 200 . The farm is located about 1 km from the home of the farmer	8	10	2000

farmer field data collection form

12	threshing	threshing of paddy is done using cattle. The cattle constantly walk over the paddy bundles till the paddy is dislodged. To complete the threshing process it requires 24 bulls and 12 labourers and it is completed in 4 hours. The farmer owns 15 bulls and the rest are borrowed from other farmers in a quid pro quo agreement	8	12	2400
13	winnowing	the farmer does winnowing at her pace. It is done for 4 hours a day and completed in 4 days. The dirty paddy is tossed in the air and the air currents separate the paddy from the chaff.	NA	NA	NA
15	transportation and storage	the paddy from the local variety is kept for self consumption and the gopalbhoj variety is sold at the lamps procurement system (apmc).	NA	NA	NA
pain points in farm activities					
injuries to the hand while harvesting and scratches due sharp tips of the harvested stem of the paddy are common. Constant bending while deweeding and transplanting has caused injuries and this accumulates over time.					
climate related problems					
the rains in 2022 was 2 month late. Rain that sould have arrived in june arrived in august.					
key take aways and learnings					
two different varieties of paddy are cultivated side by side in the same plot. Bullocks and labour play a big role in farming process. Interestingly importance of cattle as draught work is higher than milk production. All the farmers have more bullocks than cows.					

Paddy processor (small medium large)(local / regional / national)

Section 1 :Paddy processor details

1) Name of the paddy processor company

2) Age of the mill / company

3) Nature of interviewee with mill
    a) Proprietor
    b) Employee , position in the company
    c) Renter of machinery
    d) Other

4) Age of interviewee and duration spent in paddy processing industry

5) Location of the mill (add gps coordinates to calculate distances involved if possible)
    a) Address of mill
    b) Address of head office if any equivalent
    c) Have other mills ? if so address of the same

6)

    - No of people employed

Section 2 : Business operations

- Name of individual, association/group, company / how is it referred to locally
- Range / area of operation (from maximum how far away sourcing and sales are done)
- Duration in the paddy processing industry
- Milling as a service or milling to sell rice ? and reason for selection
- Additional services provided ? in the value chain

- Location(s) of processing
  - Reason for selection

- Processing capacity for paddy
  - Processes undertaken
  - Quantity of paddy processed per day…… / per season…..
  - Storage capability in tons / kg……
  - Cost incurred per unit / batch of paddy processed
  - Products produced and quantity (per batch of paddy) (monthly , yearly basis)

	Quantity	Monthly	Yearly
For rice			

For brokens			
For husk			
For bran			

- **Targeted market. Break up in quantity and percentage**

Export	
Institutional customers	
Urban	
Rural	
Direct to home	

- Factors determining sale of rice

Location: gogodown block , Kamrup rural

Mill owner	Anjan Rajbanshi
Date of installation	Feb 2022
Milling capacity	120 kg per hour
Grinding capacity	150 kg per hour
Daily highest milled quantity in mun	20
Daily average milled quantity in mun	12
Lowest daily milled in mun	6

Cost of setup and installation

Machinery cost	650000
Subsidy availed	80%
End user contribution for machinery	130000
End user expenses for infrastructure setup	75000

Milling particulars	Costs
Milling of paddy	1.25 Rs / kg
Grinding of rice	2.5 Rs/ kg
Crushing paddy for animal feed	2.5 Rs / kg
Crushing rice for animal feed	5 Rs/ kg

Customer details

Number of customers	100 households
Customers in the same village	50-60 households
Customers from other villages	40-50 households

Income and savings

Lowest income monthly	15000 rs	
Average income monthly	18000-20000	200 Mun
Highest income (peak season)(dec 15-jan 10) monthly	28000	300-350 Mun
Daily income	410-1320	
Daily savings (money kept aside)	300	

Servicing and maintenance

Monthly spares cost	3000
Location of purchase of spares	guwahati
Most worn out parts	Bearings, friction plate sieve, hammer mill sieve
Labor hired for repair	NA

Milling efficiency

25-27 kg of rice is obtained from 40 kg of paddy

If the entirety of business was bought on loan , the entrepreneur is confident to repay the loan in 3-4 years. From the business alone the entrepreneur is capable of repaying 5000 per month as EMI

Issues faced

- The grinder does not work while it is connected to the solar but it works when connected to the grid electricity .
- Delay in repairing when there is an issue with the inverter.

Mill name Dheeraj mill

Location Kamrup rural

Mill owner	Bimola das
Milling capacity	13-15 mun per hour
Motor specification	10 hp 440 V
Date of installation	40+ years ago
Daily milled in peak season	10 mun
Daily milled in off season	6 mun

Cost of setup and installation

Machinery cost	NA
Subsidy availed	NA
End user contribution for machinery	NA
End user expenses for infrastructure setup	NA

Milling particulars	costs
Milling of paddy	1 rs per kg

Income and savings

Lowest income monthly	
Average income monthly	
Highest income (peak season)(dec 15-jan 10) monthly	
Daily income	

Servicing and maintenance

Monthly spares cost	
Location of purchase of spares	
Most wornout parts	Friction plate and grain separator
Labor hired for repair	na
Electricity costs off season-peak season	2200-3200 rs

Milling efficiency

25-27 kg of rice is obtained from 40 kg of paddy
If the quality of paddy is very bad then percentage of broken can go upto 80%

Issues faced

- Slackness in belt driver
- Difficulty in controlling input feed to the mill
- Power fluctuation and power cuts in monsoon

Mill owner name : Sarmoni Rabha

Location Nalbari village , Kamrup rural

Mill owner	Sarmoni Rabha
Date of installation	March 2022
Motor hp rating	3
Milling capacity	160 kg/ hour
Grinding capacity	60 kg/ hr
Daily highest milled quantity in mun	20-22 Mun
Lowest daily milled in mun	4-5 mun

Cost of setup and installation

Machinery cost	680000
Subsidy availed	80 %
End user contribution for machinery	120000
End user expenses for infrastructure setup	50000 est

Milling particulars	Costs per kg
Milling of paddy	1 rs
Grinding of rice	5 rs
Crushing paddy for animal feed	NA
Crushing rice for animal feed	NA

Income and savings

Lowest income monthly	No records
Average income monthly	No records

Highest income (peak season)(dec 15-jan 10) monthly	No records
Daily income	400-700
Daily savings (money kept aside)	100

Servicing and maintenance

Monthly spares cost	1000
Location of purchase of spares	Kulshi bazaar
Most wornout parts	Sieves in mill and grinder and feeder mechanism
Labor hired for repair	NA

Milling efficiency

25-27 kg of rice is obtained from 40 kg of paddy

If the entirely of business was bought on loan , the entrepreneur is confident to repay the loan in 5 years.

Assam State Marketing Board (ASMB) meeting in discussion with Mr Bulbul Hussian and RP Dutta.

Duties and responsibilities of ASMB

- Marketing and sale of paddy.
- Connecting buyers and sellers
- Facilitation marketing activities for agricultural procedure
- Currently the nodal agency for paddy procurement (since 2012-2013) for Assam food and civil supply corporation (PDS)

Paddy Farmers and paddy value chain requirements / shortcomings as observed by them

- implementation of solar power irrigation systems for farmers.
- Solar powered paddy procurement centres and storage units
- Development and promotion of large scale paddy milling cum storage centres
- Enforcement of MSP for paddy procurement for all traders and farmers
- Improvement of drying infrastructure for paddy

Working and aims of ASMB

- Aim to procure the entire marketable paddy
- Target of procurement decided by food and civil supply procurement department
- Assam FCS releases payment to farmers within 72 hours of procurement
    - However delays in payment is due to errors in bank details of farmers or lack of requisite documents
- Food corporation of India started operations in Assam in 1997-98 prior to that there was no nodal procurement agency
- MSP in 2012-13 was 1250 per quintal and the prevalent market price was 700
- For procurement of paddy, the maximum accepted moisture content is 17%. Any more than that is rejected outright.
- Paddy is sold to procurement agency generally after 15 Jan
- Target for 2022-23 is 10 lakh metric tonnes of paddy
- Procurement standards are strictly maintained
- A maximum of 200 quintals per farmer is procured however the actual procurement depends on the certificate produced by the farmer showing the quantum of land cultivated
- Land survey is done by government after transplantation
- Food and civil supplies corporation office located in khanapara office in Assam provides subsidies for setting up of milling and storage infrastructure

Varieties in Assam

- Ranjith sub 1 and bahadur sub 1 (these varieties are resistant to submersion)
- Local varieties are Joha, Bora and Kula Bora

- Bina 10 and Bina 11 (these varieties are brought in from Bengal and they are high yielding)
- Each variety undergoes a strict examination process before it is approved by the appropriate committee in the regional geography
- There is demand for varieties grown in assam
    - Kunmol, Vara rice , brown and black rice has demand in Nepal
    - Kunmol rice can be consumed without cooking
    - Brown and black rice has demand In US
- Joha and bora varieties of paddy have thin straw and their water requirement is not high, however their yield is low.
    - Approximately 50kg of paddy can be gotten from 100 kg of paddy bundle

Discussion with Mr Amlan Barua

- Assam is a paddy surplus state with an excess of about 300000 tons. However the structural deficiency in the procurement process hinders the smooth movement and sale of paddy
- The land holdings are also small and fragmented. This makes deployment of technologies difficult
- Seeds used in Assam are
    - 50 % high yielding varieties
    - 25% local varieties
    - 10-12 % hybrid varieties
- Irrigation is required for the summer crop grown in Jan to Mar
- 20-25% of the land is under irrigation however actual irrigation is much lesser
- Local population tends to monocropping and non native population tend to do multi cropping
- There are 9 agroclimate zones in Assam in which paddy is grown
- There is a shortage of modern milling machinery using rubber based rollers
- A subsidy of 30-35 lakh is available for large scale rice mills
- There is no cooperative farming

Discussion with Mr Putul Bhuiyan and Mr Sandeep from APART

- APART is providing support to FPCs across Assam
- They are working in 6 districts with 42 FPCs
- Upper Assam is dominated by tea cultivation
- Agriculture in Assam in rain fed
- Irrigation as a whole accounts for about 25% the cultivated land
    - For rice it is about 15% but in practise only 3-5 % is irrigated
- Paddy can be grown in three seasons
    - Sali paddy - Apr to Nov-dec
    - Bodu paddy- jan, feb to may (harvest)
    - Aho paddy (winter paddy) Dec to mar/ apr

- For sali paddy land preparation is done after 20th April
    - 10-15% of farmers still use bullock carts
    - The rest use tractors
- Rentals and fees for land preparation are charged on basis of a bigha
- Labour requirements are generally not seen as a problem as such
    - Men 250-300 per bigha
    - Women 150-200 per bigha
- The planting density of machine transplanted paddy is seen as less dense when compared to manual planting and hence farmers feel there would be less yield
- Weeding is not done
- Machinery for on farms operations has not reached the general populace in terms of awareness and usage.
- Mechanisation of farm operations is a new concept in Assam
- Machinery is being introduced in a phased manner for all operations which consists of 9 machines
- The provision of machinery is being done through FPOs.
- The goal is to reach 125 FPCs for the government
- There are approx 40 FPOs working with apart in which
    - 8 FPOs have received in 2021
    - 18 FPOs have received in 2022
- Machinery needs to be tested for suitability in a particular geography before being introduced to the public. Machinery meant for Punjab , TN will not work in Assam due to varying conditions and vice versa.
- Ranjith sub 1 and Bahadur sub 1 can sustain being submerged in water.
- Beyond selection of water resistant paddy there is a lack of disaster mitigation efforts done by farmers and government
- Approximately 0.50 million hectares of paddy is lost per year due to natural disasters.
-

Discussion with NABARD with Mr Nabin Kumar Roy and the FSTD team

- Selection and promotion of suitable machinery tested by local agricultural institutions
- Need for upgradation of single stage mills to multistage mills
- To provide loans for purchase of machinery to FPOs it requires about 250-600 members
- Selection of machinery to promote via finance is done by local KVKs and Agricultural universities
- NABARD does not directly lend money to farmers but to rather other institutions (both lending and non lending)
- Also supports the promotion of machinery , farm practises and other awareness building and knowledge sharing programs
- Aids in identification and promotion of GI tagged products
    - This is done via
        - increasing producers
        - Popularising
        - Improving post production and processing

- To identify risk factors involved in lending to FPOs , Nabard has its own grading matrix and grading scale. Based on this lending terms are determined

Discussion with Assam State Rural Livelihood Mission (ASRLM) Mr Dhruba Jyoti Gogoi, State project manager

- To increase yields emphasis needs to be placed on high yielding varieties
- From one hectacre only about 18-20 quintals of paddy can be sold
- There are a total of 219 blocks in assam and 35 districts
- There is a big need for value addition and post harvest processing equipment . especially at a small scale level
    - If traditional value adding processes can be mechanised the same way it is carried out by hand then promotion and acceptance becomes easier.
- Importance of generating employment in villages as means to minimise push migration to cities by youth due to lack of opportunities.
- This is where small scale processing equipment and industries come in .
- This employment generation opportunities are all the more important for indigenous products.
- Machinery for puffed rice making, rice flour , straw processing etc is required.
- Growing and selling mushrooms using straw as a growth stratum. However this is a risky business venture as it requires a continuous cold chain.

Discussion with Uttaran Krishi FPC representative

- There are 2200 farmers as part of the FPC from 90 villages and 14 gram panchayats
- Started as a co operative in 2017
- Incorporated as a company in 2020

- Paddy is seen as a consumable rather than a commodity to sell
- Paddy requires value addition to improve revenue.
- Pesticides usage is minimal as it is not required rather than promotion
- The sale of planting seeds is done by KVK
    - Joha: 80 INR/kg
    - Bahadur 40 INR/kg
    - Ranjith INR/kg
- For weeding of paddy men and women are hired at 300 and 350 INR respectively
- It requires about 4-5 people per bigha
- Mushroom cultivation is done by about 10% of the farmers. In general it is seen as a risky business

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The following Individuals have contributed greatly to the report by sharing their experiences and insights. The Alto precision team sincerely appreciates their inputs and thanks them for their time.

1) Mr Amlan Barua retired from the Assam state marketing department.
2) Mr Mithlesh Kumar kalindi (Dt officer cum PD) ATMA jharkhand
3) Mrs Geeta , (Deputy Project Director) ATMA Jharkhand
4) Mr Dhruba Jyothi Gogoi - (state project manager) Assam State Rural Livelihood Mission
5) Mr Md Bulbul Hussain (Joint Chief Executive Officer) Assam state Agricultural marketing board
6) Mr RP Dutta Assam State marketing board.
7) Dr Putul Bhuyan - APART
8) Mr Sandeep - APART
9) Mr Nabin Kumar Roy and team - Nabard
10) Mr Nrusingh Sutar- Pradhan
11) Mr Rajneeti Paswan, field staff - Pradhan
12) Mr Sumit - CWS NGO ,
13) Dr Tapas Paik TSCRC NGO
14) Mr Suman Paul JSLPS
15) Mr Anup Upadaya -JSLPS
16) Mr Martin JSLPS
17) Mr Senthil Kumar ICAR post harvest machinery testing
18) Mr Shiv Mangal prasad and team from CRURRS
19) Sr Sajitha - Holy cross KVK , Hazaribagh