A STUDY ON ENTREPRENEURIAL BEHAVIOUR OF MAKHANA GROWERS IN MADHUBANI DISTRICT OF BIHAR

काशी हिन्दू विश्वविद्यालय BANARAS HINDU UNIVERSITY

Thesis submitted in partial fulfilment of the requirements for the award of degree of

MASTER OF SCIENCE (AGRICULTURE)

IN

EXTENSION EDUCATION

By

Shalini Kumari

Under guidance of

Prof. Arun Kumar Singh

DEPARTMENT OF EXTENSION EDUCATION
INSTITUTE OF AGRICULTURAL SCIENCES
BANARAS HINDU UNIVERSITY
VARANASI-221 005
INDIA

ID. No. 18412EXE023 **2020** **Enrolment No. 406640**

Dr. Arun Kumar Singh
Professor

Department of Extension Education
Institute of Agricultural Sciences
Banaras Hindu University
Varanasi - 221 005
(INDIA)

Ref. No. …… **Date ……**

CERTIFICATE

To,
The Registrar (Academic)
Banaras Hindu University
Varanasi – 221005.
(INDIA)

Through: The Head, Department of Extension Education, Institute of Agricultural Sciences, BHU, Varanasi – 221005.

Dear Sir,

I have great pleasure in forwarding the thesis entitled, **"A Study on Entrepreneurial Behaviour of Makhana Growers in Madhubani District of Bihar"** submitted by **Ms. Shalini Kumari,** I.D. No. 18412 EXE023 in Partial fulfillment of the requirements for the degree of Master of Science (Agriculture) in Agriculture Extension Education, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi.

I certify that the entire work was presented in this thesis, was planned and carried out solely by the candidate under my supervision. To the best of my knowledge, the data presented in the thesis are genuine and original.

Sources of materials and help obtained from the others are duly acknowledged.

Thanking You.

Forwarded **Yours faithfully**

(Head)

(Dr. Arun Kumar Singh)
Chairman of Advisory Committee

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THESIS APPROVED BY ADVISORY COMMITTEE

Chairperson : **Dr. A.K Singh**
Professor
Department Agriculture Extension

Member : **Dr. O.P. Singh**
Assistant Professor
Department of Agriculture Economics

Member : **Dr. B. Jirli**
Professor & Head
Department of Agriculture Extension

Member : **Dr. Kalyan Gadhei**
Professor
Department of Agriculture Extension

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Similarity	10%
Analysis address	cenlib2014.bhuni@analysis.urkund.com

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Shalini Kumari..

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ABBREVIATIONS USED

%	:	Per cent
₹	:	Rupees
$	:	United States Dollor
@	:	At the rate of
°	:	Degree
°C	:	Degree Celsius
Kg	:	Kilogram
Fig.	:	Figure
etc.	:	For example, for instance
i.e.	:	*Id estra* (that is)
No.	:	Number
Cm	:	Centimeter
M	:	Meter
Qtl.	:	Quintal
S. No.	:	Serial number
MT	:	Metric ton
et al.	:	Etalli and others (Co-workers)
KVK	:	Krishi Vigyan Kendra
MSP	:	Minimum support price
NRC	:	National Research Centre
ICAR	:	Indian council of Agricultural Research
CSIR	:	Council of Scientific and Industrial Research
MSME	:	Micro, Small and Medium Enterprise
WHO	:	World Health Organization
FAO	:	Food and Agricultural Organization
ICD	:	Inland container depot
GDP	:	Gross domestic product
/ha	:	Per hectare
N	:	Nitrogen
K	:	Potassium
P	:	Phosphorus
R.H.	:	Relative humidity
q/ha	:	Quintal per hectare
Temp.	:	Temperature
viz.	:	Namely
USA	:	United states America
UK	:	United Kingdom
DARE	:	Department of Agricultural Research and Education
IIT	:	Indian Institute of Technology

Chapter 1

INTRODUCTION

Makhana (Euryale ferox) (Chromosome number 2n=58) is fundamentally an aquatic macrophyte having a place with the family Nymphaeace and ordinarily it is at times grouped in a particular family, Euryalaceae. Makhana plant is local of South-East Asia and China, however nearly appropriated to each piece of the world. Makhana develops well in stale lasting water bodies like lakes, land melancholies, jheel, bogs, trench or wetlands having stale shallow watera(4-6 ft.) which are for the most part perpetual in nature.Makhana is a sea-growing and skimming leaf rising macrophyte.It is an outright seed spread plant and germination of new plant emerges from completely developed seeds. It has group of monocotyledonous roots which are thick, long (40-50 cm) plump and sinewy comprising various air pockets. A solitary plant of makhana delivers around 100 seeds and there are around 10,000 plants in a single ha of lake- zone. The yield of crude Makhana seed fluctuates in the middle of 1.8-2.0 t/ha of lake -region. Fundamentally it doesn't bear stem yet the rootstalks are short, thick and wiry including 3 to 5 bundles, each involving around 15 rootlets. The plant roots make their course into fine earth base soil while the plant shows especially snappy vegetative turn of events. The leaves are orbicular shaped, skimming, glabrous green and wrinkled above and pink or significant purple underneath, maintained by weighty, penetrable and prickly ribs.

Makhana is natural, wholesome, non-oat produce. Makhana is generally excellent wellspring of starches, proteins and minerals. As of late cost of makhana has expanded because of increment popular from residential just as remote market. The harvest has been perceived as a significant yield in the province of Bihar and can possibly reduce the neediness of segment of individuals associated with its development. The examination was directed in Madhubani region of Bihar. The effectiveness of makhana seed preparing is practically 35%. Cost of taking care of per kg of makhana seed goes around Rs 7.33 while cost of getting ready per kg of makhana pop is Rs 20.95. As planning cost is high in this manner there is prerequisite

for headway of taking care of device. In all the publicizing channels grasped for makhana pop edges of representative are much higher when stood out from the edge got by the processors. From now on there's prerequisite for tremendous extension improvement in planning, regard development, assessing, packaging, accumulating, and market structure. Geographical Indication (GI) enlistment, Proper stamping of makhana pop and worth incluresults of makhana close by sensible business which would improve the enthusiasm for makhana pop and its value included things.

Consumable bits of Makhana contains generally 12.8% dampness, 9.7% protein, 0.1% fat, 0.5% minerals, 76.9% starches, and 1.4 mg/100 g of carotene. Calorific examination gives an assessment of around 362 kcal/100 gm. for rough Makhana and 328 kcal/100 gm. for popped Makhana. It's seen as superior to dry normal items, for instance, almonds, coconut and cashew nut similar to sugar, protein, and ascorbic corrosive and phenol content. The remedial properties of Makhana are in like manner settled in China where it has been mandatorily used as fixing in youngster sustenance. It creates as a particular land and water proficient cash crop in shallow water bodies in north Bihar and lower Assam zones of India. It contains a couple of dietary and helpful properties and besides supports cabin industry. It's created in lakes, tanks and other land and water proficient water bodies. The critical drawback of Makhana improvement is that the lacing ribs of leaves and petioles are prickly. To create natural items are borne on long pedicels and are difficult to gather as a result of the intense prickles on the outer surface. Makhana is a monotypic assortment and the available inherited powerfully is compelled.

Basically, its transport is fantastically limited to various bits of tropical and sub-tropical districts of South-East Asia and known to exist in Japan, Korea, North America, Nepal, Bangladesh and a couple of bits of India. In India, it's scattered in West Bengal, Bihar, Manipur, Tripura, Jammu and Kashmir, Eastern Odisha, Madhya Pradesh and Uttar Pradesh. Mainly, its business improvement is limited to specific parts of North Bihar, Manipur, segments of West Bengal and Madhya Pradesh.

In Bihar, major Makhana conveying locales generally consolidate Darbhanga, Sitamarhi, Madhubani, Supaul, Araria, Kishanganj, Purnea and Katihar. Around, 80%

of the supreme production of arranged Makhana begins from Darbhanga, Madhubani, Purnia, and Katihar regions on a very basic level. Locale under Makhana advancement is around 13,000 ha.

Separating its business noteworthiness, a National Research Center was set-up to coordinate examination on various pieces of Makhana in Darbhanga territory of Bihar under the administrative control of ICAR Research Complex for Eastern Region.

Makhana grows well in stale interminable water bodies like lakes, land depressions, jheel, swamps, channel or wetlands having stale shallow watera(4-6 ft.) which are generally suffering in nature.Makhana is a land and water proficient and floating leaf rising macrophyte.It is a level out seed jeopardized plant and germination of new plant rises up out of totally created seeds. It has gathering of monocotyledonous roots which are thick, long (40-50 cm) full and strong including different air pockets. Basically it doesn't bear stem yet the rootstalks are short, thick and wiry including 3 to 5 bundles, each containing around 15 rootlets. The plant roots make their way into fine earth base soil while the plant shows brisk vegetative turn of events. The leaves are orbicular framed, skimming, glabrous green and collapsed above and pink or significant purple underneath, maintained by intense, penetrable and prickly ribs.

The full-created leaves of makhana are basically of 1.2 - 1.5 m in separation over. Petioles is portrayed by prickly and significant greens or pinks appearance. The bloom is around 5-6 m in separation across and are violet, blue or diminish pink in concealing. Makhana is basically a self-pollinated crop, in which treatment occurs toward the starting times of their unforeseen development. Each plant produce 15-20 berry type natural item, which are basically round, light and prickly outside. Every normal item involves 20-25 monocotyledonous seeds, which are pretty much nothing (0.5-1.5 cm in separation over), dull and encrusted with a thick sheath around the white consumable part. Makhana plant requires shallow water significance having thick layer of filthy base that is significantly a wealthy in normal nutrients. For its real turn of events and improvement, the great extent of air temperature ranges from 20o C

- 35o C, relative humidity - 90% and yearly precipitation 100cm - 250cm.According to a brutal measure 100 kilogram of makhana natural item can convey about 35.0 kg of seeds.

Makhana cultivation in lake condition require least use as new plant develops from the left over seed of past years. Investment used in makhana is generally for keeping up plant people insecticidal activity, water framework, social event or variety of seed(guri) from the lake bed, treatment of seed which is in any case called popping. Getting ready of makhana seed is dull or tricky strategy, it is so far done genuinely by the practiced individuals of the conveying zones.

Making of fox-nut in Bihar

About 80% of the Makhana making of the country is met by Bihar alone. Darbhanga, Madhubani, Saharsa, Katihar, Purnea, Supaul, Kishanganj, Araria locales which contributes huge degree to Makhana cultivation. These regions include a zone of 15000 ha under makhana advancement with an ordinary gainfulness of 1.5 t/ha. The State Government has set a target to grow the advancement of makhana in 20,000 ha by 2020 to twofold famer's pay, by accepting the field based makhana improvement development. Around five lakh ranchers are clearly drawn in with makhana advancement, its social event, popping, and produce selling, etc. Around 7500 to 10,000 tons of popped makhana is sold every year in the market which costs Rs. 200-500/kg, contingent upon openness and season, etc.

Stress of center to help commercialization of makhana

The exceptional yield collection made of 'makhana' (gorgon nut, fox nut or lotus nut), known as 'Swarnavaidehi' made by Indian Council of Agricultural Research (ICAR), is recognized by captivated farmers concerning Bihar for an enormous extension to propel its business advancement, and this variety is well headed to ascend as a huge business crop in the state's nine regions, carrying giant pay to farmers attracted makhana cultivating. Regardless of the way that 'makhana' is known to people in the country's 10 states, including Bihar, it's Bihar alone which

speaks to 90% of its world creation and making major contribution. The essential nine Bihar locales where it is standard and created by farmers fuse Darbhanga, Madhubani, Purnea, Katihar, Stamarhi, Saharsa, Supaul, Araria and Kishanganj. "The 'Swarnavaidehi' grouping would help farmers with choosing consolidated developing by including popular yield like 'share' and even fish developing which would basically reinforce makhana developing. Farmers can create it as any expansive yield like wheat or paddy. The procedure for advancement of the new combination of 'makhana' would be the equal.

Jalkar farmers of Bihar and Bihar Government's initiatives:

Govt. of Bihar is showing half enrichment to the farmers' on standard cost of makhana improvement to the tune of Rs. 13000/ - and Rs.16000/ - for lake and field system, independently. Still jalkar farmers are going up against inconveniences and need uphold in diesel, seed and data uphold since its advancement is commonly cleaned by resource helpless farmers. In like way, NABARD is moreover widening 25% subsidy on makhana improvement.

Makhana advancement in altering structure modes offers unique opportunity to create it at shallow water significance with ideal yield.

Importance and Uses of Makhana

From edible point of view, Makhana is considered as a superior dry fruit, as endowed with several rich and nutritional ingredients. Edible part of the seeds contain 12.8% moisture, 9.7% protein, 0.1 % fat, 0.5% mineral, 76.9% carbohydrate and 1.4 mg/100g of iron and traces of carotene (CSR, 1952). The calorific value of raw and popped seeds of Makhana is 362 and 328 K Cal/100g, respectively. From sustenance point of view, the eminence of Makhana protein is very superior to a number of food plant and animal based diet. The details of nutritional content of raw and popped makhana may be seen here through the Table 1;

Table 1. Nutritional Content of Raw and Popped Makhana*

Parameters	Raw Makhana	Popped Makhana
Carbohydrate	76.9%	84.9%
Protein	09.7%	09.5%
Fat	00.1%	00.5%
Moisture	12.8%	04.0%

*National Research Centre for Makhana, Darbhanga; 2011

In this regard, comparison of amino acid between Makhana and egg may also observed through Table 2.

Table 2. Comparision of Amino-Acid between Makhana and Egg*

Amino Cad	Makhana		Egg	FAO/WHO (1973)
	Raw	Fried		
Lysine	3.79	4.69	6.70	5.40
Histone	3.15	3.12	3.50	2.50
Arginine	15.19	16.07	6.70	5.20
Aspartic Acid	5.76	5.05	10.40	7.70
Threonine	3.34	3.51	5.10	4.00
Serine	5.05	5.64	6.00	7.70
Glutamic Cad	16.64	17.06	25.20	14.70
Proline	4.00	3.24	-	10.70
Glycine	3.01	3.28	3.60	2.20
Alanine	5.50	5.84	3.50	6.10
Valine	5.18	5.49	7.50	5.00
Cystine	0.75	1.21	3.00	_
Methonine	3.06	2.95	2.30	3.50
Isoleucine	4.18	4.80	5.60	4.00
Leucine	8.34	8.85	8.90	7.00
Tyrosine	6.38	2.91	3.60	3.05
Phenylaline	5.78	6.12	6.70	3.05
Tryptophan	_	_	1.50	1.00
Ammonia	0.90	1.16	_	1.00
Protein(%)	11.10	11.50	_	_

*Jha*et al.*, (1991)

Makhana has similarly enough home developed Medicinal properties consequently; the American Herbal Product Associations has given Makhana seed as class 1 rating. The therapeutic properties of Makhana are especially filed in Indian and Chinese old composition. According to these composition, all the plant parts have tonic, astringent and de-obstruent properties (Dragendorff, 1898). The seed is torment calming. It is used in the treatment of steady detachment of the guts, vaginal delivery, clumsiness, less than ideal and programmed releases, evening time spreads and kidney deficiency related with visit fertilizers. The seeds of Makhana are used in the arranging of different Ayurvedic prescriptions. Makhana lessens Vat and Pitta dosha. It's a huge home developed course of action, used for erectile dysfunctions. In China, its common seeds are used in standard drug to fortify the male power and retard developing. The leaves are viable against affliction which may be attributed to the proximity of an alkaloid "Drummne" (Sokolov, 1952) and implantation of leaves was viewed as convincing against problematic parturition. Leaf flotsam and jetsam cooked with matured rice was found to be able to control unique gleet. It's acknowledged that 10-15 gm. for consistently usage of makhana could help in strengthening kidney to spare substance, tong the kidney to catch basic release, visit pee affirmation, invigorate the spleen to soothe detachment of the entrails, deny saturation to recollects Leucorrhoea, significant against awkwardness, quiet deadness and harming near mid-region and knees, suitable for joint torment, it check developing effect or go about as an Anti-Oxidants. It moreover help in cardio protections, controls blood pressures. Makhana moreover observes as accommodating for women during pregnancy and post natal deficiencies.

Not with standing therapeutic properties, there are different employments of makhana. It's reaped from the stale wetland and in the entire procedure of its development no usage of manures or pesticides is made. In the wake of gathering the leaves and stems stayed in a similar water body which demonstrates as manure for the following harvest, subsequently it is called absolutely natural. Being herb, Makhana is one of the main elements of natural medication. It's one of the most fundamental elements for tasty food planning. Pop simmered makhana is a respectable nibble thing. Makhana Kheer and Sewa made of makhana isn't just an irritable yet in addition stomach related a best itself. It's utilized in pudding, milk based sweet. Dal-Makhani and

vegetable curries demonstrate flavorful food overflows when Makhana is spread for taste and thickening with object. Makhana-Raita is more delectable and it's stomach related in nature. In Manipur nearly developed organic products before their blasting are sold as prime vegetable in the market. They frequently utilized it for the arrangements of different neighborhood heavenly dishes like 'Eronbia' or 'Morokmetpa'. Youthful products of the soil petioles are additionally utilized in plate of mixed greens arrangement called 'Sngju'.

The makhana seed is exceptionally wealthy in starch content. From yearning perspective, the starch of popped Makhana seed is of premium quality thus its utilized for covering in the quality textures like Banarasi sarees and high quality cotton dresses. The Makhana grain, which is considered as a waste materials can be likewise utilized as a total nourishment for animals' and poultries. The external outside layer establish about 4.98-5.46% of the popped makhana. Makhana grain constitutes 89.2% dry issue, 7.1% protein, 0.62% fat and 94.4% natural issue. Taking care of makhana wheat to Birds/Livestocks came about into higher development rate, nearly high milk yield alongside supplements digestibility. Essentially, makhana is expended as a non-oat food by fan during their quick. Henceforth, it fills the strict need as well. In each religion, makhana is considered as the devout and perfect food term particularly in Hindu religion, it is utilized in all the adoring functions, hawan, pooja and so forth. Notwithstanding these, because of its great nature, it's considered as the best contribution to God and Goddesses in sanctuary. Indeed, even Muslim people group is additionally devouring a great deal of makhana just before their Ramadan.

Development of Research Problem:

On the reason of above real factors it is, evident that, Makhana manifestations has colossal market potential in India similarly as abroad. In the year 2018, India exchanged popped Makhana worth with US$ 1,049,544 to Australia, Canada, Greece, Singapore, Togo, United Arab Emirates, United Kingdom and Untied States of America. Uinted States is the greatest transporter of popped Makhana speaking to convey assessment of worth US$ 536,550 followed by Untied Kingdom and Canada which imported phool Makhana with worth assessment of US$ 133,133 and US$ 102,072

separately. The out of the total, 37.1% of charge was finished by NhavaShevaSea followed by Mundra and Sabarmat CD which speaks to 36.7% and 6.7% of full scale admissions exclusively. Ordinary expense of phool Makhana per unit US$ 4 and typical worth for each shipment is NR 1,073. (Mahawar, H.K., 2016; T, Mumbai).

The money manager is a monetary man, who endeavors to support his advantages by appointment of improvements. Nevertheless, the business visionaries are not pioneers but instead they are the individuals with a will to act to ensure risk and understand a change through relationship of human undertakings. Business undertaking has become notable and great district today. Business endeavor is the best approach to quick advancement of a country. A country with able finance manager will reliably go snappier in transit of industrialization when appeared differently in relation to a country, which has no fit financial specialists. Business venture is a development that objectives starting setting up and growing the size of an endeavor that produces and sells product or organizations in publicize. Doing new things and doing things that are starting at now done in another way is thusly an essential importance of business venture.

It is acknowledged that makhana is used in various traditional prescription in China (Export import Bank of India, 2005).In spite of this forsaken picture, the improvement of Makhana is astoundingly confused and least examined with confined documentation under makhana advancement and its surveyed manifestations. Since, no exact reports identifying with the plan of makhana creation, its taking care of and advancing are open thus far no reliable data identifying with improvement practices are available subsequently, considering its noteworthiness, uses, market and toll potential, a need was felt to have conscious assessment to comprehend the grass root reality related with Makhana advancement and its manifestations. At present, some isolated information's are open about the Makhana manifestations, regardless, the gather is such huge in nature that the all-around consistent endeavor is required related with nature and regular course of action of Makhana advancement.

With the assistance of makhana cultivators who are a definitive maker of this dark precious stone. Owing to extravagance in the nutritive substance and having an extraordinary potential for money crop so as to make two fold the farmer's income the

current investigation has been arranged, Assessing and creating conduct and perspectives of producers for turning out to be effective are the most significant segment of cultivators' business enterprise advancement. Keeping the above elements in see, the current examination was attempted with the accompanying destinations **"Entrepreneurial Behavior of Makhana Growers in Madhubani District of Bihar"** with following specific objectives:

OBJECTIVES OF RESEARCH

1. To know the demographical, socioeconomic characteristics of Makhana growers.
2. To assess the technological knowledge related to Makhana Production.
3. To know the entrepreneurial behavior of Makhana growers.
4. Major constraints and suggestions confronted by Makhana growers.

SCOPE OF THE STUDY

- This is a unique and pioneering study of this kind, wherein an attempt has been made to study the entrepreneurial behavior makhana growers in Madhubani district of Bihar.
- The study makes a sincere attempt to know the factors contributing to the entrepreneurial behavior of makhana growers.
- The study will provide valuable information to the rural development workers, executive officers, administrators and planners to implement the programme in a pragmatic manner.

LIMTATIONS OF THE STUDY

The present study consists following limitations

The present study has the following limitations which are obvious for any student researcher especially in the Feld of social sciences.

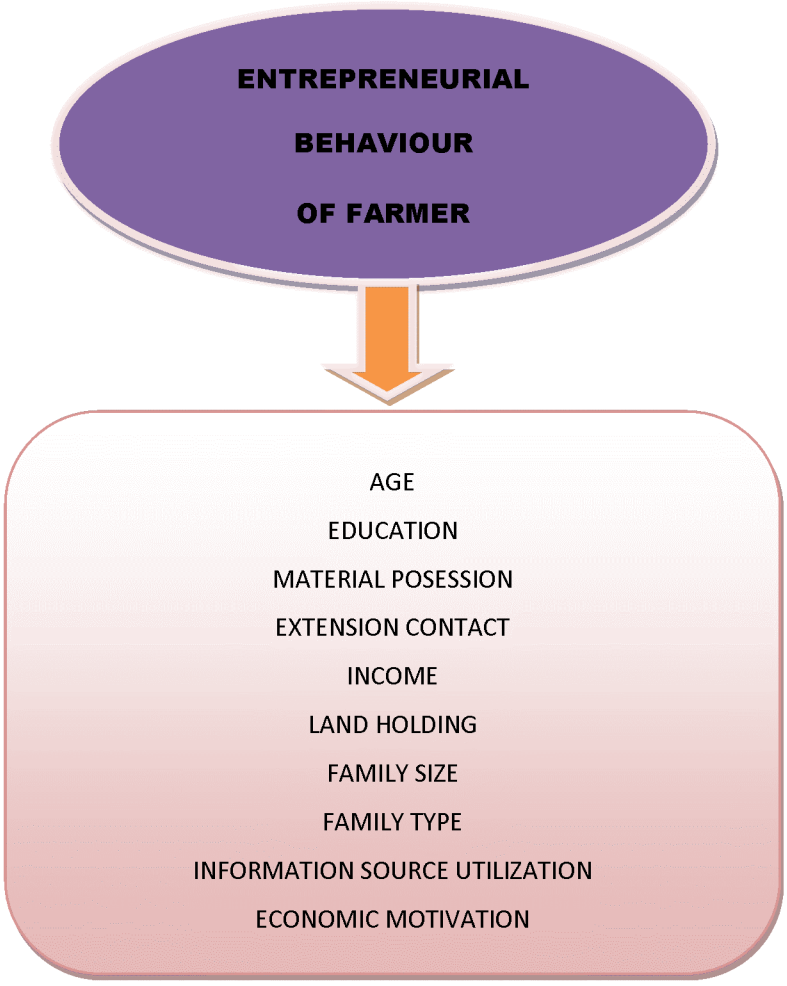
1. Time and financial constraints were the main problems of the present study as faced by the any researcher.

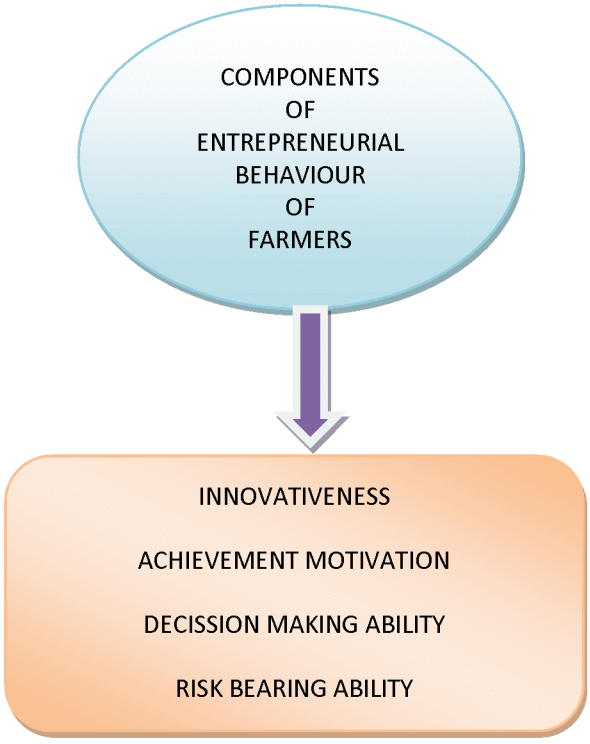
2. The area of the study was restricted to different blocks in Madhubani district. Hence generalizations if any based on this could be restricted to the areas with similar conditions.

3. The study was based on the expressed onions of the respondents allowing little chance for the investigator to control the subjectivity.

APPLIED MODEL

Any deliberate examination ought to basically be founded on sound hypothetical model. A specialist builds up a model with the end goal of his examination, since it helps in normal contemplating the exploration issue and speaks to the conceptualization of the ideas utilized in the exploration study. In light of the conversation on previous audits of the past investigates, a calculated hypothetical model has been produced for the current examination and delineated in Figure





PRESENTATION OF THE STUDY

- The report of the investigation is introduced in five sections.
- The principal part plots a concise presentation, need and significance, objectives scope and impediments of the examination.
- The second chapter depicts of writing applicable to the issue is referred to in the subsequent part.
- The third section depicts the material and strategies which have a heading on estimation of factors, with factual methodology utilized.
- While the fourth section manages the outcomes and conversation dependent on the acquired outcomes.
- At long last, the fifth part set forth rundown and ends and ramifications of the investigation and recommendations for future exploration.

Chapter 2

REVIEW OF LITERATURE

The knowledge gathered in the past is consolidated to keep in records for future use. In this context, the present chapter attempts to provide a relevant studies with reference to the objectives of the present research endeavor. The relevant literatures which have been reviewed are presented here systematically under the following sub-headings:

1. To know the demographic, socio-economic characteristics of Makhana growers.
2. To assess the technological knowledge related to Makhana Production.
3. To assess the entrepreneurial opportunity in Makhana production.
4. Major constraints and suggestions confronted by Makhana growers.

1. To know the demographic, socio-economic characteristics of Makhana growers

As indicated by Parsons and Shis (1951), conduct arranged to the achievement of the finishes circumstance by methods for normatively controlled consumption of vitality. This conceptualization of conduct impels that:

Behavior situated in attaining finishes or objectives and other foreseen situation.

It happens as indicated by situation.

It is fundamentally normatively managed.

It includes use of endeavors and motivation.

Srivastava (l956) depicted eastern Utter Pradesh comprising the divisions of Gorakhpur, Azamgarh and Varanasi proliferates in transitory and perpetual freshwater

bodies which have been concentrated by different laborers. The joined act of makhana-fish cultivation as integrated cultivating may likewise be intensified in these localities.

Rogers (1962) brought up that it was not the characteristics of the stimuli that chooses the conduct yet in addition the view of an individual about the quality of stimuli that are significant.

Handoo (1978) portrayed Euryale ferox is a component of associations Nelumbetumnucferae found on delicate natural rich substrate in shallow water (1.0-2.5 m profundity), privately known as Jewar. Its seeds are eaten crude or simmered and establishes an element of ceremonially utilized in wording on favorable event in Kashmir. The species beforehand involving the lake littorals is presently discovered infrequently, if at any time, by one or barely any plants Dal Lake and a couple of disconnected stands towards the shores of Meniscal Lake. Present correspondence is made to assess the nature of the species opposite the effects on the endurance of E. ferox in Kashmir.

Thakur (1978) in his article "Makhana culture" underscored the significance of Makhana development in the locale of Darbhanga. He saw that Makhana development and handling was an undeniable industry which was connected with the employment of the angler's network in the Darbhanga. He further saw that the pay of the anglers network expanded by loading lakes with different types of workmanship breathing fishes with an extremely moderate beneficial taking care of.

Meehan (1983) saw that lion's share of fish ranchers had a place with fundamentally youthful age bunch having essential to optional degree of instruction with non-fish culture as their significant occupations. Fish ranchers would do well to information on fish culture rehearses. A large portion of the ranchers fundamentally had a place with low to medium degree of social interest, expansion organizations contacts, monetary inspirations and aroma directions.

Venkataramanujamm et al. (1987) in focus on budgetary conditions of chankfishermen arrange communicated that all the adult females and 95.7 percent of the folks were mainly illiterate. Concerning dwelling conditions, the assessment revealed 85% had kuchha houses and 15 % had semi-pucca houses.

Sujath Kumar (1988) expressed that the greater part of the conventional anglers had a place with center (38.33 %) and mature age (48.33 %) and among fishing boat proprietors a large portion of them had a place with center (43.33 %) and old (35.00 %) age gatherings.

Mishra et al. (1990) uncovered like other rural harvests, makhanaharbors the relationship of various photograph and zoo pontoon. To the principal come different bugs, gastropods and offensive weeds and other drifting and lowered aquaphytes which for the most part rival the plant for space and sustenance. The subsequent class includes a portion of the lowered plants which add to the dirt richness through mineralization of their flotsam and jetsam during terrific time of the yield and the bugs and fishes species which go about as operators of organic control through taking care of upon the bug bothers.

Jha et al. (1991) depicted the use and protection of Euryale ferox North Bihar. This plant is the principle oceanic money crop and is available in huge water bodies including store where the consolidated development of fish and makhana is completed as a significant wellspring of work for the anglers.

Jha (1991) clarified makhana has shifted utilizes as a healthful fixings and alongside some different aquaphytes it finds a spot in the indigenous frameworks of prescriptions of India, Japan and China. Consumable pieces of the seed contain 12.8 % dampness, 9.7 % protein, 0.1%, 0.5 % mineral issues, 76.9 % starches, 1.4 mg/l00 g of iron and hints of carotene (CSR, 1952). Old Indian and Chinese references are marker of its monstrous clinical properties against various human afflictions including the respiratory, circulatory, stomach related, execratory and regenerative frameworks.

Jhaet al. (1991) explained that the protein level of Makhana is almost around 10-12 % which is better than most plant and animal put together eating regimens with respect to record of its high fundamental amino destructive association. During the examination year, considering flood, noteworthy zones having these plants were washed away bringing in an extraordinary cash related hardship the farmers.

Jha and Barat (1991) have depicted that the amino corrosive organization and suggestions on the nutritive and natural estimation of makhana which is the fundamental sea-going money yield of Mithila, Bihar.

Singh (1992) portrayed Euryale ferox developed in a large number of stale freshwater bodies in around twelve locale of North Bihar. It causes in giving job to two a great many fishing females in these districts. It is a possible worker of unfamiliar trade. It's known for its wholesome and clinical properties. Present undertaking considers a relative environment investigation of makhana in North Bihar.

Mishra et al. (1992) depicted Euryale ferox, privately known as "MAKHANA" is one of the significant amphibian money yields of North Bihar, especially in the region of Darbhanga, Madhubani and Saharsa. In lake, a few bugs have relationship with Major creepy crawlies, bothers related with crop are essentially aphids, caseworms and a root drills. Aphids swarm over its initial membranous leaves during December to March and cause close to add up to obliteration to crops. Hatchlings of Elophlla species bite away the leaf edges of generally more youthful leaves during January to early May and makes extreme harm the harvest at this stage. Anoxic condition at the lake bed favors the invasion of the harvest by Donacadelessert during April to July, causing demise and obliteration of the yield. The harvests experience some other minor bugs like the leaf eating bug fundamentally during March to early June.

Mishra et al. (1992) enrolled the bug relationship of Euryale ferox in the lakes of Darbhanga, North Bihar, that the significant bug irritations are aphids, caseworms

and root drill during the investigation time frame from 1988 to 1985 in the chose lakes.

Choudhary et al. (1994) depicted advertising of makhana to different pieces of state and nation. Subsequently it has commitment in acquiring unfamiliar trade too. It has been assessed that roughly 19,000 q of makhana worth about Rs 95 million was promoted out of Bihar during 1991. Notwithstanding financial commitment, makhana development is additionally town based and government assistance oriented industries providing profitable employment to the backward fisherman community to the area.

Verma et al. (1996) depicted in North Bihar, wetlands chiefly incorporates freshwater bogs, swamps, chaurs, and mauns, which are naturally different and profitable eco-framework. Yet, weighty invasion of amphibian weeds makes the wetlands abandoned. Incorporated culture of air breathing, ruthless and flesh eating fishes (Clarasbatrachus, Heteropneustesfossls, Channastratus, Channapunctatus, Channamarulus and Anabas testudneus) with makhana (Euryale ferox) is viewed as the best practice to tackle the possibilities of such forsaken wetlands. The decayed plant buildups of makhana crops prompts the development of natural waste, which are devoured by these base dwelling fishes and give safe house to youthful ones to evade barbarianisms. There is a degree to get yields of around 1400 kg/ha of makhana seeds and 3600 kg/ha of fish after incorporated culture of predatory fishes (Magur, Singhi, Murrels and Kawai) and makhana crop giving Tlapa as scrounge fish.

Ahamad and Singh 1997(a) depicted the incorporated culture of makhana with various speciess of cultivable fishes in a 0.4 ha lake which upgraded the oceanic efficiency of the lakes and in this manner improving the financial states of the helpless ranchers of North Bihar.

Ahamad and Singh 1997(b) announced heaps of lakes and tanks of different measurements are dispersed all through in North Bihar, with water spread zone of 39997.16 ha which covers around 42 % of the all out spread territory of 95116.84 ha in the whole province of Bihar. These dissipated and disengaged water bodies are excessively appropriate for raising and refined of helpful sea-going creatures and

plants of high monetary incentive under controlled or semi controlled conditions. It can productively be overseen for fish culture as well as for growing water fruit makhana. These aquatic fruits are highly nutritive and are very much relished in India and other countries.

Ahmad and Singh (1997) portrayed possibilities of coordination of fish culture with makhana cultivating will offer more prominent proficiency in asset usages and decreases hazard by differentiating crop and will give extra great pay and improve financial profile of the ranchers. This paper considered the incorporation of makhana with significant carps, extraordinary carps and distinctive air-breathing fishes.

Sushant et al.(2002) uncovered that a majority of trap-cum-fish ranchers in Jabalpur area of Madhya Pradesh were basically moderately aged, having low training status, enormous family sizes and had a place with medium yearly salary bunch with low augmentation contact and presentation to broad communications though their credit direction was high.

Singh and Singh (2004) clarified an examination of fish promoting framework uncovered that fish is sold up-to area level in Bihar. Little lake proprietors for the most part sell at lake level. Ranchers who carried fish to area level market, cushion unapproved charge to wholesalers. Ranchers didn't review their fish as per promoting reason. There are four significant makhana and fish advertising channels. Around 90 % of checked makhana fish lakes under investigation had sold their fish through these four channels. Makers, on a normal, gotten three fourths of customer's value which is by all accounts sensible yet it was because of deficiency of market channel. Per kg cost of bundling and wastage was considerable market expense was paid two channels simply because other two channels were worked outside managed market. Subsequently it might be said that fish market is as yet disorderly in North Bihar.

Dey and Ahmed (2005) portrayed a diagram of innovative and strategy gives that should be considered to cause hydroponics to convey food and business security to poor people. These issues incorporates: expanding creation viability and economically; making fish accessible to the poor at a moderate cost; outfitting

staggered profits by the fish part and adjusting fish exchange for poor people and fitting polices at the worldwide level. The paper likewise gives a prologue to a progression of 11 articles on as a hydroponics that follows this volume.

Choudhary and Kumar (2005) clarified Bihar is rich enough in fisheries, both characteristic and synthetic. The state having such a plentiful normal assets is as yet ailing in regard of its Daily or yearly interest of fish. The yearly fish creation of the state, including both from culture and catch fisheries, has been assessed at around 2.25 lakh tons against request of about 4.56 lakh tones.

Chaudhary and Dutta (2006) featured on licensing measure for making stockpiling stable consumable food materials from parts of gorgon nuts or fox nut (machine) which bears enormous effect on biodiversity bringing about set off mass culture and commercialization of this sea-going macrophytes. Other than biological effect, it bears social and monetary effects as well. The paper featured the effect of licensing on biodiversity at miniature level. The examination uncovered that huge scope culture of these plants in water bodies rather than fishery has made an interlinked environmental, social and financial equalization. Maintainable culture of both including fish and the concerned macrophytes is the need of great importance to ensure biodiversity further and harmony of nature, and support society and economy. The paper finishes up with giving proposals of individuals' mindfulness and the further exploration for better understanding.

Jhaet al. (2006) revealed that North Bihar continues a system of lotic and lentic water bodies. Which assume a significant part in nonstop energize of groundwater. These lentic and lotic water frameworks goes about as a store of various gatherings of fish and shell fish. This paper fundamentally investigates the conceivable of upgrading the profitability of incorporated fish-makhana framework in the water collections of North Bihar. It additionally features fishing network which needs consideration of the organizers so as to draw in business for the improvement of fisheries in this district through the fishing network.

Rural Finance Corporation (2007) led an investigation on financial profile of Makhana producers in Darbhanga, Madhubani and Katihar area of Bihar and reported that the Makhana cultivators were principally from the Mallah/Machhuara standing with fishing and Makhana development as their principle wellspring of economy for their occupation. Normal size of their family basically varied from 5 to 8 members. Major proportion of Makhana growers constituted poor and illiterate. The Corporations-further reported incidence of acute poverty, malnutrition and undernourished children in the community. Menfolk engaged in cultivation of Makhana included sowing, transplanting and harvesting of Makhana seeds, trading of Makhana seeds and Makhana pop. The womenfolk basically looked after domesticated animals, Field cultivation, and freed Makhana for popping, beside household activities children rearing. Children also contributed in removing the kernels from Makhana pop.

Sharma and Saka (2008) in their study found that most of the inhabitants around the study set were from economically poor background and the communities comprised of *Assamese, Bengal Hindu, Bengal Muslim, Bihar, Dmasa*(Tribe), *Monpur*(Tribe and general caste), *and Nepal.* Major part of these communities belonged to fisherman family and their main occupations are fishing, agriculture, sericulture and cattle, goat and duck rearing etc.

Kumar (2009) reported Bihar is blessed not only to have vast water bodies but also matching sustainable fish resources for development. Capture and culture fishers in Bihar has been seen to be moving up to new heights of productions, there by reaching a position to add significantly to the food basket of the state.

Mandal*et al.* (2010) found in their study that harvesting and processing are a tedious and laborious task performed by 50 % males followed by 40 % females and 10% of child labors. He also concluded that a long range of age groups are involved in performing these activities and respective works are performed by either male or female or together.

Minten *et al.* (2010) observed from their study that the average age of the head of household to be 49 years. Head of households are mainly male and 93% of the households belonged to the mallah caste.

Amitabh Chatanya(2011) came forward on the basis of their study that collection of seeds is performed by 15 to 60 years range of age group however seed cleaning, seed transportation, drying, gradation and storage of pop is basically done by the members of age group in between 12 to 60 years. Frying and rubbing of pop is mainly performed by female members only mainly having an age group of 30 to 60 or 40 to 60 years old.

Sah (2013) closed through his examination that out of 150 respondents 20.67% of respondents were of 26 to 35 years age, 36% of respondents were in the middle of the age of 36 to 45 years of age, 30% of the respondents having an age of 46 to 55, 13.33% of the makhana producers have finished their 56 years old or above. He further saw that lion's share of makhana cultivators are moderately aged gathering having great number of long periods of encounters in makhana development, which is required for makhana handling.

Kumar etal. (2014) uncovered that, over the age principally the Mallah people group (anglers network) exceeded expectations the procedures of makhana development, reaping and preparing. They are for the most part ignorant people and move starting with one spot then onto the next during makhana gathering season. The normal family size essentially contains 6-8 people and the entire family is engaged with this occupation. Male people are engaged with development, collecting and preparing of makhana and ladies are principally associated with handling.

Masram etal. (2016) deduced in their investigation that Euryale ferox (Nymphaeaceae), known as Makhana, is fundamentally harvest of tropical and subtropical locales of south-east and East Asia. Makhana is developed fundamentally as a select amphibian money crop in shallow water bodies in north Bihar and lower Assam region. It conveys healthful and restorative properties and supports house industry. It's developed in lakes, lakes, tanks and other oceanic bodies. Traditional

reading material of Ayurveda gave restricted data about Makhana. In Bhavprakash Nghnatu depict Makhana. Likewise different Nghantu creator depicts the Makhana. It's therapeutic and nourishing spice and is broadly utilized in Ayurveda and Chinese medication.

Ahmad An and Kumar B (2020) Concluded makhana cultivators are fundamentally old matured, ignorant and have a place with joint sort of family with enormous family size. They have own territory yet convey crafted by makhana development in rent lake. They essentially have pay not as much as lakh rupee and are fundamentally associated with other calling likewise alongside makhana development.

2. The extent of knowledge related with Makhana Production Technology.

Dragendroff (1898) expressed that, the seed of Euryale is pain relieving and aphrodisiac. It has sharp significance in the therapy of incessant looseness of the bowels, veginal release, barrenness, untimely and automatic discharge, nighttime emanations and kidney shortcoming related with successive pee.

Lakhaman (1978) made a review to gorgon nut creating zones of Bihar and gave a proposal of 4-5 weeding for the yield till the lake was totally secured with the expansive thorny leaves of gorgon nut plants.

Jha (1989) had an examination on the activities of makhana preparing and revealed that the nuts dried at any temperature between 40-60°C and containing dampness about 33.5%, Preheating of dish surface at around 300 ± 5°C temperature, the dampness content decreased about 25.8%, trailed by further warming for around 48 hours and cooking of nut at a similar temperature, lessens the dampness substance to about 12% bringing about great quality makhana. On a normal, one quintal of wet seeds yields 40 kg of the completed item as popped bit.

Jha and Prasad (1990) found that cycle of handling of gorgon nut includes various tasks, for example, drying, size reviewing, preheating, hardening, simmering

and popping. Broiling of nuts is fundamentally completed in an open room dish at around 300 °C surface temperature.

Jha and Kumar (1991) recommended that utilization of excrement and compost was not of much significance as the base of the lakes had sufficient amount of humus for basic supplements to the enduring development rehearses.

Ranjana (1997) chipped away at Euryale ferox Salsb (Makhana) - a sea-going yield of Mithlanchal, of North Bihar. She saw that the Euryale ferox, as a jeopardized plant species utilized for food, fiber and therapeutic objects, was set as one of the significant money crops in North Bihar. Seeds were planted in October-November and reaped in the long stretch of September and October. The yield was assessed at around 5-6 q/section of land. On a normal around 80 000 individuals from the neighborhood fishing network were occupied with its development.

Jha and Prasad (2003) detailed that it's classified as a money crop (dry leafy foods) as popped makhana normally known as Makhanalawa, developed in stale lasting water bodes like lakes, land sorrows, oxbow lakes, bogs and jettison. Makhana seeds are otherwise called Black Diamond. The popping cycle requires ability, is dreary, tedious and torment taking. A large portion of the specialists conveying this innovation has a place with the ladies populace of a particular network known to be 'Mallah' of North Bihar. For the most part, the post-collect innovation includes sun drying, size evaluating, preheating and treating, broiling and popping, cleaning, and reviewing and bundling.

Jha and Prasad (2003) and Kumar et al. (2011) expressed that popped Makhana are utilized in number of readiness of delightful and rich sweet dishes like Makhanakheer, Makhana vermicelli and Makhana halva, it is likewise utilized in pudding and milk based desserts. Dal makhani and vegetable curries become more scrumptious in the wake of including Makhana for taste and thickening item. Makhanarata is likewise exceptionally delicious and conveys stomach related properties.

Chaudhary and Dutta (2006) after their investigations expressed that a couple of feet water level is sufficient for makhana development. Numerous large Beels (Big and extended lakes) are being utilized as makhana development. Planting begins from November to December however it fluctuates with atmosphere and region. Euryale feroxs is fundamentally self-pollinated, round with dark, thick, hard external covering and around 100-125 kg seeds are adequate for planting in one hectare and if there should be an occurrence of helpless germination relocating is done in the long stretch of April-May. Gathering happens fundamentally in the long stretch of August-September and the crude seeds are whipped physically by feet to break the papery external skin and afterward broiled. Warmed seeds are moved to a fixed wooden mallet and the seed breaks because of inward weight. Further crude seeds are protected for future development and popped seed for human utilization.

Sharma and Lahara (2006) detailed that the readiness of any improvement methodology implies data about the current degree of information on the objective gathering. Hence, the current examination was led to evaluate the components related with information level of the makhana cultivators in regards to makhana creation innovation.

Singh and Gupta (2006) detailed that the sea-going plant, Euryale ferox, is likewise found in the sub-tropical atmosphere of Manipur and the development of plants doesn't put enormous work. Because of its popularity, it is monetarily sold in nearby business sectors of Manipur.

Tiwari et al. (2007) announced that the significant mechanical angle incorporate lake the executives, feed and compost the board, choice of seeds and the executives, while the less significant innovative viewpoint included undesirable fishes and weed the board, fish security, collecting and capacity the board.

Muhammad et al. (2010) found that when all is said in done, appropriation of machine is exceptionally restricted to tropical and subtropical locales of South-East and East Asia and is known to exist in China, Japan, Korea, Russia, North America, Nepal, Bangladesh, Marala Headworks wetlands, North West side of Punjab,

fundamentally developing along the water gulfs on the left bank of River Chenab, confronting Village Gondal, District Gujrat, Pakistan.

Goswami et al. (2010) uncovered that dominant part of the fish ranchers 74.00% had medium reception and information on fish creation innovation.

Kumar et al. (2011) and Mishra et al. (2003) announced that Gorgon nut or Fox nut (Euryale feroxSalsb) is a significant sea-going yield, having a place with family Nympheaceae and usually known as Makhana. Makhana plant is considered as a local of South-East Asia and china, yet circulated to pretty much every pieces of the world. Its appropriation is amazingly restricted to tropical and sub-tropical areas of South-East and East Asia and known to exist in Japan, Korea, Russia, North America, Nepal, Bangladesh and a few pieces of India. In India, it is disseminated in West Bengal, Bihar, Manipur, Tripura, Assam, Jammu and Kashmir, Eastern Odisha, Madhya Pradesh, Rajasthan and Uttar Pradesh. Kumar et al. (2011) found in their examination that Ecologically, Euryale feroxSalsb is delegated a yearly sea-going spice with immense drifting leaves, eminent macrophyte of monotypic sort, harping on the littoral pieces of the flood plain wetlands of deteriorated shallow water (4-6 ft.) which are of enduring in nature. Euryale ferox is a completely seed proliferated plant and its new plants rises up out of germination of its completely developed seeds. The germination of Makhana seed is of "hypogeal" type. After germination, the cotyledons and hypocotyls of seeds stay in the dirt. The roots are thick, long (40-50 cm), meaty and sinewy in nature and have various air pockets. Each plant has around 3–5 bunches of roots and every one of these group comprising of around 10-15 rootlets.

Apata (2012) detailed that the respondents for the most part conveys incredible mindfulness and information about different innovations on fish creation. It ranges from Lake Site determinations (78.8%), lake developments (96.3%), lake arrangements (85.0%), loading of fishes (72.5%), feedings (88.8%), lake systems of support (81.3%), gathering of fishes (70.0%) and fish conservations (86.3%). This may likewise be the motivation behind why the individuals are getting such a lot of money from their fishing endeavor. Numerous respondents (65.6%) guaranteed more than one wellspring of data on their fishing undertaking.

Rajan et al. (2013) from their examination announced that the all out fish ranchers, most elevated rate (48.89%) were found in medium information bearing, while (32.22%) of high and (18.89%) of low information bearing classification. Accordingly, it very well may be presumed that the higher (48.89%) of the fish ranchers had medium degree of information on fish creation innovation.

Nitesh (2013) revealed that assortment of gorgon nut from the base of the lakes starts in the period of August and proceeds till the finish of November month. It is profoundly repetitive and careful activity and must be completed by the accomplished anglers. By creeping underwater surface, they sweep these nuts into the heaps which are then scooped out with the help of horn shaped split bamboo contrivances. Mintenet al. (2014) expressed that in India, it is developed in a territory of 20,000 ha, out of which 80% region lies in Bihar. The normal creation and profitability of Makhana crop in Bihar is assessed to be around 3.19 lakh q and 21.25 q/ha, separately.

Kumar et al. (2016) announced that, Swarnavaidehi was delivered as an ever first assortment of makhana began from determination 6. The investigation of nourishing profiling of "Swarnavaidehi" uncovered that most extreme dampness content (34.7 %) was recorded if there should be an occurrence of crude seeds of Swarnavaidehi. Most extreme debris content recorded was near (0.4%) in the event that popped seeds of both tried examples. Swarnavaidehi, most minimal worth (0.3%). Most extreme seed protein content (8.7%) was acquired by the Swarnavaidehi. Greatest rough fiber content (0.5%) was gotten in the crude seeds of Swarnavaidehi when contrasted with popped seed. Greatest all out starch content (79.8%) was recorded in popped seeds of Swarnavaidehi, anyway the least worth (57.0%) was recorded in crude seeds of Swarnavaidehi. It is worth to see that greatest calorific worth (358) was recorded in popped seeds of Swarnavaidehi. Limit of (18.5mg) calcium content was recorded if there should be an occurrence of popped seeds of Swarnavaidehi. Likely greatest (1.3) manganese content was recorded in the event of popped seeds of Swarnavaidehi. It is worthful to specify that limit of (1.1)

zinc content was recorded if there should arise an occurrence of popped seeds of Swarnavaidehi.

Singh et al. (2017)) created model of incorporated Farming System by coordination of fish and water chestnut with fox nut in region of 50 ha of land in Darbhanga locale. The net profit by the framework was recorded to be of Rs. 68,545 (1,26,505–57,960) as against to conventional framework . Fox nut creation alone. Field arrangement of Makhana development was incorporated with different yields like fish, race and water chestnut in editing framework. The gross come back from Fox nut-fish, Fox nut-race and Fox nut-water chestnut was assessed roughly Rs. 2,82,810, 2,73,840 and 3,54,340 for each ha, individually while a gross return of Rs. 1,32,552 was acquired from Fox nut development alone.

Jana (2017) a field review at ,National Research Center Makhana, Darbhanga, Bihar during 2015-16 for water significance standardization for gorgon nut or machine advancement and its related weed control. The makhana crop development went from 10, 20, 30, 40, 50 cm and > 50 cm of water bodes following randomized square structure and perception taken on weed appearance and their control. It was presumed that more the profundity of water represented more fiery vegetative development of makhana crop. Makhana development in field framework, where development of the plant were fundamentally decreased which was taken as certain attribute for agricultural practices because of decrease in water segment of the field. In field having 30 cm water profundity delivered the medium leaf breadth (104.84 cm) and unit having (82.50) strong seeds. The most extreme test weight of the crude seed was acquired to be around 97.12 g found in 30 cm water containing plot. The greatest number of organic products (12.66) and yield of 23.83 q/ha were found in field having 30 cm water. Weed populace had huge increment in shallow profundity of water. The regular weed fundamentally found in the yield in Darbhanga were essentially Cyperusdefforms, Cyperusrotundous, Hydrllavertcllata, Aeschynomeneaspera and Sagttaraguayaness. Weed populace was exceptionally decreased when field was very much pounded with rotavator followed by use of castor and neem cake in equivalent extent [2T (50:50) per ha]. Butachlor splash was

incapable for weed control as water system of 30-40 cm water was given trailed by herbicide application. It was finished up from the examination that Makhana performed well under field condition giving yield of 23.83 q/ha in the wake of keeping up a water level of 30 cm for the duration of its life expectancy and when weeds were constrained by the utilization of natural cakes (2t/ha).

Nath et al. (2018) after their investigation expressed that, six creepy crawly species and diverse undented types of gastropods were imprinted as vermin of Makhana crop. All pieces of Makhana plants .e. leaf, leaf rib, petiole, shoot, sinewy root, blossoms, organic products and so on were discovered to be assaulted. The creepy crawly bothers, aphid, case worms, rib drill and gastropods under the changing trimming examples and escalation of harvest rose as significant limitations in getting recorded yield. Further, the absolute bug like leaf bug and singhara insect additionally developed as minor vermin and in future strengthening and changing trimming designs likewise exasperated their populaces and pervasions. Among the common foes, Coccnellids bug vz, Coccnella septumpunctata, Scymnusspp, Menochlussexmaculatus, Brumus spp. and so forth were discovered to be related with aphid.

3 ENTREPRENEURIAL BEHAVIOUR OF MAKHANA FARMERS

Nzamudeen (1996) characterized innovative conduct attributes related with people who have the drive and abilities to start creation, take choices, bear chances and oversee assortment of data sources important to effectively attempt the endeavor.

Banarjee and Talukdar (1997) characterized ladies business as the degree of subjective and imaginative enacts completed by ladies business person in her individual undertaking to build the creation suddenly, where her exercises are likewise an appearance of inward mental occasions and cycles.

Nagesha (2005) saw that dominant part (68.35%) of the respondents had a place with medium innovative conduct class though, 17.50 percent were in low

pioneering conduct classification and 14.15 percent of the respondents were in high enterprising conduct class.

Vidhyadhar (2007) found that dominant part (67.50%) of the respondents had medium innovative conduct followed by low (18.34%) and high (14.16%) levels of enterprising conduct individually.

Ravi (2007) uncovered that dominant part (41.87%) of the respondents had a place with low innovative conduct class. Though, 33.75 percent of them were in medium pioneering conduct class and staying 24.38 percent of the respondents were in high enterprising conduct classification.

Chananda (2008) revealed that larger part (71.66%) of the respondent ranchers were in medium innovative conduct class followed by high (16.67%) and low (11.67%) pioneering conduct classifications individually.

Kiran et al (2012) found that that 75.00 percent of the respondents had medium degree of pioneering conduct followed by low (15.50%) and high (9.50%) level of enterprising conduct, separately.

Naidu (2012) uncovered that instruction, ranch size, yearly salary, social cooperation, augmentation contact, trainings got, logical direction, monetary direction and level of yearning were emphatically and essentially related with innovative conduct of sugarcane ranchers.

While cultivating experience was adversely and fundamentally related with innovative conduct at 5 percent level of criticalness.

Aparna and Patel (2012) uncovered that greater part (60.00%) of the respondents were discovered to be medium in their enterprising conduct, trailed by 23.30 percent of the respondents with low-level of innovative conduct. Just 16.70 percent respondents were discovered to be high in their enterprising conduct.

Lawrence and Ganguly (2012) revealed that the vast majority of the dairy ranchers (55.00%) were found to have medium pioneering conduct followed by low (33.00%) and high (12.00%) level of innovative conduct.

Components of entrepreneurial behavior:

Innovativeness

Reddy (1997) uncovered that greater part (62.00%) of the business visionaries had medium ingenuity, though 20% of them had high, trailed by low imaginativeness (18%).

Vijay Kumar (2001) demonstrated that 47.50% of business visionaries fell in low classification, trailed by 31.66 % in medium class and 20.84 % in high classification of ingenuity.

Bhagyalaxmi et.al., (2003) saw that larger part (69.44%) of the business visionaries had medium resourcefulness, followed by 15.56 and 15.00 % of respondents having high and low level of inventiveness, independently.

Suresh (2004) showed that the milk creators in the area had medium, high and low creativity of the solicitation 55.00, 24.58 and 20.42 %, independently.

Accomplishment inspiration

Vijay Kumar (2001) communicated that 44.16% of respondents were having medium level of achievement motivation, followed by 28.34 and 27.50 % of financial specialists falling in low and high achievement motivation class, independently.

Decision making ability

Chandrapaul (1998) reasoned that lion's share of business people around (50.90%) had medium

Dynamic capacity, trailed by low around (25.80%) and high around (23.30%) dynamic classes.

Vijay Kumar (2001) demonstrated that lion's share of the rancher around (46.66%) of the business people had medium dynamic, trailed by low around (27.50%) and high around (25.84%) dynamic classes, individually.

Risk orientation

Vijay Kumar (2001) showed that 38.34, 35.00 and 26.66 % of business visionaries fell under low, medium and high danger taking capacity class, individually.

Subramanyam (2002) inferred that 75.00 percent of the prepared ranchers had medium danger inclination, trailed by high (13.34%) and low (11.66%) levels of danger inclinations.

Bhagyalaxmi et. al., (2003) reasoned that dominant part of the business people (75.56%) convey medium danger direction, trailed by low (15.56%) and high (13.33%) hazard direction classifications.

Suresh (2004) demonstrated that a large portion of dairy business people had medium degree of danger taking capacity, trailed by not many in low and significant level at the pace of 62.02, 24.58 and 13.34 percent, separately.

Information seeking behavior

Chandrapaul (1998) uncovered that 41.60 percent of the business visionaries had uninformed chasing, trailed by medium (32.50%) and high (25.90%) data looking for classifications.

Kumar (2001) saw that 41.66 percent of the business visionaries had uninformed chasing, trailed by medium (32.50%) and high (25.90%) data looking for classes, separately.

Vjaykumar (2001) detailed that 41.66 percent of business visionaries fell under uninformed looking for classification followed by 33.34 and 25.00 percent of business people fell under medium and high data looking for classes, separately.

Suresh (2004) announced that larger part of the dairy business visionaries had medium degree of data looking for conduct, trailed by high and low level with 68.75, 17.08 and 14.17 percent, individually.

Cosmo politeness

Pandey (1998) uncovered that feeling head, companions and neighbors being significant wellsprings of data had used by 78.33 percent and 77.50 percent of ancestral ranchers and 61.66 percent and 67.50 percent of non-ancestral ranchers, separately. Likewise found that there was less degree of usage of individual cosmopolite wellsprings of ancestral ranchers when contrasted with non-ancestral ranchers for accepting data on animal cultivation rehearses.

Patel et.al., (2003) saw that dominant part of business people (74.00%) had medium cosmopolites, while 14.50 percent of business visionaries had high cosmopoliteness, trailed by low cosmopoliteness.

Patel (2003) presumed that greater part of the business visionaries were found in low to medium degree of cosmopoliteness.

Antha (2004) showed that more than one-fourth (28.30%) of business visionaries had high cosmopoliteness, trailed by medium (44.20%) class and low (27.50%) cosmopoliteness gatherings.

Suresh (2004) announced that 45.00 percent of business visionaries had low degree of cosmopoliteness, 44.17 percent of them had medium level and 10.83 percent had significant level of cosmopolitness.

5 The strategies for eliminating the constraints in order to enhance the Makhana production.

Jan et al. (2010) expressed that, alongside the development of foxnut plant, raising of fishes like air-breathing and base taking care of can likewise be refined which can give extra pay to the rancher. The fishes appropriate for raising alongside foxnut plant incorporate Ukab (Anabas testudnens), Porom (Chana spp.), Ngamu (Chana spp.), Ngakra (Clars batrachus) and others and so on. Culture of fishes which are surface and scavengers are not reasonable because of anoxic conditions brought about by thorough spreading leaf lamina on the water surfaces and the long and sharp spines present all through the plant body.

Amitabh Chatanya (2011) in light of his investigation recommended that GI status ought to be conceded to Bihar based on broad development practices and satisfaction of nation request by 80-85% by single state, endeavors ought to be made by NRCM (ICAR) and Bihar govt. with assistance of JEEVIKA for limit building, and different administrations, for example, soil and water testing, hole filling, re-transplantation, measures for bother control, tang and presentation at basic stages to be bestowed to the ranchers' field approach by the accomplished makhana cultivator, researchers at their entryway step, decreases the innovative hole, improves esteem Chain by different intercessions, appropriation of Field based Makhana-Rice crop heightening based methodology particularly in locale of Madhubani and Darbhanga, welcoming enormous retail players, for example, Reliance, Aditya Birla, Future Group for more guaranteed come back to the makhana producer, since there 'is extremely less or no use of synthetic concoctions and manures so this harvest can be taken as Organic produce and in like manner it's advancement is required among the shoppers and so on to be advanced so as to upgrade the creation of makhana.

Randhir (2012) recommended that there is a need of foundation of a dirt and water testing focus, for granting tang about improved makhana-fish culture rehearses, accessibility of good nature of seeds and feeds, need a reasonable artworks and riggings for gathering purposes, the foundation of preparing plant, the foundation of

an administration managed fish market, courses of action of credit staff at low rate by various credit associations would really support the ranchers.

Udyogmitra Bihar (2012) reasoned that different suggestions, for example, incorporated realities for Makhana evaluating, preparing and Packaging Facts, Storage foundation advancement, Processing and Value add-on, Geographical signs (GI) enlistment for Makhana and item, Product Quality Certification, Brand Promotions, Umbrella marking under a typical brand name like Mithilamakhana, Madhubanimakhana and so on., which are additionally characteristic of the spot of the cause of the item, Logo structuring/item tag, Tang of makhana cultivators/processors, Pond Development, Project executions for limit building segments and so forth approaches are need of great importance.

Nitesh (2013) as indicated by his examination expressed a few proposals like sorting out tang cum show programs by NRC, Darbhanga, enormous scope improvement in preparing, esteem augmentations, reviewing, bundling, stockpiling and market framework, demonstrating bundles and practices to ranchers by means of expansion functionaries, so as to feature and advance makhana as a natural item among created nations, GI enlistment for Makhana, remembering this yield for the educational plan of Agricultural investigations so as to encourage research around there, marking and adverting to improve the interest of makhana and so forth.

RESEARCH HYPOTHESES

Keeping the objectives of the study in view, the following research hypotheses were framed on the different aspects of the study. Based on the review of literature presented, null hypotheses are set up and presented in null form (Ho), as follows:

1. Null hypothesis (Ho): There is no significant relationship between age of makhana farmers and their entrepreneurial behavior.

2. Null hypothesis (Ho): There is no significant relationship between education of makhana farmers and their entrepreneurial behavior.

3. Null hypothesis (Ho): There is no significant relationship between income of makhana farmers and their entrepreneurial behavior.

4. Null hypothesis (Ho): There is no significant relationship between extension contact of makhana farmers and their entrepreneurial behavior.

5. Null hypothesis (Ho): There is no significant relationship between economic motivation of makhana farmers and their entrepreneurial behavior.

Chapter 3

RESEARCH METHODOLOGY

This chapter deals with the methods and procedures followed in carrying out the study. It describes and clarifies methods used for measuring dependent and independent variables as well as techniques followed for collection and analysis of data. The details of methodology followed in the present investigation were presented under the following headings.

3.1. Locale of study

3.2. Selection of sample

3.3. Selection of variables and their measurement techniques

3.4. Development of instrument and procedure for data collection

3.5. Statistical methods used for analysis and interpretation of results

3.1 Locale of study

The present study was conducted in Madhubani district which is predominantly makhana growing district of Bihar state based on its area and production. There are lot of ponds, rivers and other reservoirs in the district which are the vital source for makhana cultivation and many fisherman communities are also residing in this district who are involved in production and marketing of makhana in order to secure their livelihood. Based on the available information as per record Madhubani district occupies 1st position in both area and production of makhana (>20 % in state) as well as it is the traditional center for the cultivation of this crop. Therefore Madhubani district was purposely selected as the locale of present study.

3.1.1 District at a glance

The district of Madhubani was carved out of the old Darbhanga district in the year 1972 as a result of reorganization of the districts of Bihar. It was a sub-division of Darbhanga and was situated in the northern part of the same. It consists of 21 Revenue Blocks. Nepal is situated in its North. Darbhanga is in the south. Sitamarhi in the west and Supaul district in the East. The territory is known as Mithila and this region has special characteristic. It has a characteristic culture what is called Maithili Culture. The district ranks 37th in terms of population out of total 707 districts of the country. It has two parliament constituency and ten assembly seats. The district headquarter of Madhubani is easily accessible by bus or rail. Nearest railway station is known as Madhubani Junction which is 1km from the district head quarter. Nearby airport is at Patna which is 178 km by road. The main rivers of this district are Kamala, Kareh, Balan, Bhutahi Balan, Gehuan, Supen, Trishula, Jeevachh, Koshi and Adhwara group of rivers.

As regards trade and commerce, this district exports fish, handloom cloth, makhana, mangoes, sugar-cane, litchi, paddy, and brass metal articles to various cities insides and outside the state. It imports medicine, machine, fine clothes, shoes, and cosmetic materials from other places. The predominant economic activities of the district includes - Agriculture, Makhana cultivation, Fisheries, Mithila Painting, Sikki and Mouni, Handicrafts and Weaving. A number of rice mills, sugar mills and timber saw mills have been set up in the district. Madhubani has been an important center for trade with Nepal since the latter part of the 19th Century. The principal items of export from Madhubani to Nepal are cotton, sugar, silk, betel nut and tobacco.

Table 3. Profile of District*

Demographic	
Total number of blocks	21
Total number of panchayats	399
Total number of villages	1111
Total population	4,325,884
Total male population	2,244,287
Total female population	2,081,597
Total literacy	58.62%
Total male literacy	78.81 %
Total female literacy	62.39 %
Total urban population	3.60%
Sex Ratio	928

*https://madhubani.nic.in/

Table 4. Agricultural perspective of District *

Agro-climatic zone	Zone I
Geographical area	3501km^2
Total density	1282 /km^2
Net sown area	2251km^2
Total forest area	136km^2
Total barren area	14.56km^2
Total irrigated area	1000km^2
Soil type	Younger or Older Alluvial Soil
Soil PH	6.5 - 8.4
Average rainfall	1245 mm
Temperature	7.7 - 36.6

*http://www.bameti.org/pdf/agriculture_profile_of_the_state.pdf

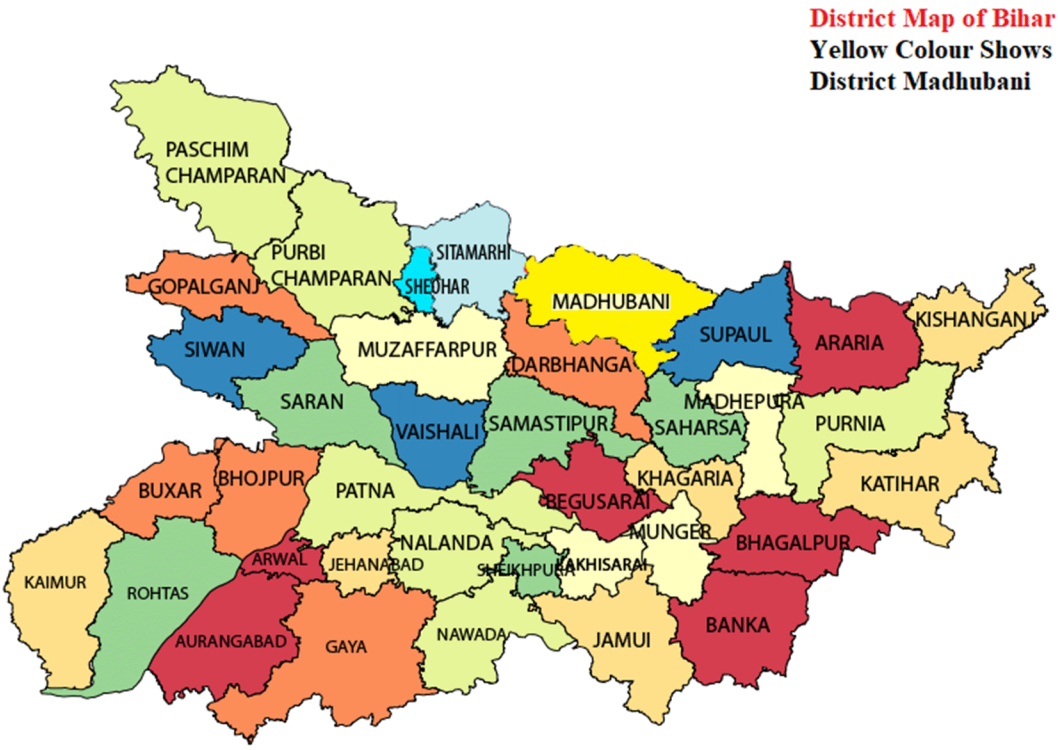


Figure 1. Location of the study

3.1.2 Area and Production of Makhana in Madhubani District

The total wetland area in the district is about 3730 ha, which includes the area contributed by 3591small wetlands (< 2.25 ha). This accounts for 2.5 per cent of the geographical area of the district. The other major wetland categories are tanks/ponds (407 ha), ox-bow lakes/cut-off meanders (159 ha) and natural waterlogged (135 ha)*. The district Madhubani occupies the highest share in total production of Makhana pop. It is a major trading centre for makhana clusters with presence of major wholesalers. They procure makhana pop from processors directly. Approximately 3500 MT of makhana is traded in the district annually which holds a share of 20-40% followed by the district of Katihar, which accounts for 18% of the total production of makhana in Bihar state.

*Space Application Centre (ISRO), Ahmadabad, May, 2010

3.2 Selection of Block

In view of area for study, six blocks of Madhubani district were again purposely selected for the present study based on the assumption that largest area as well as highest production of makhana is obtained through these blocks. These blocks were, Khajauli, Rajnagar, Basopatti, Rahika, Kaluahi and Benipatti of the Madhubani district. The location of the respondents selected for the study is given here through Figure 2.

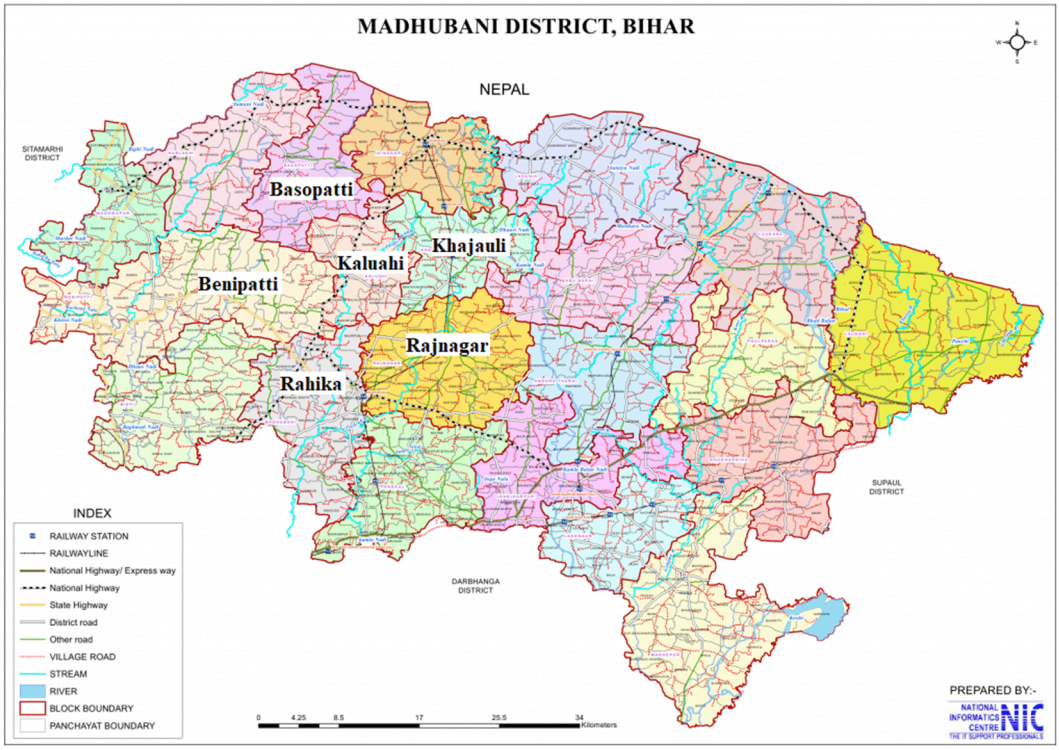


Figure 2. Location of the selected blocks.

A National Research Centre for Makhana was established on 28th February, 2002 in the District of Darbhanga. It is the nodal centre established by Indian Council of Agricultural Research, New Delhi under the administrative control of Ministry of Agriculture and Farmers Welfare, Government of India to look after the scientific cultivation of makhana in order to enhance its area as well as its production so that makhana growers of this region may be able to get more profit and livelihood options from this crop.

For the purpose of study the help of scientist working under NRC, Makhana, was sought. A list of potential makhana growers of Madhubani district was obtained. Further, from the list of Madhubani district, the makhana growers belonging to the selected blocks were identified and from those total 120 respondents were drawn who were known as makhana producers from the different villages of selected blocks by using proportionate probability principle. The details of sample selected for the purpose of study are given here through Table 5.

Table 5.Sample Details, block and village wise (N=120)

Block	Village Name	Number of respondents
Khajauli	Kanhauli	04
	Khajauli	06
	Lachhmipur	03
	Kormauli	02
	Nararh	05
	Total	**20**
Rahika	Bhauara	05
	Basuara	04
	Nazirpur	04
	Satlakha	05
	Saurath	01
	Sapta	01
	Total	**20**
Kaluahi	Belahi	04
	Kalikapur	02
	Bharaspatti	04
	Belahi	06
	Dokahar	04
	Total	**20**
Benipatti	Damodarpur	03
	Balain	04
	Dhanga	06
	Benipatti Bazar	03
	Kapasiya	04
	Total	**20**
Basopatti	Basopatti	05
	Phent	04
	Marhia	03
	Belauna	08
	Total	**20**
Rajnagar	Kaithali	02
	Koilakh	03
	Mahinathpur	05
	Majhaura	06
	Mangrauni	04
	Total	**20**

3.3 Variables and their measurement

Based on the extensive study of available literature along with widespread contact made with extension functionaries of the concerned area, discussion with the members of advisory committee, the potential variables associated with the research were listed. The pertinent best suitable variables were further scrutinized after informal discussion held with the scientists associated to Makhana production and the other scientist of Banaras Hindu University, Varanasi. Lastly, a list of selected variables along with their measurement procedure were finalized for the further study, the details of which is placed here as;

Table 6. Independent Variables:-

(A)	Variables	Measurement
1	Age	As per the chronological order
2	Caste	SC/ST, EBC/BC, UR, EWS
3	Education	Developed by Venkatramaiah 1983 revised 1990
4	Family Type	Scale developed for study
5	Family Size	Scale developed for study
6	Size of land holding	Scale of Pareek and Trivedi (1963) with slight modification
7	Occupation	Scale developed for study
8	Income (Annual)	Scale by Pareek and Trivedi (1963) with slight modification
9	Material possession	Scale by Pareek and Trivedi (1963) with slight modification
10	Economic Motivation	Scale of Supe and Singh (1969)
11	Social and Extension contact	Scale developed for study
12	Information sources utilization	Scale of Nandapurkar (1982)

Dependent Variables:-

(B)	Variables	Measurement
1	Technological knowledge	Scale developed for study
2	Entrepreneurial behavior	Entrepreneurial self-Assessment scale development by Technonent Asia (1981)

3.3.1 Independent Variables

Age

It refers to the completed years of age as reported by the respondents at the time of interview in nearest whole number of years. The age of respondents was recorded based on their recall memory. According to the obtained range of lower and higher age limits, the respondents were categorized in four groups as:-

Categories	Scores
Young age (Upto 35)	1
Middle age (36-50)	2
Old age (51-65)	3

Caste

Caste is social system, the membership of which is determined by birth and is endogamous in nature. In other words, it is a closed class system, which clearly distinguishes the status and role for its member in particular society. The selected respondents of the study were classified into different group based on their caste affiliation. They are described here as,

Categories	Scores
UR	1
EWS	2
BC	3
EBC	4
SC/ST	5

Education

Education is the key element in the production and creation of desirable changes in the human behavior. For the study, the term education refers to the level of formal education received by the respondents at the time of study. Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, beliefs and other traits. On the basis of their formal education, selected respondents were categorized in following manner:

Categories	Scores
Illiterate	1
Primary School	2
High School	3
Higher Secondary	4
Graduation and above	5

Family Type

It referred to weather the family was nuclear or joint. A nuclear family is considered as members of the family of only one person which included minors and other dependents. A joint family refers to one which constituted by two or more brothers families living together. Scores assigned to each of these categories as follows:

Family Type	Score
Nuclear	1
Joint Family	2

Family Size

Family size can be defined as all individuals within a household are included. This may include parents and children, but it may also include members of the extended family (e.g., aunts, uncles, grandparents) and sometimes people who are not related by genes. The relevant information was obtained under following categories and scored as follows;

Category	Members in Family	Score
Small	0-5	1
Medium	6-10	2
Large	10-15	3
Very Large	More than 15	4

Size of land holding

The size of land holding refers to an area of land possessed by an individual for the purpose of cultivation in ha. Based on the size of land holding the respondents were categorized into four following groups with respect the scores:

Categories	Score
Marginal Farmer (up to 1ha)	1
Small Farmer (1.01 to 2 ha)	2
Medium Farmer (2.01 to 4 ha)	3
Large Farmer (above 4 ha)	4

Occupation

It refers to the respondents means of livelihood. It was operationalized as the specific major work which the whole family possessed to secure their bread and butter. Following pattern was scrutinized for the scoring pattern:

Occupation	Score
Only Agriculture	1
Only Aquaculture	2
Agriculture + Aquaculture	3
Agriculture + Aquaculture + Other (Labour, Business, Service etc.)	4

Annual income:

It refers to total annual income of the selected respondents through all sources. On the basis of data collected, the respondents have been classified into following three categories as, low, medium and high.

Categories	Score
Low (Rs.50,000 to Rs.1,00,000)	**1**
Medium(Rs.1,00,001 to Rs. 1,50,000)	**2**
High (More than Rs.1,51,001)	**3**

Material possession:

It refers to the total tangible property (domestic, transport, agricultural and communicational) possessed by an individual. The variable was measured on the basis of G. Trivedi and Pareek scale (1963). On the basis of scores three categories were developed as low, medium and high.

Sl.No.	Categories	Score
1	Low material possession	Upto 3
2	Medium material possession	3-6
3	High material possession	Above 6

Economic motivation

Economic motivation in the present study referred to the occupational success in terms of profit maximization and relative value placed by the respondent makhana grower on economic ends. For measuring economic motivation value of makhana growers a scale developed by Supe (1969) was used. The scale having 5 categories of responses i.e. strongly agree, Agree, Undecided, Disagree and strongly disagree. The scale had six statements. Statement number 1, 2, 3, 4 and 5 was positive and statement number 6 was negative. The score of 5, 4, 3, 2 and 1 was assigned to strongly agree, agree, undecided, disagree and strongly disagree responses respectively for positive statement and reverse procedure for scoring was adopted for negative statement. For working out the economic motivation of makhana growers, scores of all the statement of the scale was summed up. The makhana growers were categorized into following categories based on mean ± standard deviation.

Categories	Score
Low economic motivation	Below mean – S.D.
Medium economic motivation	Between mean ± S.D.
High economic motivation	Above mean + S.D.

Social and Extension contact

Extension contact has been operationally defined as the frequency of contact of respondents with extension personnel and extension agencies for seeking information about farming practices. The procedure followed by Gandhi (2002) was used. Contacted once in a week, Contacted once in a fortnight, Contacted when problem arose, Never contacted with a score 3,2,1,0 respectively.

Frequency of extension Contact	Score
Once in week	3
Once in fortnight	2
Contact when problem arose	1
Never	0

On the basis of range obtained, the respondents were classified into three categories based on mean ± standard deviation.

Categories	Score
Low extension contact	Below mean – S.D.
Medium extension contact	Between mean ± S.D.
High extension contact	Above mean + S.D.

Information sources utilization

It is the degree of frequency of contact by an individual with various information sources. This is the pattern by which a farmer gets his information either on his own seeking or as a consequence of his being a part of the network. The information seeking behavior was measured with the help of scale developed by Nandapurkar (1982) with slight modification. In the present study the information source utilization was measured by taking consideration all the possible sources available to the makhana growers. A list of all the possible sources was prepared and

each respondent was asked to rate each source on the three point continuum viz., frequently used, sometime used and never with a score 2, 1 and 0, respectively. On the basis of total scores gained by each respondent, three categories were prepared based on mean ± standard deviation score.

Categories	Score
Low information source utilization	Below mean – S.D.
Medium information source utilization	Between mean ± S.D.
High information source utilization	Above mean + S.D.

3.3.2 Dependent Variables:

Technological Knowledge

The meaning of knowledge as given in Webster's dictionary is acquaintance with fact, range of information, awareness etcetera accumulated by mankind as far as one know within the range of one's information. English and English (1965) defined knowledge as "a body of understood information possessed by individual or by a culture". Bloom et. al. (1956) defined knowledge as those behaviors and test situations which emphasized remembering either by recognition or recall of ideas, materials or phenomena.

Knowledge of the respondents in the present study refers to a test situation and their response to a set of questions by recalling.

Determination of Knowledge

With a view, select the question to test the knowledge of respondents all available literature about makhana production technology relevant to the study area were collected. Based upon extensive study and inclusive discussion a set of question was prepared. Further the knowledge score obtained were put into mean ± SD

procedure for categorization of the respondents into different category based on their knowledge score.

Knowledge level	Score
Low	Less than (Mean-S.D.)
Medium	In Between (Mean ± S.D)
High	More than (Mean + S.D)

Entrepreneurial Behavior

For the present study entrepreneurial behavior of machine growers is operationally defined as cumulative outcomes of six selected components of entrepreneurial behavior viz. (Innovativeness, Decision making ability, Risk bearing ability, Achievement motivation, Self-confidence, Management orientation) were measured by following methods.

Components of entrepreneurial behavior.

(a). Innovativeness

This refers to the behavior pattern of an individual who has interest and desire to seek changes in makhana production techniques and is prepared to introduce such changes into his operation wherever practical feasible.

In today's world, knowledge is currency; a person with accurate information can exploit the opportunities by acting at the right time. A person who adopts improved technologies earlier than others in his social system can take relative advantage of the innovativeness.

For quantifying innovativeness Nandapukar (1980) self-rating scale was used. This scale has nine statement and responses were obtained on five point continuum namely Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree. A weightage

of 5, 4, 3, 2 and 1were assigned to the response categories in the case of positive statements and the scoring was reversed for statement number 3, 5 and 6 as these are negative statements. The total scores obtained for each of the respondents were classified into 3 categories, based on mean and standard deviation as check.

Category	Score
Low innovativeness	Below mean – S.D.
Medium innovativeness	Mean ± S.D.
High innovativeness	Above Mean + S.D.

(b). Decision making ability

It was operationally defined as the ability of makhana growers to select the most efficient means from among the alternatives regarding makhana production on the basis of modern techniques to maximize the economic profit. Decision making ability was measured by using scale developed by Supe (1967) and suitable modification was done for the study. The schedule consists of fifteen items related to makhana production. Makhana growers were asked whether they are taking self-decision, participating in decision or not involved in decision making and scores assigned to them was as follows:

Category	Score
Not involved in decision making	0
After consulting family members and fellow makhana growers	1
After consulting fellow makhana growers and agriculture scientist	2
Self-decision	3

Based on scores obtained the respondent were categorized into three groups based on mean and standard deviation.

Category	Score
Low decision making ability	Below mean – S.D.
Medium decision making ability	Mean ± S.D.
High decision making ability	Above Mean + S.D.

(c). Risk bearing ability

The risk bearing ability has been operationalized during the study as the extent of degree of orientation to which makhana growers are willing to take risk in order to get or expect higher returns from the cultivation of makhana production. The zeal to take risk and face uncertainty in making innovative decision pertaining to adoption of makhana production is called risk bearing ability during the study. The risk taking ability variable was measured with the help of scale developed by Supe (1969). This scale was adopted on the farmer's sample at many occasions in several extension researches. The scale consists of six statements. The fifth statement was negative in nature while all other statements were positive statements. The responses were collected on five point continuum as, strongly agree, agree, undecided, disagree and strongly disagree. The score were assigned for the responses as 5,4,3,2 and 1 respectively for the positive statement and reverse order for negative statement and the value of possible score ranges in between 6 to 30,which denotes that minimum score is 6 while maximum possible score is 30. The scoring procedure related with the different items of the scale is given here as,

Category	Score
Low risk bearing ability	Below mean – S.D.
Medium risk bearing ability	Mean ± S.D.
High risk bearing ability	Above Mean + S.D.

(d). Achievement motivation

This variable was operationally defined as the desire for excellence to attain a sense of personal accomplishment. The scale developed by Rani (1985) was used for the study with suitable modification.

The instrument consists of six statements (four positive two negative) and responses were obtained on response categories namely strongly agree, agree, undecided, disagree and strongly disagree with the score of 5, 4, 3, 2 and 1 were

assigned respectively in the case of positive statements and the scoring was reversed in the case of negative statements. The total score of the achievement motivation was arrived by the summing up the weightages of the responses of the respondents were categorized into three categories based on mean and standard deviation.

Category	Score
Low achievement motivation	Below mean – S.D.
Medium achievement motivation	Mean ± S.D.
High achievement motivation	Above Mean + S.D.

(e). Self Confidence

It was operationally defined as the respondent's belief in his own abilities in getting the things done in his enterprise. Scale developed by Basavan (1971) was used and scheduled was developed with ten statements and responses were obtained on response categories via. Strongly agree, agree, undecided, disagree and strongly disagree. The score assigned as 5, 4, 3, 2 and 1 respectively to each of the positive statements and the scoring was reversed for negative statements. The possible score range was 10 – 50. The respondents were categorized into three groups based on mean and standard deviation.

Category	Score
Low self confidence	Below mean – S.D.
Medium self confidence	Mean ± S.D.
High self confidence	Above Mean + S.D.

(f). Management Orientation

It was operationalized as the degree to which makhana growers were oriented towards managing their pond regarding planning, production and marketing functions. The scale developed by Samantha (1977) with moderate modifications was used for this study. The scale consists of three items.

Planning orientation: This consists of six items out of which three were positive and three were negative.

Production orientation: This consists of six statements out of which four were positive and two were negative statements.

Market orientation: This consists of six statements out of which four were positive and two were negative statements.

The score was given for all the statement on five point continuum. The categories were strongly agree, agree, undecided, disagree and strongly disagree with the weightages of 5, 4, 3, 2 and 1 for positive and reverse for negative statement. The scores obtained for each statement were summed up to get individual respondents management score. The possible score range was 18 – 90.

The respondents were classified into three categories based on mean and standard deviation as;

Category	Score
Low management orientation	Below mean – S.D.
Medium management orientation	Mean ± S.D.
High management orientation	Above Mean + S.D.

3.3.3 Constraints and Suggestions for Enhancing Makhana Production

One of the objectives of the study is to find out the constraints confronted by the growers in makhana production. For this list of twenty possible constraints were identified based on the previous research and a conversation with scientists, extension workers and farmers related to this enterprise. During the process of study, the selected respondents were asked to express their views regarding the constraints which are encountered by them in makhana production. The problems mentioned by most of the respondents would become the first problem and similarly the rest were followed in order to their magnitude based on the number of respondent of mentioned.

Similarly the respondents were requested to elicit their suggestions to enhance the makhana production performance of the area. The suggestions stated by most of the respondents would become the first problem and similarly the rest were followed in order to their magnitude.

3.4 Development of Schedule and Procedure for Data Collection

During the process of study, data were collected with the help of the structured interview schedule incorporating all the variables undertaken during the study. The pilot testing of schedule was made with the help of dozen of the makhana growers in the same area apart from the sample respondents. The irrelevant items of the schedule were deleted based on response of the makhana growers during the pilot survey of the area.

For final collection of data from the sample, the investigator visited to their respective home or farm wherever they were made available along with interview schedule. Every care was taken to build a good rapport with each and every respondent, before the interview schedule was applied. After building desired and possible rapport, the schedule was administered to each respondent individually and their responses were recorded on schedule at the spot. This necessitated intensive contact with the growers along with several visits of the respective villages by the investigator. After collection of data, master table was prepared on the basis of

appropriate scoring procedures for each components of the schedule. After quantification of each response sheet, the data were put for suitable statistical analysis in order to get meaningful results of the study.

3.5 Statistical Methods Used for Analysis

The data were systematically arranged and tabulated for further analysis and meaningful interpretation. Following statistical methods were applied for the analysis and interpretation of data to present the results and findings of the study.

3.5.1 Frequency and percentage

Frequency and percentage was used in descriptive analysis for making simple comparison. For calculating percentage, the frequency of a particular cell was multiplied by 100 and divided by total number of respondents in that particular category of sell to which they belong.

3.5.2 Arithmetic mean

The average of n numbers is obtained by finding their sum (by adding) and then dividing by n.

Let $X_1 + X_2 + X_3 + \ldots + X_n$ be n numbers and then their average or arithmetic mean is given by

$$\bar{x} = \frac{\sum Xi}{n}$$

Where,

X_i is the observation and n is the number of observation.

3.5.3 Standard deviation

It is positive square root of the mean of the squared deviations taken from arithmetic mean. It is represented by symbol

$$S.D = \sqrt{\frac{1}{n}\sum(Xi - \bar{x})^2}$$

Xi = Values of random variable x

$\bar{x}$ = Mean of all the variables or observations

n = Number of observations.

3.5.4 Correlation analysis:

To find out the intensity of the association ship/ relationship showing strength of correlation between personal, socio economic attributes of the respondents and their extent of different components of entrepreneurial behaviour. The symbolic representation "r" as showing by Karl Pearson of correlation coefficient was applied the correlation coefficients were worked out by using the following formula.

$$r = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{\sum(X-\bar{X})^2}\sqrt{(Y-\bar{Y})^2}}$$

Where, $\bar{X}$ = mean of X variable

$\bar{Y}$ = mean of Y variable

3.5.5 Graphical representation

In order to present the findings in much more meaningful and impressive manner, the results were presented with the help of histogram and pie-chart based on the value of different tables.

(i) Histogram

(ii) Pie Charts

Chapter 5

SUMMARY AND CONCLUSION

The section in nutshell gives portrayal of the current examination covering the synopsis of significant research, ends and recommendations for additional investigation.

Foundation:

Gorgon nut or fox nut, ordinarily known as makhana, is a sea-going yield with enormous skimming leaves, creating brilliant purple blossoms. Naturally it is known as Euryale ferox and it has a place with family Nymphaeceae. Appropriation of Makhana is constrained to tropical and sub-tropical districts of South East and East Asia. In any case, it happens in wild structure in Japan, Korea, Bangladesh, China and Russia. Makhana is a high worth item monetarily developed uniquely in Bihar and certain pieces of eastern India. Other than this, it develops as a characteristic harvest in Madhya Pradesh, Rajasthan, Jammu and Kashmir, Tripura and Manipur. With bounty of numerous regular and man-made water bodies' wealthy in natural rubbish; makhana develops plentifully in the stale water of wetlands, tanks, lakes, lakes and discard in the northern pieces of Bihar. Other than stale water bodies, it is additionally developed in paddy fields and low-lying territories. Development of Makhana is exceptionally bulky, work escalated and include human drudgery while clearing base of the water body for seed assortment. It is trailed by preparing of crude seeds, which is similarly careful action. Anglers people group having a place with the more vulnerable segments of the general public is predominantly associated with makhana segment. These anglers are sorted out into anglers helpful social orders and the administration lakes reserved for fish cum makhana development are rented to the agreeable social orders and these cooperatives further appropriate it among their individuals.

It is a blossoming plant local to Asia. It develops in water, delivering enormous gliding leaves with a sewed surface, splendid purple blossoms and dull

white seeds. Environmentally makhana develops in shallow water bodies that have a specific measure of natural waste amassed at the base. In North Bihar, makhana is broadly developed in the stale water of wetlands, tanks, lakes, lakes and trench. Makhana development is done on customary lines ranchers despite everything follow age-old act of development.

The dispersion of Euryale ferox is restricted to tropical and sub-tropical districts of South East and East Asia. It happens in wild structure in Japan, Korea, Bangladesh, China and Russia and so on. In India, it develops as a characteristic harvest and is conveyed scantily in parts of Manipur, Orissa, Jammu and Kashmir and so forth. It is developed as a money crop in Bihar and parts of West Bengal and Assam. Makhana plant requires shallow water profundity having thick layer of filthy base that is wealthy in natural supplements.

Makhana pop is viewed as nutritious and sound food with a protein substance of 10 - 12%. 100 gm of crude and popped makhana gives a calorific estimation of 362-kilo cal and 382-kilo cal individually

USES

A portion of the employments of makhana are recorded underneath:

- Broiled makhana pop is utilized as a nibble thing.
- Makhana powder is utilized for arrangement of Kheer.
- Makhana pop is utilized for making curries like paneer makhana and so on.
- In certain pieces of Manipur, the vegetative pieces of the plant are utilized for making vegetables and leaf petiole is utilized as serving of mixed greens.
- Utilized as starch in material industry.

India in this contemporary is a developing economy and is bound to accomplish different achievements, on its different fronts, in coming future. So as to secure the status of created country, it needs to make 100 million occupations.

The extremely pitiful development rate in horticultural sectors challenge for rustic advancement in India. Huge development in assembling and administration divisions is contributing for the better day to day environments and way of life of urban populace though agribusiness and unified segments are still in back foot in giving the better day to day environments in rustic India. As contrast with urban region greater part of individuals living in provincial zone can't crawl the advantages of the formative plans occurring in India. In remembering these lopsided characteristics and to accomplish adjusted financial turn of events, it gets unavoidable to advance agripreneurship for the improvement of rustic zone. So as to tap the undiscovered potential rich and unexplored provincial assets, agripreneurship has a gigantic extension. Despite the fact that it is sounding exceptionally encouraging and alluring, it is difficult way to walk on account of the issues like absence of mindfulness among the individuals, absence of enterprising society, poor infrastructural improvement, absence of sufficient institutional help and government arrangement.

Agripreneurship is the innovative procedure taken up in agriculture or the unified areas. It is the way toward receiving new strategies, forms, procedures in farming or the associated divisions of agribusiness, for better yield and monetary profit. Agripreneurship changes over rural action into a pioneering movement. By embracing creative thoughts in agribusiness and unified divisions an agripreneur who is a trend-setter, drives the progressions in rustic economy. An agripreneur work is never simple as he faces challenge, embraces development, makes better approaches for getting things done and taps new markets openings. Keeping the above realities in see, the current investigation was attempted "A study on Entrepreneurial behaviour of makhana growers in Madhubani district of Bihars" with following destinations:

1. To know the demographical, and socio economic conditions of makhana cultivators.

2. To study the technological knowledge of Makhana cultivators.

3. To study the Entrepreneurial conduct of Makhana cultivators.

4. To distinguish the limitations as stood up to by Makhana cultivator

Philosophy

The principle reason for this examination was to comprehend the entrepreneurial conduct of the makhana cultivators in Madhubani Region of Bihar. The decrease in Makhana creation is affecting the job of the mallah (angler) network who are essentially reliant on makhana cultivation. Current study was directed in area of Bihar which is well known for makhana development. Lakes, waterways and different repositories go about as the imperative hotspot for makhana development for angler networks who are living in this region are likewise engaged with creation and promoting of makhana so as to make sure about their vocation and complete crafted by their starting point. Madhubani the conventional home community for the development of makhana. Consequently, Madhubani region was deliberately picked for region of present research. Zone with the end goal of study, recorded squares were intentionally chosen for concentrate in Madhubani region carried on the presumption that biggest region just as most elevated creation of makhana is acquired in these squares. These chose squares were, Khajauli, Rahika, Kaluahi, Benipatti, Basopatti, and Rajnagar of the Madhubani area. Out of the chose squares 20 respondents were chosen from Khajauli square, 20 respondents from Rahika, 20 from Kaluahi, 20 from Benipatti and 20 from Rajnagar square. Consequently, inside and out an all-out example size of 120 was taken for study. Based on comprehensive survey of writing, conversation with concerned departmental researchers, augmentation specialists and individuals from warning board of trustees twelve autonomous and two ward factors were chosen with the end goal of study. The primary free factors were age, standing, instruction, family type, family size, size of land holding, occupation, yearly pay, material belonging, monetary inspiration, social/augmentation contact and data source use were chosen as the needy variable in course of the examination. Two ward factors

information level of ranchers and their enterprising conduct was chosen for the investigation.

Information for the examination was gathered by close to home visit to rancher with the assistance of timetable created. At long last the consequence of the investigation was summed up with assistance of different factual apparatuses like mean, recurrence and standard deviation. Result was additionally summed up in graphical structure comprising of histogram and pie diagram

The discoveries of the examination can be finished up with following realities:

Consequently, finishes of the current examination are introduced here, in view of the targets:-

Demographical and socio-economic condition of makhana cultivators.

1. The discovering prompts the way that higher number of makhana cultivators (53.33%) were old enough under 35. Around (33.33%) had a place with the age gathering of 36-50. What's more, rancher old enough gathering over 51 were near (13.33%).Hence it tends to be presumed that greater part of ranchers had a place with more youthful gathering and it could be identified with their latent capacity and enthusiasm to convey crafted by enterprise.

2. The examination prompts the end that lion's share of the makhana ranchers (87.5%) had a place with the classification EBC. This discoveries can be identified with the way that makhana cultivating is essentially done by ranchers who have a place with standing mallah or angler network and locally known as sahni. Around (08.33%) of it was finished by SC/ST and a populace of (04.1%) who fundamentally have a place with upper classification however are financially feeble do crafted by makhana development.

3. The investigation prompts the way that populace of (46.66%) have training up to essential level which is a lot of required to do the necessary work productively. Makhana ranchers of populace around (39.166%) are in absence

of any instruction i.e. they are uneducated. (14.166%) of populace have training level of center school.

4. It very well may be finished up from the finding that larger part of the makhana ranchers (75%) had joint family framework conveying the estimation of conventional family patter and just (25%) degenerate followed family unit design.

5. Finishing up the family size of makhana famers a greater part of ranchers (61.66%) had family size comprising of 10-15. A populace of (20.83%) had family size comprising of 6-10 individuals. 14.16% of makhana ranchers had little family size comprising up to 5 individuals followed by (3.33%) with family size with individuals more than 15.

6. The investigation recommends that dominant part of makhana ranchers (90%) are peripheral ranchers claiming exceptionally less or no land upto 1 ha. They are trailed by (9.1%) populace of makhana ranchers who have size of land holding of 1-2 ha. (0.833%) of them have medium size holding of 2-4 ha.

7. The finding recommends that dominant part of the rancher (35%) work in relationship with 2 lakes, rancher populace of (20.883%) work in relationship with 3 lakes, around (19.166%) of makhana rancher work in relationship with 4 lakes, a populace of (16.66%) work is related with 1 lake followed by (8.3%) rancher who work in relationship with 5 lakes.

8. Closing the size of lake in which rancher work the vast majority of the lakes (55.833%) had region running from 1-2 section of land, around (25%) of lake had region of 2-3 section of land, (12.5%) lake had zone 4ha or more just (6.66%) lake had zone of 0-1 section of land.

9. Finishing up the control of makhana ranchers dominant part (56.66%) work convey work of horticulture in blend with makhana development and fish cultivating. Joined by (40.83%) of ranchers who are occupied with other

monetary exercises. Just (2.5%) of rancher convey just crafted by makhana and fishery.

10. After an examination it is inferred that dominant part of rancher (45.83%) had medium degree of income level which ranges from 1 lac to 1.5 lac. A populace of (40.83%) had low pay level extending from 50,000 to 1 lac.

11. The scrutiny of results show that a decent level of populace (58.33%) have medium material belonging, trailed by (21.66%) populace of makhana cultivators having low material belonging and just (20%) with high material belonging.

12. Further, as far as monetary inspiration (64.166%) of makhana ranchers had medium financial inspiration, joined by (19.166%) having low monetary inspiration and just (16.66%) of makhana ranchers having high monetary inspiration.

13. (61.67%) of respondents had medium augmentation contact, a populace of (25%) makhana ranchers had low expansion contact and just a populace of (13.33%) ranchers had elevated level of augmentation contact.

14. Concluding data source usage greater part of the makhana rancher had medium degree of formal, informal and broad communications as wellspring of data followed by low and high data source use.

5.2. Technological information

Portraying the mechanical information on makhana rancher's lion's share of them (61.66%) conveyed high innovative information identified with makhana development on different angles, trailed by (21.66%) ranchers who conveyed medium degree of innovative information identified with makhana creation and a populace of (16.66%) who conveyed low mechanical information about makhana development.

5.3 Entrepreneurial conduct of makhana cultivators

Considering different parts of pioneering segment like creativity, dynamic capacity, chance bearing capacity, accomplishment inspiration, self-assurance and the board direction dominant part of the ranchers had medium degree of enterprising conduct fulfillment.

The factors Age, Instruction, Material belonging, Financial inspiration, Data source use Augmentation contact had positive and huge relationship with pioneering conduct of the makhana cultivators.

5.4 The requirements saw by the makhana cultivators underway and showcasing of makhana.

The makhana cultivators revealed the requirements underway like issues significant expense of works, low creation because of environmental change, non-accessibility of data with respect to specialized direction, absence of preparing about logical creation innovation of makhana and non-accessibility of improved seeds. Concerning the limitations saw by makhana cultivators in advertising like high charges of agent and intermediaries commission, low market cost of produce, absence of least help value, absence of handling offices and absence of transport offices.

5.5 DESIGN

Ex-post- facto research design was used for conducting the study.

5.6SELECTION OF THE STATE

Selected blocks of Madhubani district was purposively selected

5.7SELECTION OF RESPONDENTS

120 respondents were selected from a total six blocks by employing simple random sampling method.

5.8COLLECTION OF DATA

The data were collected by personal interview method through a structured interview schedule. The data thus collected was coded, classified, tested statistically, tabulated and were suitably interpreted.

Relative importance of different components of Entrepreneurial behaviour

Among the ten different components of entrepreneurial behaviour majority of respondents ranked 'Ability to coordinate the entrepreneurial activities' as preferred first by the members followed by 'Decision making ability', 'Innovativeness' and 'Cosmo politeness' which were preferred 2nd 3 rd and 4th respectively. Other components of entrepreneurial behaviour like 'Managerial assistance', 'Risk taking ability' 'Knowledge of the selected enterprise', 'Achievement motivation', 'Information seeking' .

5.9Suggestions for future work:

1. This study was confined to selected blocks of Madhubani district hence the results may not be applicable to a large area. For generalization, similar work should be undertaken in other blocks and districts.

2. In this study the dependent and independent variables were limited. Therefore more number of variables may be included.

3. Comparative study of makhana growers may be planned for finding actual status of makhana growers and extent of their involvement in entrepreneurial behaviour of makhana growers.

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APPENDICES

Sl. No.	Variables	Scale
INDEPENDENT		
1	Age	As per the chronological order
2	Caste	SC/ST,EBC/BC,UR,EWS
3	Education	Developed by Venkatramaiah 1983 revised 1990
4	Family Type	Scale developed for study
5	Family Size	Scale developed for study
6	Size of land holding	Scale of Pareek and Trivedi (1963) with slight modification
7	Occupation	Scale developed for study
8	Income(Annual)	Scale by Pareek and Trivedi (1963) with slight modification
9	Material possession	Scale by Pareek and Trivedi (1963) with slight modification
10	Economic Motivation	Scale of Supe and Singh (1969)
11	Social and Extension contact	Scale will be developed for study
12	Information sources utilization	Scale of Nandapurkar (1982)
DEPENDENT VARIABLES		
1	Technological knowledge	Scale developed for study
2	Entrepreneurial behaviour	
A	Innovativeness	Scale by Nanda Puker (1980)
B	Decision making ability	Scale by Supe (1967)
C	Risk bearing ability	Scale by Supe (1969)
D	Achievement motivation	Scale by Rani (1985)
E	Self confidence	Scale by Basavan (1971)
F	Management orientation	Scale by Samantha (1977)

Objective of the study

(a). To know the demographical, socioeconomic characteristics of makhana growers.

(b). To assess the technological knowledge related to makhana production.

(c). To assess the entrepreneurial orientation of makhana growers.

(d). Major constraints and suggestions confronted by makhana growers.