PRE-FEASIBILITY REPORT VOLUME II

AGRICULTURE

2022

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Province Government
Province Policy and Planning Commission
Madhesh Pradesh
Janakpurdham, Nepal

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Disclaimer : The views presented in this report are those of the authors and do not necessarily represent the views of any agency of the UK government, Province Policy and Planning Commission Madhesh Pradesh, The Palladium Group, or the Economic Policy Incubator.

Government of Madhesh Province

Province Policy and Planning Commission

Janakpurdham,Nepal

Foreword

The Province Policy and Planning Commission has been involved in the formulation of provincial policies and plans for the economic prosperity and poverty reduction of the province in close coordination with the government line ministries, development partners, private sector, and civil society.

We are pleased to come up with a published book entitled "Pre-feasibility study report of the selected Public Private Partnership possible project of the Madhesh province". The book has carried out the feasibility study report of the 16 selected projects of the province with detailed technical and financial analysis. The projects in the book have been selected in close coordination and consultation with the provincial ministries, private sector, and civil society. This list of projects in this publication will be helpful to meet the requirement of the investor whose interest to invest in the Madhesh province. Similarly, the publication will be helpful to select the project for investment summit under the implementation modality of the Public private partnership.

I hope that the document will be useful to interested planners of provincial and local level as well as private sector investors in economic development and poverty reduction, and that it will be able to attract investment opportunities in the province.

I would like to take this opportunity to extend my sincere thanks to Hon. Chief Minister Lalbabu Raut and the Hon. Ministers of the Government in Madhesh Province. My sincere thanks are also due to the Principal Secretary, the Secretaries of the Ministries and their colleagues, and other stakeholders for all their inputs to the various sectors covered by the publication. I would like to express my sincere thanks to the Economic Policy Incubator (EPI) for their technical support in preparing the final document of the project bank.

Dr. Bhogendra Jha
Vice Chairperson

May 2022

ACCELERATING INVESTMENT AND INFRASTRUCTURE

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Acknowledgments

It gives me immense pleasure to see that the Policy and Planning Commission (PPC) of Madhesh Province is publishing the pre-feasibility reports of 16 projects in three volumes. These projects are related to tourism, infrastructure, education, agriculture, and industry.The reports present detailed technical and financial analysis, legal frameworks, environmental and social impact, risk analysis, and implementation modality for selected projects. This is an important exercise in terms of improving project preparation and prioritization in the province and can help improve capital expenditure.

Capital expenditure has always been a challenge in Nepal, including at the provincial level. Budget allocated to development activities is not spent in time, which often leads to a bunching of expenditure towards the end of the fiscal year. This has implications for the quality of spending and raises questions over the quality of project outputs and, of course, value for money. Legislative and institutional efforts so far have yet to bear fruit. Poor preparation of projects, low project readiness, and the resulting delay in awarding contracts are other problems.

The guidelines on developing project bank issued by the National Planning Commission can be an important step forward in addressing this problem at all levels of government. The PPC was quick to recognize this opportunity and approached EPI for support towards institutionalizing the process for project prioritization based on feasibility assessments. We at EPI feel proud to have been able to work with the PPC on this innovative initiative.

I sincerely hope that the reports included in this publication will help the Province Government allocate resources to areas that offer high development returns. This would ultimately help improve capital expenditure of the Government, thereby creating economic opportunities for the people of the Province. The publication could also be a useful reference for private-sector investors.

EPI received significant support and guidance from the PPC in carrying out the feasibility work. I would like to extend my sincere thanks to Prof. Bhogendra Jha, Vice-Chair of the PPC and his team. All concerned line ministries of the Province Government provided critical support. I would like to express deep appreciation for their support and engagement. My special thanks are also due to Invest and Infra Pvt ltd and Dikshya Consulting for carrying out the feasibility assessments and preparing these reports. Finally, I would like to acknowledge the crucial role of my colleagues at EPI. They have put significant efforts into this publication.

Hiramani Ghimire, PhD
Team Leader

June 2022

PRE-FEASIBILITY REPORT CONTENTS

PRE-FEASIBILITY STUDY OF

ESTABLISHMENT AND PROMOTION OF SEEDS AND SEEDING CENTER

LIST OF ACRONYMS

BCR	Benefit Cost Ratio
DESR	Debt Equity Service Ratio
DFID	Department for International Development
EIA	Environmental Impact Assessment
GoN	Government of Nepal
IEE	Initial Environmental Examination
IRR	Internal Rate of Return
NPV	Net Present Value
PPP	Public Private Partnership
USD	United States Dollar

EXECUTIVE SUMMARY

Commercialization of agriculture is one of the major priorities of the Agriculture Development Strategy (ADS). ADS has also provided the provinces with the ability to set plans and develop strategies as per the contextual suitability. This project is designed to be included in the Project Bank of Madhesh Province. As agriculture is a major source of GDP and occupies the majority of people in the Province, contribution of this project is expected to be highly significant for sustainable and eco-friendly development planning in the agriculture sector.

By establishing a single platform at the next Investment Summit, the Provincial 2 Planning Commission (PPC) hopes to attract investment in a variety of initiatives, including agricultural projects. Establishment and promotion of seeds and seeding centers in Madhesh Province is one of the primary sites designated for investment. The research on the establishment and promotion of seeds and seeding center in Madhesh Province is primarily intended to document the project's technical and financial feasibility. Both primary and secondary data gathering approaches were used in the study. Primary data was acquired from field-based research, which included a field visit and stakeholder consultations and group discussions. Secondary data was gathered from a variety of sources, including published papers, journal articles, and other verified and trustworthy online sources.

This project appears to be best suited for a Public Private Partnership (PPP) approach, in which GoN will assist in obtaining the necessary land for the project. The developer will then build all of the infrastructure required for the project's smooth execution and will run it for 30 years before handing it over to GoN in good working order.

The research examined the project's technical and financial elements and determined that it is technically and financially feasible, with a total anticipated cost of roughly NPR 224,030,000 (including interest component throughout the construction period) and an equity IRR of 19.35%.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SALIENT FEATURES OF THE PROJECT

Table 1: Salient features of the project

General information of the project		
1	Name of Project	Establishment and Promotion of Seeds and Seeding Center
2	Project Location	Province: 2 District: TBD Municipality/Rural Municipality: TBD
3	Project Implementation Modality	☐ Public ■ PPP ☐ Private ☐ Others/Please Specify
4	Category of Project	■ Short term: 5 years and below ☐ Mid term: 6 – 10 years ☐ Long term: 11 – 15 years
5	Sector as per 1st 5 years Provincial Plan	Economic
6	Type of Project (Sub Sector)	Agriculture
7	Implementing/Facilitating Agencies	Private sector facilitated by the provincial Ministry of Land Management, Agriculture and Cooperative.
8	Project Management (Implementation Mechanism)	Private sector will manage the project with support from the Federal, Provincial, and Local Governments and local stakeholders.

Project specific information

1	Salient Features of Project	● Increase productivity of crops. ● Increasing quality of seed resulting in increasing supply of seed. ● Develop a mechanism for production and marketing of seed. ● Proper branding by the Provincial Government.
2	Affected Population, Land Requirement, Acquisition & Resettlement, Materials and Ease of Access	
	Land Requirement	Approx. 15 Hectare
	Acquisition & Resettlement	No issue of resettlement.
	Materials and Ease of Access	High quality seeds can be imported from India for the initial phase of seed production.
	Environmental and Social Management Plan (ESMP)	Direct seeding offers eco-friendly and sustainable alternatives. It helps to keep the waterways clean while cutting carbon emissions. Seed storage can use chemical pesticides, which will be in closed conditions.
3	Project Document Available	■ None (New/Rehabilitation) □ Concept Note/Desk Study □ Feasibility Study □ Detailed Engineering/DPR
4	Estimated Cost to Complete the Project	NPR 224,030,000
5	Estimated Time to Complete the Project	Feasibility Study/DPR: 6 months Approval and Financial Closure: 6 months Construction Period: 1 year
6	Project Financing Options	Majority investment of the private sector while the province and relevant Local Governments will provide land and subsidies for the procurement of seeds. The government will be provided with minority equity at 10% of the total share capital.
7	Project Technology/Components	● Development of superior crop plant varieties. ● Evaluation and release of seeds. ● Seed production, processing, and storage. ● Seed testing, certification and quality control. ● Seed marketing and distribution. ● Research on seed physiology, seed production and seed handling based on modern botanical and agricultural sciences. ● Support public, community and private enterprises in source seed production. ● Enhance marketing skills of seed entrepreneurs and invest in seed related infrastructure.
8	Contribution to SDG and Green Growth	Direct seeding leads to better air quality. This means less fuel burned and lower emission levels. It helps to replenish soil quality. If soil is healthy, it supports better water retention, and it contains a wealth of living organisms that break down organic matter into vital nutrients. Following Sustainable Goals can be attained: Goal No. 2 Zero hunger Goal No. 3 Good health and well-being Goal No. 6 Clear water and sanitation Goal No. 11 Sustainable cities and communities
9	Project IRR	16.13%

10	Benefit Cost Ratio	1.31 Times
11	Private Sector/Consumer Committee/ Beneficiary Roles	Planning, designing, building and financing the project
12	Government's Roles	• Provide concessions for establishing a company • Marketing and branding of the seeding center • Provide land for the establishment of a seeding center • Provide nucleus seed, seed processing plant and storage facility

Other project information

1	Target Beneficiaries	Entire Nepali people
2	Market of Project's Service/Product	Entire Nepali market
3	Key Risks and Opportunities of Project Development & Operation	
	Strengths and Opportunities	• Availability of highly fertile land in the province • Production of high quality seeds of indigeneous variety of crops ensures the availability of the market within and outside the province • This project would expedite technology transfer of tried and tested seed technologies developed globally into the province. • Limited number of qualified breeders.
	Risks and Issues	• Lack of technical manpower having the domain expertise • Quality assurance and control can be a challenge for competitive edge since there is an abundance of imported seeds in the market. • Seed production would need to be done on a large scale to ensure price competitiveness in the market, especially compared to Chinese and Indian products. • Research and development of high quality seeds is expensive and technology-intensive.

1

BACKGROUND

1.1 Introduction

Agriculture solely contributes more than 35% of national GDP. Nepal's agriculture represents a higher level of diversification due to the existence of varied climatic and geographic conditions. Also, Nepal is well known for the existence of indigenous cultivars and local genetic resources. The value of such varieties lasts longer though productivity might be lesser than improved and modified varieties.

After the introduction of the new constitution, the country restructured into 7 provinces. These provinces have been divided mostly on the geographic basis. For agriculture development, all provinces have particular strengths and bear the potential of producing diverse agricultural/livestock products.

Quality seed is a very important thing for increasing production. It is necessary to maintain the varietal characteristics of seed, and control the seed borne disease for the production of high quality seed. This manual tries to improve the knowledge of farmers about technical and management activities during the wheat cultivation, and support the improvement of quality seed production. The improved technical and management farming activities will be supportive for quality seed production, and raise the livelihood of farmers living in the hilly areas. The key components of the seed value chain are varietal development, release or registration, seed multiplication, processing, packaging, distribution and maintenance of different varieties of crops.

Foundation seeds are being practiced to produce at the community level through making agreements with private companies, farmers, and social institutions like groups, cooperatives, etc. Nepal Agriculture Research Council (NARC) has many research stations to develop breeders' seeds. The National Seed Board (NSB) is responsible for seed quality control and certification at the national level.

Commercialization of agriculture is one of the major priorities of the Agriculture Development Strategy (ADS). ADS has also provided the Provinces with the ability to set plans and develop strategies as per the contextual suitability. With the launching of the federal system in the country, Province Level Governments have encompassed a series of responsibilities of developing the long-term plans along with planning for short to long-term projects for execution of development programs. Hence, in recent years province governments are in the process of formulating policies, developing strategies and preparing the potential projects for short and long term development. This project is also designed to be

included in the Project Bank of Madhesh Province. As agriculture is a major source of GDP and occupies the majority of people in the province, contribution of this project is expected to be highly significant for sustainable development planning.

1.2 Objectives

Madhesh Province's Ministry of Land Management, Agriculture and Cooperative (MoLMAC) intends to develop projects of different sectors to be run in the Public Private Partnership (PPP) model. Out of them, this project is related to establishment of seeds and seeding centers within province in a specified area. Also it aims to benefit farmers through quality fruit saplings and community based seed production of cereal grains in all districts of Madhesh Province as a contract basis supporting farmers with technology transfer for improved quality seed production and income generation through purchasing seeds at a good price level.

Specific Objectives of the project are to:

- Establish seeds and seeding centers approximately in 15Ha. areas with key components: cereal grains and summer fruit (banana and papaya) propagation.
- Quality check and certification system within the seeding center farm.
- Support farmers with quality foundation seed inputs to produce main/source seed of rice maize and wheat with buy back agreement.
- Produce banana saplings through tissue culture and papaya through vegetative propagation.
- Maintain true to type high performing banana and papaya seedlings, improved pure lines of grains.
- Development of superior crop plant varieties
- Seed production, processing, and storage.
- Seed testing, certification and quality control and marketing.
- Research on seed physiology, seed production and seed handling based on modern botanical and agricultural sciences.
- To study the technical and financial viability of the project in the proposed location.

1.3 Scope of Work

The pre-feasibility study aims to develop and operationalize the seed and seeding center in Madhesh Province. The project has two major areas of operation:
1. Community based quality seed production of cereal grains
2. Tissue culture and vegetative propagation of banana and papaya for quality planting materials with high yielding performance and consumer preferred taste/ attributes. Ultimately, study will help to get an overall idea of possibilities of investment in this specific sector and area for seed sector development in the province along with checking the technical and financial feasibility. Some of the major scope of the study are:

- Improvement of production of quality seed and planting materials.
- Decrease in imports and increase in domestic production as well as opportunity for export of quality seed/saplings.
- Sustainable industry with high earning potential
- Prepare the tentative structure design, the cost-revenue structure and financial viability of the proposed plants.
- Develop the best suitable investment model i.e. Private or PPP or Blended Finance.
- Research on breeding for quality seed/saplings to establish a recognized seed and seeding center in the country.
- Seed multiplication, processing, branding, packing.
- Seed quality control and improved market chain.
- Conserve genetic resources.

1.4 Project Relevance

The key inputs that cause increases in agricultural output are seed, fertilizer, and irrigation. A 15–20 percent boost in productivity can be attributed to high-quality seed alone. Lack of availability to high-quality seed and seed replacement rates of less than 10% are the main challenges faced by Nepalese farmers when it comes to major grains. One of the essentials for increasing agricultural productivity and improving the livelihoods of Nepali farmers is access to inexpensive, high-quality seed. However, boosting Nepal's seed sector and helping to feed a rising population sustainably face enormous obstacles.

Crop yields can be increased by 15-20% by using high-quality seed. However, there are significant obstacles to Nepal's seed industry's expansion. In Nepal, there is a growing demand for hybrid seeds, however research into variety creation is minimal. Imports account for the majority of the country's supply.

The government's emphasis on the agriculture sector and its commercialization was reflected in the approval of the 20 years Agriculture Perspective Plan (APP) in 1997. At present, Agriculture Development Strategy (ADS) – 2015-2035 is the main plan document and directive for the agriculture development movement. Also, agriculture has been a key priority for the Province Governments and is actively involved in documenting the policies and plans. Despite several efforts in the past, the sector's performance has been poor, with agriculture output estimates remaining unchanged.

Public investment in productivity-enhancing agricultural R&D has been declining in most of the world. Private investments and capability continue to grow in most of the developing nations in recent years. These trends open up the need and opportunities for joint effort for increased agricultural productivity and value chain through establishment of large scale seed and seeding centers. Like other provinces, Madhesh Province has a competitive edge in agricultural output due to its location, water resources, and abundant labor supply. In this context, this project would be a pilot approach to establish a seed and seeding center in the PPP model and can open the door for further expansion in different places with varied components.

2

APPROACH AND METHODOLOGY

This pre-feasibility study has been prepared by a technical team of Invest and Infra Pvt. Ltd. The components of the project were identified after a holistic analysis of provincial agricultural production system, market demand and prospective of business expansion. The feedback received during consultation with province level ministries and related stakeholders were also considered for determination of project features/ components. The required data, information and facts for fulfilling the objectives of the study have been gathered from both secondary and primary sources.

Primary Data and Information

Primary data were gathered from the field survey. Stakeholders' consultation and group discussions conducted with producers, marketers, entrepreneurs and the government authorities (Provincial Ministries, Rural/Municipalities, etc.) of Madhesh Province.

Secondary Data and Information

Secondary data and information on Nepalese agriculture production and marketing system have been collected by reviewing the relevant literature, documents and previous study reports at the central, regional and district levels. The published data of MOAD on the area and production were referred to for the trend analysis and the province-wide production status assessment. The key aspects considered during this pre-feasibility study include:

- Identification of production volume and commodity specific value chain status, input supply status and market need.
- SWOT and market sector analysis for long term viability of operation.
- Financial and cost estimation for the proposed project.

During preparation of the Detailed Project Report (DPR), following additional aspects will be considered and analyzed:

- Level of production, yield and growth rate analysis (specific commodities) and seed producing opportunities.
- Population distribution, growth rate and projection of catchment areas (backyard linkage) and possible markets (forward linkage) of inputs like seeds and other possible expansion of components.
- Market prospects, marketing strategies, operation plan and sustainability vision.
- Competitor analysis, project expansion and foreign trade prospective.
- Quality maintenance strategies.

2.1 Overview on Agriculture System in Madhesh Province for Components Identification

Madhesh Province has a mostly tropical climate. The area of Terai region is 34019 Sq. k.m. which is 23% of the total area of the country and includes 20 districts. Madhesh Province includes 8 core Terai districts-Parsa, Bara, Rautahat, Sarlahi, Dhanusha, Siraha, Mahottari, and Saptari of about 9661 sq km. Though being the smallest province of Nepal, the contribution of Madhesh Province in the agriculture sector is higher in terms of quantity and yield. Livestock, fish, summer vegetables and grain legumes are major potential products grown in the province.

The province is very important from the perspectives of agriculture, industry, and tourism with the least possibility of hydro-electricity development. Major cereal crops grown are paddy, maize, wheat, millet, barley and buckwheat, cash crops are potato, sugarcane, jute, and major pulses are lentil, chick pea, pigeon pea, black gram, grass gram, horse gram, soyabean and others. The proposed project has explored potentialities of producing seeds of specific agronomic and horticultural crops with an expected open-ended platform for expansion and inclusion of additional components.

Summer fruit production and yield level at all provinces are given in the table below: In fact, the average Tarai

Figure 1: Project Area (Madhesh Province Districts)

Table 2: Glance of the general status of Madhesh Province

S.No.	Particulars	State
1	Cultivated land out of Cultivable Land	90%
2	Population	20.4% of Nation's (second highest among Provinces)
3	Forest Covered Areas	27.29%
4	Food Grains Production	19,86,300 Mt.
5	Population Density	559/sq. km.

Source: Province Profile, 2077

Table 3: Summer fruit production status and yield

Province	Area	Productive Area	Production	Yield
1	16,663	14,151	156,908	11.09
2	**43,074**	**36,398**	**429,586**	**11.80**
Bagmati	8,676	6,451	71,462	11.08
Gandaki	5,424	3,352	38,187	11.39
Lumbini	11,075	9,921	106,443	10.73
Karnali	2,957	1,627	13,618	8.37
Sudurpaschim	4,795	3,468	42,618	12.29
Nepal	**92,664**	**75,368**	**858,822**	**11.40**

Source: MOALD, 2077

belts have somewhat similar yield levels. For commercial farming, summer fruit like mango, banana, papaya and litchi can be grown commercially in the proposed project with potential for planting material development of commercially important crops like banana and papaya.

Presence of higher productive areas with irrigation and other facilities encourages the commercial production of high quality planting materials of specific summer fruits in this province. Also, districts with similar kinds of climatic conditions provide a favorable environment for business expansion covering entire districts.

Rice, wheat, maize and pulses being major food crops produced in Nepal, the national requirements are found to be fulfilled by domestic production, however due to lack of proper storage facilities and fine milling/ packaging, raw products are exported and refined products are being imported at higher prices.

Province Agriculture Ministry has prioritized the production of grains (rice, maize and wheat), milk, meat, vegetables and fruits like mango and litchi for commercial production. Out of total agriculture (including livestock) products, the province contribution is around 13%. Though being the smallest province in terms of area, agriculture production and productivity of tropical crops are higher in this province as compared to other provinces. Madhesh Province contributes around 22%, 21% and 26% to the country's total production of food grain/legumes, fruits and vegetables respectively. The status of major cereal grain production is given hereunder:

Table 4: Province wide status of major cereal grains production

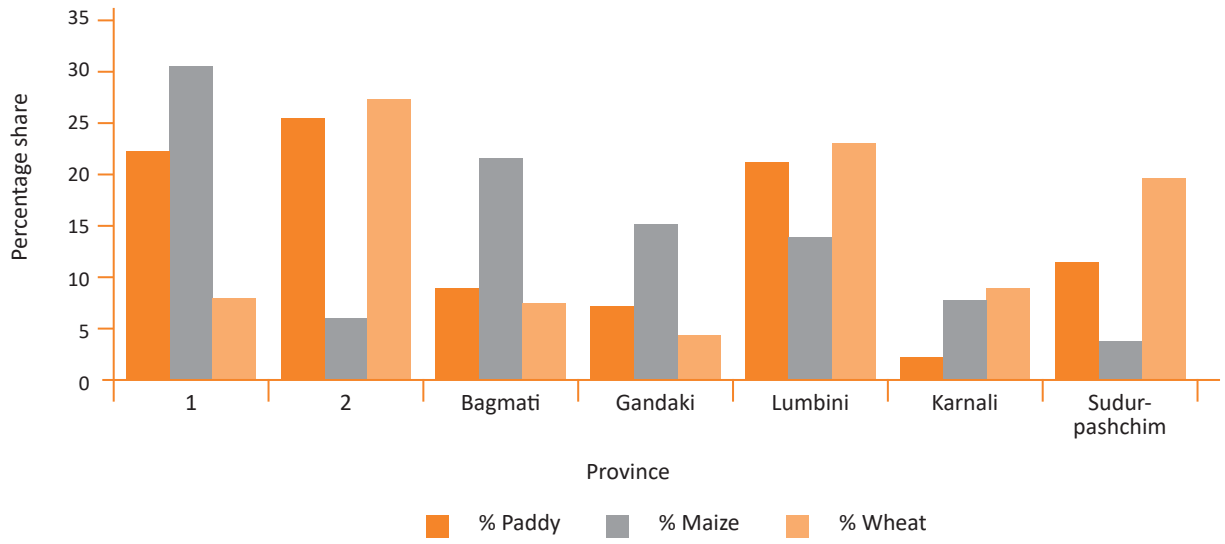
Province	Paddy	Maize	Wheat
1	1,245,545	867,718	176,707
2	**1,420,436**	**175,641**	**601,709**
Bagmati	510,200	617,760	168,429
Gandaki	408,737	433,560	99,401
Lumbini	1,185,493	398,462	508,459
Karnali	134,407	225,237	196,297
Sudurpashchim	646,059	117,296	434,288
Nepal	**5,550,878**	**2,835,674**	**2,185,290**

Source: MOALD, 2077

While analyzing the percentage share of the countries' total production of major cereal crops (rice, wheat and maize), the status of Madhesh Province is highest for rice and wheat and general for maize. The statistics are shown in the figure below:

The figure below has indicated that Madhesh Province has ample biophysical conditions to produce and expand the key cereals like rice and wheat. And thus, it creates a favorable environment to produce quality seed. Also, for maize improved techniques can be applied to produce synthetic and composite varieties. Being the entire Terai region, spring maize seed production can be practiced well which might develop recommended cultivars for Terai in the spring and mid hills during the summer/rainy season.

Fig 2: Percentage share by provinces in total country's production of major cereals



3

PROJECT DETAILS

3.1 Project Background and Description

In order to achieve the goal of Commercialization of agriculture set in the Agriculture Development Strategy (ADS) and priority of Provincial Ministries, seed sector improvement is an essential aspect to raise the level of agricultural production and productivity. Provincial Ministries' effort on the agriculture development in the specific zones/regions can encourage the promotion of site specific potential commodities.

In this instance establishment of a seed and seeding center project with public and private partnership based management, can result in yield maximization of the products and transfer of technology to farmers and rest of the areas where there lack commercial farming projects/programs. With this target, the proposed project is focused in Province 2, where an integrated type of seed and seeding center establishment is planned to develop with the following different components:

i) Community based spring maize seed production: 1 season planting in farmers' field with possibility of expansion during post monsoon production (autumn/winter varieties)
ii) Community based seed production of rice and wheat: adoption of technologies and high yielding cultivars
iii) Banana and papaya vegetative propagation: spread over 15 hectare areas including certification, storage admin and other required infrastructures.

Other General Features

- Development of superior crop plant varieties.
- Evaluation and release of seeds.
- Seed production, processing, and storage.
- Seed testing, certification and quality control, Seed marketing and distribution.
- Research on seed physiology, seed production and seed handling based on modern botanical and agricultural sciences.
- Support public, community and private enterprises in source seed production, enhance marketing skills of seed entrepreneurs and invest in seed related infrastructure.

3.2 Project Features/Components

Madhesh Province districts are highly productive zones for agriculture commodities like vegetables, summer fruits and tropical cereal crops along with the presence of a favorable bio-physical environment for industrial development and market linking infrastructures. Out of 8 districts within Madhesh Province, Dhanusha (Dhalkebar) is the main hub for agricultural production and marketing. The proposed project components are defined here under:

Figure 3: Key project components and primary allocation of areas

Banana Propagation Tissue Culture, Papaya Propagation, Vegetative Propagation of Papaya 10. Ha.

Rice, Maize and Wheat Seed Collection, Processing and Storage (Silo) 5 Ha.

Seed Testing, Certification and Validation Unit

Additional Coverage: After initiation of project operation the gradual process for expanding the project will be initiated and in cooperation with NARC and SQCC the center will be established as a key hub for seed testing, certification and accreditation. For this, advanced practices in international markets as well as authority from International certifiers will be attempted.

- Making buy back agreements with farmers and providing proper technologies and inputs.
- On-farm learning and demonstrations, training to farmers.
- Attempt to pay good price to the farmer's products (seed).
- Engaging farmers and technicians in leased lands for employment generation.
- Advanced practices for tissue culture and vegetative propagation in banana and papaya.

3.2.1 Community Based Improved Seed Production (Rice, Maize and Wheat)

The community-based seed production of specific cereals will take special considerations for improving components of the seed value chain which includes seed multiplication, processing, packaging, distribution and maintenance of different varieties of crops. For this, collaboration will be made with organizations involved in varietal development, release and registration. The project will emphasize its efforts on maintenance and deployment of location specific high yielding competitive varieties. Certified seed will be used for improved truthful labelled seed production. The proposed seed producing farm areas are planned to be around 400 to 500 for each commodity (rice, maize and wheat). There will be winter, spring and summer/rainy cropping systems. The yield level of seed is estimated to be increased by at least 1.5 times the national average level.

In the context of seed distribution to farmers, the foundation seeds mainly produced by NARC (along with other possible producing national and international centers) and private sectors as permitted by NSB will be used to produce certified/improved seeds via CBSP. The organization will mainly be focused to maintain the grain seed quality and attributes as mentioned below:

- Seed purity: genetic purity, physical purity (no mix of other crop seed, weed seed and inert matter).
- High germination vigor, germination rate and sprouting capacity.
- Free from seed borne disease and pests.
- High growth and development capacity with germination capacity.
- To the extent possible, equal size and weight to produce healthy plants.
- Standard moisture level - with a maximum of 13–15%

Unavailability of quality seeds of preferred variety is the major production problem for rice in Nepal. Hence, linking with NARC and other private breeder's seed producers will be the key priority of this project unit. Proper technologies will be provided to farmers during the project construction period and before initiation of cultivation by them. Wheat productivity is lesser in Nepal as compared to other countries. The high yielding varieties with better consumer preferred attributes will be multiplied and supplied to the entire Nation.

The estimated production area, seed sale amount and the yield level is illustrated as below:

- Expected cultivation area (rice, maize and wheat) at community farm: 1200-1500 Hectare
- Maize seed sale 2000 mt/year
- Rice seed sale 2000 mt/year
- Wheat seed sale 2000mt/year
- Expected yield: Maize-4 mt/ha, Rice-5 mt/ha, Wheat-3 mt/ha

Note: the detailed amount of input use, operation expenses and cost vs return features are assessed in financial analysis.

3.2.2 Banana Propagation-Tissue Culture

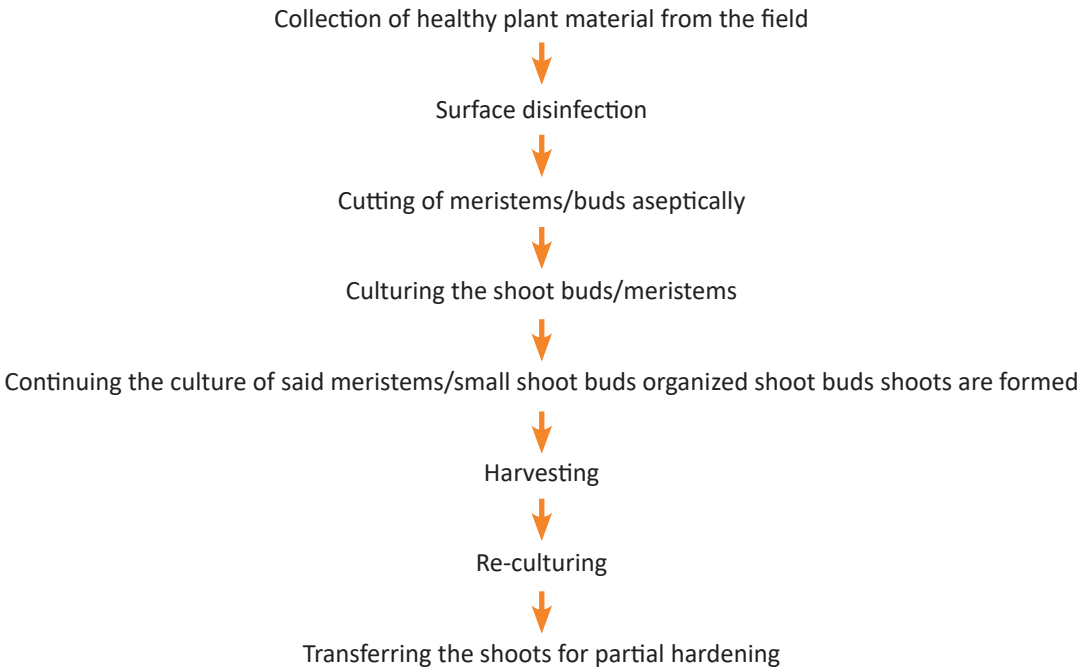
In order to maintain an enormous supply of the desired type of planting/sowing material by micro propagation, development of tissue cultured saplings are planned in the proposed seed and seeding center. Tissue Cultured (TC) plants avoid genotypic and phenotypic abnormalities and are better than conventionally propagated in overall performance. The proposed plant is supposed to produce one million banana saplings per year and depending upon the market strength and future demand, capacity can be enhanced in the long run. Below is the process of tissue culture (Fig. 4)

3.2.3 Vegetative Propagation of Papaya

Vegetative propagation using the technologies of cutting or grafting constitutes an important practice to obtain clonal plants, with characteristics identical to the mother plant. This supports the commercial plantation of papaya avoiding genetic heterogeneity among seedlings. The expected quality of planting materials are:

- Uniformity in fruit size.
- Uniformity in flavor and shape.
- Sexual uniformity among individuals.
- Establishing crops with 100% hermaphrodite plants.

Figure 4: Flow chart of process of developing saplings from tissue culture



- Attaining special attributes such as higher yield, lower fruiting height and higher cultivation longevity
- Research to develop seedless varieties by introducing available similar traits from International market

In papaya cultivation, the regeneration of plants from vegetative branches are detached from the mother plant and submitted to the appropriate conditions for rooting with special rooting media. Female plants are maintained by vegetative propagation and some male plants to ensure pollination.

For vegetative propagation, papaya will be planted in around 5-7 hectare areas within the central/main farm. Proper fertilization and maintaining good plant health status can help quicker plant growth and better fruit yield quality. The saplings of papaya will be high yielding propagated saplings and stress resistant, dense fruit bearing vegetative propagated planting materials. The source of saplings/planting materials will be the authentic seeding center or certified agro companies.

Possible Additive Component

Tissue culture:- Plant tissue culture can be practiced in papaya as there will be established equipment and technologies for banana. This includes different types of plant cells, tissues and organs for regeneration of a whole individual.

3.2.4 Seed Storage, Certification and Marketing Unit

Grain seeds will be collected, dried and stored in modern silos. 3 silos with 2500 mt. capacity each will be installed for storage. There will be an additional administration and certification/validation unit. Besides the area allocated for banana and papaya plantation and propagation (around 10-12 Ha.), around 3-5 hectares might be utilized for these units (Table 5).

Table 5: Specification of storage, certification and propagation unit

S.No.	Specification	Application and Features	Capacity
1	Metal grain seed storage silo-2500 Mt. capacity (total 3 numbers).	Storage of rice, maize and wheat seeds. Features: loading and intake chain conveyor, cleaner, temperature and moisture screen etc.	Each Silo has a 2500 Mt. capacity. Each with 10 tph loading and 5 tph discharge capacity
2	Solar cum electric grain dryer.	Drying seed gradually after collection. Automatic loading and discharge.	0.5-1 Metric Ton per hour
3	Banana and papaya propagation unit.	Laminar flow hoods, culture vials or bottles with screw caps, autoclave for sterilization, Stereomicroscope, refrigerators with freezer and refrigerators without freezer, air conditioners, heaters and large stainless steel wares. Additional: glass measuring devices, distillation units, balance, ordinary + fine.	10,00,000 planting materials per annum
4	Seed Testing lab and certification.	Inspection of the seed crop in the field to verify its conformity to the prescribed field standards. Supervision, germination test, purity, grading, yield assessment, certification and branding.	Added capacity of certifying and seed testing of farmers and other producers in discounted price
5	Automatic seed packaging machine, packaging yype: Airtight Pneumatic	Packaging of seeds 2 kg to 25 kg packs.	12-14 pouch/ per minute

3.3 Developing a Business Case

Product Mix

The industry will primarily focus on producing seeds of major cereals (rice, maize and wheat) and fruits (papaya and banana). Secondly there will be activities like product grading, processing, packaging and supply to the market centers. Community based production systems will be applied for grains to be produced at farmers' fields in contracted/leased farms. Collection and processing however will be done with a central seeding center even in the context of business expansion. It is targeted to include the entire 8 districts within Madhesh Province and the project unit will produce:

- Quality certified seeds rice, maize and wheat.
- Inclusion of other cereal grain seeds in the future as per demand.
- Quality summer fruits saplings (graded and certified): Papaya and banana.
- Transportation and market outflow to various places of Nepal (in fresh condition) by using temperature controlled/humidity maintained vehicles.

Quality assurance of the products and other Services

The project unit will be operated and managed by a unit which is planned to be developed with Public and Private Partnership.

Public

Provincial Agriculture Ministry, Municipality and (other possible)

Private

Private investor, wholesalers, commercial farmers and other members.

In order to maintain the product quality and sustainability of project operation, government units will be regularly monitoring the product quality and handling & storage /processing standards. Subsidies for production increment, linkage establishment and international market assurance are expected to be facilitated by government bodies. The role of private sectors will be to make attempts for regularization of operation in full capacity with extended linkage networks. Major considerations will be for the (not limiting to) following quality aspects:

- Seed purity.
- Free from seed borne disease and pests (grains and fruit saplings).
- Good seed shape, size and weight.
- Healthy and shining without any spot and weakness on looking.
- It should be in equal size and weight.
- Standard moisture level (maximum 12-15%) for grain seeds.
- High yielding, stress resistant, pest/disease resistant properties and uniform sized sapling of fruits.

3.4 Market Assessment

In Nepal, there is a growing demand for hybrid seeds, however research into variety creation is minimal. Imports account for the majority of the country's supply. Advantages of tissue cultured and vegetative propagated fruit may expand marketability of planting material. Dhalkebar is the major market center of Madhesh Province, where different commodities are introduced from connecting districts and outflow. Also, major hubs for importing goods (agricultural and non agricultural) i.e. Birgunj is situated in the south western side of Madhesh Province.

In order to make in and outflow of the plant regular, projects will have their own testing, branding, and packaging unit along with supply units in different accessible areas.

Existing market networks and trade flow status of the seed sector indicate that the future potential market of quality seeds is incredible within the entire nation and already there is huge prospect to supply to major national market hubs being located at the central point with accessible road networks to those areas. Proposed project's operation strategy will be to make strong connections with the major market hubs of seed around the country. For transportation, own vehicles can be utilized with available GoN's subsidies in fuel and vehicle related taxes.

3.5 SWOT Analysis

This SWOT analysis is made for the Public Private Partnership (PPP) model. During the DPR, the SWOT analysis for additional options of the operation model will also be explored and presented.

SWOT Analysis for Establishment and Promotion of Seeds and Seeding Centre

Strength	Weakness	Opportunities	Threats
• Increasing commercialized concept among farmers and stakeholders. • Well accessed domain connected with potential markets • Increased awareness of farmers on quality inputs for increased productivity. • Effective monitoring and quality control system (PPP) • Integrated seed production might have lower chance of failure in business and opportunity of expansion. • Planned and well set project features.	• Crop varieties' performance at field level against research outcomes. • Quality of breeder's seed and timely availability. • Community interest on quality production at farm. • Existing middlemen based market interventions. • Lack of technical manpower for micro propagation • Time management challenges.	• Interest of respective stakeholders. • Increased involvement in commercial farming, development of distant marketing and information system. • Surrounding infrastructures being improved. • Potential of expansion of project covering various products with international market demand. • Increased interest of investors in the Agriculture Sector • Better inclusion of social groups and interested farmers in CBSP.	• Widespread private owned seed production, processing and marketing system. • High cost of production leading to higher price than imported commodities. • Low economic status of Nepalese buyers for quality products. • Poor research and extension linkages by GoN.

4

FINANCIAL ANALYSIS

4.1 Pre-Feasibility Approaches & Assumptions

Project Cost

Total cost of the project amounted to NPR 215,000,000 Excluding Interest during construction. The total cost including interest amounted to NPR 224,030,000. Costs are assumed to occur evenly in the construction period.

Particulars	Amount in NPR
Land	
Plant & Machinery	141,000,000.00
Building & Civil Works	50,000,000.00
Vehicle	24,000,000.00
Interest During Construction	90,30,000.00
Total Project cost	224,030,000.00

The portion of the interest during construction is capitalized in the individual assets on a proportionate basis.

Capital Structure

The project is proposed to be financed in a 70:30 debt equity ratio on the total cost of the project including Interest During Construction (IDC). The requirement of working capital would be financed by internal resources itself. Based on the structure, the total investment pattern has been tabulated below:

Component	Percentage	Amount in NPR
Equity	30.00%	67,209,000.00
Debt	70.00%	156,821,000.00
	Total	**224,030,000.00**

Collection Efficiency

Based on the various studies conducted by international agencies and prevailing market tendency, collection of the solid waste has been assumed as follows-

Household Collection Efficiency

From	To	Efficiency
0 year	1 year	0%
4 years	9 years	30%
14 years	24 years	50%

Project Construction and Operation Period

The project is assumed to be built in the period of 1 year. And the total operation period after the construction period would be 30 years. The project would be handed over to the government after the completion of the operation period.

Tax, staff Bonus, and Depreciation Assumptions

The tax rate for the project is assumed at 25% on profit earned during the year. Further the loss carryforward has been taken for 12 years in due consonance with the provisions of Income Tax Act 2058. Further, the staff bonus is assumed at 10% on taxable income earned during any year of the operation as required by the Bonus Act.

Also, the rate depreciation and basis of depreciation is in due adherence to the provisions of the Income Tax Act as follows:

Particulars	Depreciation Method	Rate of Depreciation
Land		
Civil Structure	WDV	5%
Machinery	WDV	15%
Vehicle	WDV	20%

However, 1/3 of the additional depreciation has not been taken into consideration as facilitated by the Income Tax Act.

Direct Income and Direct Expense

The project has mainly two streams of Revenue Module:

1. Revenue from sale of seeds of rice, maize, wheat.
2. Revenue from sale of banana planting material/ sapling.

The total units, rates and associated direct cost percentage in 100% capacity has been detailed below:

Particulars	Category	100% Capacity	Rate per Event/Person Amount in NPR 1000	Unit of Measurement
Direct Sales Revenue	-	-	-	-
Certified Seed Sale Rice	Direct Sales	1500 Mt	150.00	Annually
Certified Seed Sale Maize	Direct Sales	1600 Mt	200.00	Annually
Certified Seed Sale Wheat	Direct Sales	1500 Mt	200.00	Annually
Banana Planting Aterials/Saplings	Direct Sales	500000 No	0.05	Annually

The Operational Efficiency

The operational efficiency of each component in various years has been estimated as below:

From	To	Overhead and Salary charging	Direct Sales
0 year	1 year	-	0%
3 years	9 years	60%	30%
10 years	14 years	70%	35%
15 years	24 years	80%	40%
25 years	32 years	100%	60%

Salary & Overhead Expenses

Total of the office overhead cost of per annum is USD 225,000.00 and employee cost of USD 293,930.00 shall be apportioned throughout the project period on 100% operation capacity.

The details of Overhead is as below-

Details of Office Overhead	Cost Amount in Dollars
Electricity and fuel	5,000.00
Labour Cost (for overall)	17,500.00
Technical Labor	2,250.00
Technical assistance, monitoring and support to farmers	5,000.00
Testing, certification, storage, handling, transport	10,000.00
Total	**39,750.00**

Details of employee cost on 100% capacity is as below:

Department	Total Number of Employees	Total Cost Amount in NPR (1000)
A. Administration	25	16,598.40
Total	25	16,598.40

The overhead is charged based on the following modality for employee cost and overhead charging is as below:

From	To	Overhead and Salary Charging
0 year	4 years	0%
5 years	9 years	60%
10 years	14 years	70%
15 years	24 years	80%
25 years	34 years	100%

Direct Expenses

Details of direct cost related to sales are below:-

Details of Direct Cost of Sales	Amount in NPR 1000
Direct Cost of Sales	-
Foundation Seed Maize	2,600.00
Foundation Seed Rice	2,000.00
Foundation Seed Wheat	9,000.00
Purchase Seed with Farmers-Rice	160,000.00
Purchase Seed with Farmers-Maize	200,000.00
Purchase Seed with Farmers-Wheat	160,000.00
Banana Tissue Culture Raw Materials/ Media/Chemicals	5,000.00
Total	**538,600.00**

Other Cost of Operations

Inclusive of all staff salary, vehicle maintenance but don't include interest cost and depreciation cost componentIt is further assumed that the total operating expense is likely to increase at the rate of 5% With the cap of 200%As discussed in earlier paragraph, the project would be financed by 70% Debt. The interest rate that has been taken into the calculation is 12% Which would be repaid in Four Equal Installments In the period of 12 years.

Working Capital and Other Assumptions Used

It has been assumed that the overall working capital requirement would be financed by the equity holders. The working capital has been assumed on the following basis.

Receivable & Advance	30	Days
Payable and Liabilities	15	Days

4.2 Financial Analysis

4.2.1 Financial Results

The project cost for the Seed & Seedling Company has been taken from a desk study report prepared by IBN. It is assumed that all the costs presented are in line with the current cost structure. It is also assumed that the project development cost was prepared based on the district rates and prevailing market rates.

The total cost of the project is NPR 224,030,000 of Which 9,030,000 NPR is an interesting component during construction. The total project excluding working capital has been financed by 70% debt and the remaining by Equity. In analysis of the pre-feasibility of the project, projections were made using different techniques. Based on the analysis, project Net Present Value (NPV) was calculated to 66,045.81 NPR.

Also, the project IRR is calculated to be 16.13% which exceeds the required rate of return of the project. Equity IRR of the project is computed at 19.35%. Project IRR & Equity IRR substantiate the feasibility of the project. Project Benefit Cost Ratio (BCR) is 1.31 times whereas Equity BCR is 1.98 times.

The project payback period & equity payback period are 7.54 years and 14.00 years respectively. Considering the specific nature of business and overall industry, the pay-back period seems to be satisfactory.The average DSCR is computed at 1.27 times. Although DSCR is low in initial years, It has gradually increased.

Indicators	Results
Firm IRR	16.13%
Equity IRR	19.35%
NPV Equity	66,045.81
Debt Equity Service Coverage Ratio (Average)	1.27
Project BCR	1.31
Equity BCR	1.98
Simple Payback Period	7.541
Discounted Payback Period	14.00

4.2.2 Sensitivity Analysis

Sensitivity Analysis has been carried out on three different components: Interest Rate, O & M Cost and Project cost.

Interest Rate Increase/Decrease by 5%

Percentage of Change Project Cost	Impact on Project IRR	% of Change
0.00%	19.35%	-
5.00%	18.73%	-3.20%
-5.00%	19.99%	3.30%

O & M Increase/Decrease by 5%

O&M Cost	Impact on Project IRR	% of Change
0.00%	19.35%	
5.00%	19.35%	0%
-5.00%	19.35%	0%

Project Cost Increase/Decrease by 5%

Project Cost	Impact on Project IRR	% of Change
0.00%	19.35%	
5.00%	17.70%	-8.50%
-5.00%	21.09%	8.97%

Based on the analysis, It seems that the project cost is highly sensitive as compared with O & M Expenses and Interest rates. The special focus on project cost ensures the cost remains as projected.

The Financial Statement of the first 10 years of operation has been separately annexed in the report.

5

PRELIMINARY ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

5.1 Socio economic aspects

This project can be reflected in-terms of multi-dimensional positive changes to producers, traders, consumers and other people who are directly or indirectly related to agro based industries. By this time, a considerable portion of regional demand for some summer fruit saplings and major cereal grain seeds are met by the import from across the border as well as transportation from other parts of the country. Producers, traders, consumers, and anyone who are directly or indirectly involved in the sector will see multi-dimensional positive improvements as a result of the initiative.

The proposed project's poverty-reduction effects are envisaged to originate from three sources:

(i) job creation,
(ii) social mobilization and grouping of small holder farmers, and
(iii) increased income options in a more dynamic rural economy.

Increased and variety of employment possibilities, both on-farm and the post production system will be used to reduce poverty through job creation. The project will have an impact on social and gender development by:

(i) increasing opportunities for poor and disadvantaged groups, as well as women, to participate in commercial activities;
(ii) reducing the vulnerability of disadvantaged groups
(iii) improving the capabilities of poor, disadvantaged groups, and women to participate directly in or benefit indirectly from commercialized agriculture farm project.

5.2 Environmental Impact Assessment

According to the planned project's environmental study, some negative consequences may be caused. These consequences might result from greater usage of land and water resources, increased use of agrochemicals (fertilizers and pesticides), and infrastructural development (agricultural roads, and rehabilitation of small irrigation systems). In order to increase productivity and protect products from insects and pests, production farms utilize chemical fertilizers, insecticides, and other chemicals, according to the proposed project's backward linkage. However, as the project is aiming at using more organic inputs avoiding hazardous chemicals and controlled use of agro chemicals minimizing the risk to consumers and environment the mitigation measures would be comfortably applied.

During storage of grain seeds, fumigation and application of chemical pesticides are essential to protect seeds. However, these effects are not transferred to the plant properties during harvesting in the next season. Also, due to storage in closed conditions, the emissions are less likely to happen. This might be only during packaging and transportation. Proper safety measures will be applied during these periods. Right use of fertilizers and agrochemicals in production processes should be propagated to producers, which can be a part of mentoring service to be provided by this project unit. Less use of chemicals and to the extent possible, no use will be encouraged by the proposed project unit.

As mentioned in international standards, this kind of industry is an environmentally friendly industry which does not produce hazardous industrial pollutants nor creates any noise pollution. Thus the project does not have significant negative environmental effects in the seed and seeding center area.

6

PRELIMINARY RISK ANALYSIS

The key challenges to the functional unit will be to encourage high technology based production, processing, storage and market linkage network development of associated products (seeds/saplings). The backward and forward enterprises can be strengthened with improved practices and adoption of integrated development models. The price of different storable agronomic and horticultural products differ from place to place and time to time depending on harvesting (Season) and non-harvesting (Off-season) periods. However, in case of seed, the significant fluctuation of price is not recorded as seeds are needed in lower amounts. Only major concerns with seeds are the quality and performance of the crop. Some possible risks and mitigating strategies would be as provided below:

Table 6: Possible risk factors and mitigation measures

S.No.	Possible Risk/Issues	Mitigating Strategies
1	Commodities produced/stored/supplied below than the capacity and price of products.	Strategies to produce early and late (by a few months) than the peak production season from every possible production sites and crop rotation.
2	Electricity (power cut), transportation facilities and fuel crisis.	Power backup (200 Kv generator), fuel efficient transportation vehicles, timely maintenance and subsidy arrangement.
3	Maintaining genetic purity and chances of appearing dominant negative natures in micro propagated saplings.	Better research and improved technologies adoption, use of skilled manpower use and regular consultation with international agencies.
4	Sudden loss in crop productivity, pest/disease abundance etc.	Linkage with price determination unit, AMIS and Insurance system.
5	Farmers continue to follow traditional farming practices.	Awareness, field based observation and guiding, TOT, Monitoring and result demonstration.
6	Security issues.	Additional arrangement and reporting system.

7

PROJECT STRUCTURE AND IMPLEMENTATION MODEL

Public Private Partnerships (PPP)

A Public Private Partnership (PPP) is an agreement between public and private entities for a certain length of time in which private businesses agree to take on the risk of all or part of the funding, construction, operation, repair, and maintenance of projects under the PPP model. Such an entity may generate a fair profit by providing public services directly or indirectly through the building, operation, repair, and maintenance of public or private assets. Through legislative, legal, institutional, and economic arrangements, public institutions must establish an environment that encourages private sector investment[1].

It will be suitable to develop a project using the PPP model, which involves both public and private entities. When national treasury resources are insufficient, assets of public utility and less expensive operation of public services, as well as resources, skills, and technology accessible in the private sector, must be drawn to nation-building projects based on the PPP idea.

The PPP model is appropriate in the current environment of Madhesh Province and its neighboring districts. According to the preliminary research done in these towns, the Local Government would give land for the establishment and promotion of seeds and seeding centers.

1 World Bank, 2072, Public Private Partnership Policy

8

FINDINGS AND RECOMMENDATIONS

8.1 Findings

The following are some of the study's significant findings:

1. The large-scale commercial cultivation of fruits and vegetables in Madhesh Province project will provide.
2. According to the study, Madhesh Province is an attractive place for the establishment and promotion of seeds and seeding centers because of its climate, proximity to the border, accessibility, and other factors.
3. The project's business model was determined to be a Public Private Partnership.
4. With a total cost of NPR 224,030,000 (including interest component throughout the construction period).
5. Also, the project IRR is calculated to be 16.13% which exceeds the required rate of return of the project. Equity IRR of the project is computed at 19.35%. Project IRR & Equity IRR substantiate the feasibility of the project.
6. Payback period has been determined as 7.54 years.

8.2 Recommendations

The project appears to be technically and financially viable for a developer to invest, based on the findings. In the following step, however, environmental and social aspects, as well as a thorough examination of all other components, must be addressed.

Disclaimer

This project profile is based on preliminary study to facilitate prospective developers to assess possible scope. It is, however, advisable to get a detailed feasibility study prepared before taking a final investment decision.

9

ANNEX

Financial Report

Projected Profit and Loss Statement for Initial 10 years

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Direct Sales	261000	268830	276895	285202	293758	302571	311648	320997	385731	397303
Total Direct Income	**261,000**	**268,830**	**276,895**	**285,202**	**293,758**	**302,571**	**311,648**	**320,997**	**385,731**	**397,303**
Less: Direct Expenses	161,580	169,659	178,142	187,049	196,401	206,222	216,533	227,359	238,727	250,664
Total Direct Expenses	**161,580**	**169,659**	**178,142**	**187,049**	**196,401**	**206,222**	**216,533**	**227,359**	**238,727**	**250,664**
Gross Profit	99,420	99,171	98,753	98,153	97,356	96,349	95,115	93,638	147,004	146,640
Add: Other Income	**13,050**	**13,442**	**13,845**	**14,260**	**14,688**	**15,129**	**15,582**	**16,050**	**19,287**	**19,865**
Profit before Overhead & Interest	112,470	112,613	112,598	112,413	112,044	111,477	110,697	09,688	166,291	166,505
Operating Expenses	-									
Depreciation	31,989	31,859	31,735	31,618	31,506	2,016	1,915	1,819	1,728	1,642
Salary Expenses	**9,959**	**10,457**	**10,980**	**11,529**	**12,105**	**12,711**	**13,346**	**14,013**	**17,166**	**18,025**
Overhead Expenses	23,850	25,043	26,295	27,609	28,990	30,439	31,961	33,559	41,110	43,166
O & M Expenses	**35,285**	**37,049**	**38,901**	**40,846**	**42,889**	**45,033**	**47,285**	**49,649**	**52,132**	**54,738**
Operating Profit	11,387	8,205	4,686	810	(3,446)	21,279	16,190	10,647	54,154	48,935
Interest Expenses	**18,543**	**17,754**	**16,866**	**15,867**	**14,743**	**13,477**	**12,053**	**10,450**	**8,645**	**6,614**
Profit	**(7,156)**	**(9,549)**	**(12,180)**	**(15,057)**	**(18,189)**	**7,801**	**4,137**	**197**	**45,509**	**42,320**
Provision for Staff Bonus	**-**	**-**	**-**	**-**	**-**	**709**	**376**	**18**	**4,137**	**3,847**
Income Tax	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**5,749**
Net profit	**(7,156)**	**(9,549)**	**(12,180)**	**(15,057)**	**(18,189)**	**,092**	**3,761**	**179**	**41,372**	**32,724**

Projected Balance Sheet for Initial 10 years of Operation

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Shareholders Fund	-									
Share Capital	**67,209**	**67,209**	**67,209**	**67,209**	**67,209**	**67,209**	**67,209**	**67,209**	**67,209**	**67,209**
Reserve and Surplus	(7,156)	(16,705)	(28,885)	(43,942)	(62,131)	(55,039)	(51,277)	(51,098)	(9,726)	22,997
Loan Fund	**-**									
Term Loan	150,537	143,465	135,505	126,545	116,462	105,113	92,339	77,962	61,781	43,569
Short Term Loan										
Total	**210,590**	**193,969**	**173,829**	**149,812**	**121,540**	**117,283**	**108,271**	**94,073**	**119,263**	**133,775**
Fixed Assets (Net)	167,033	135,173	103,438	71,820	40,314	38,298	36,383	34,564	32,836	31,194
Investment	-									
Current Assets	**45,028**	**60,339**	**72,011**	**79,694**	**83,013**	**80,861**	**73,857**	**61,577**	**88,600**	**104,861**
Sundry Debtors	9,373	9,384	9,383	9,368	9,337	9,290	9,225	9,141	13,858	13,875
Inventory	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Cash & Bank Balance	35,655	50,955	62,628	70,326	73,676	71,571	64,633	52,437	74,742	90,986
Less: Current Liabilities	1,470	1,544	1,621	1,702	1,787	1,876	1,970	2,069	2,172	2,281
Net Current Assets	**43,558**	**58,795**	**70,391**	**77,992**	**81,226**	**78,985**	**71,887**	**59,509**	**86,427**	**102,581**
Total	**210,590**	**193,969**	**173,829**	**149,812**	**121,540**	**117,283**	**108,271**	**94,073**	**119,263**	**133,775**

Cash Flow Statement for Initial 10 years of Operation

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Cash Flow from Operating Activity										
Net Profit before Interest and Tax	**(7,156)**	**(9,549)**	**(12,180)**	**(15,057)**	**(18,189)**	**7,092**	**3,761**	**179**	**41,372**	**38,473**
Add: Depreciation	31,989	31,859	31,735	31,618	31,506	2,016	1,915	1,819	1,728	1,642
Add: interest	**18,543**	**17,754**	**16,866**	**15,867**	**14,743**	**13,477**	**12,053**	**10,450**	**8,645**	**6,614**
Operating Cash fFow before Working Capital Change	43,376	40,064	36,422	32,428	28,060	22,585	17,729	12,448	51,745	46,729
Increase/Decrease in Current Assets	(9,373)	(12)	1	15	31	47	65	84	(4,717)	(18)
Increase/Decrease in Current Liabilities	**1,470**	**74**	**77**	**81**	**85**	**89**	**94**	**99**	**103**	**(2,766)**
Payment of Tax	-	-	-	-	-	-	-	-	-	**(2,875)**
Net Cash Flow from Operating Activity	35,474	40,126	36,500	32,525	28,176	22,722	17,888	12,631	47,132	41,071
Cash Flow from Investing Activity	-									
Purchase of Fixed Assets	(199,022)	-	-	-	-	-	-	-	-	-
Increase/Decrease in Investment	**-**									
Less: Payment of Dividend	-									
Net Cash Flow from Investing Activity	**(199,022)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Cash Flow from Financing Activity	-									
Increase in Share Capital	**67,209**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Increase in Borrowing Fund (Long Term Loan)	156,821									
Increase in Short Term Loan										
Less: Repayment of Long Term Loan	(6,284)	(7,072)	(7,960)	(8,959)	(10,084)	(11,349)	(12,774)	(14,377)	(16,181)	(18,212)
Less: Payment of Interest on Short Term Loan										

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Less: Payment of Interest on Long Term Loan	(18,543)	(17,754)	(16,866)	(15,867)	(14,743)	(13,477)	(12,053)	(10,450)	(8,645)	(6,614)
Net Cash flow from Financing Activity	**199,203**	**(24,827)**	**(24,827)**	**(24,827)**	**(24,827)**	**(24,827)**	**(24,827)**	**(24,827)**	**(24,827)**	**(24,827)**
Increase/Decrease in Cash and Cash Equivalent	35,655	15,299	11,674	7,698	3,350	(2,105)	(6,939)	(12,196)	22,305	16,244
Cash & Bank Balance at the Beginning of the Period	**-**	**35,655**	**50,955**	**62,628**	**70,326**	**73,676**	**71,571**	**64,633**	**52,437**	**74,742**
Cash Balance At the End of the Period	**35,655**	**50,955**	**62,628**	**70,326**	**73,676**	**71,571**	**64,633**	**52,437**	**74,742**	**90,986**

PRE-FEASIBILITY STUDY OF

LARGE SCALE COMMERCIAL CULTIVATION OF FRUITS AND VEGETABLES IN MADHESH PROVINCE PROJECT

EXECUTIVE SUMMARY

Commercialization of agriculture is one of the major priorities of the Agriculture Development Strategy (ADS). ADS has also provided the Provinces to set plans and develop strategies as per the contextual suitability. This project is designed to be included in the project bank of Madhesh Province. As agriculture is a major source of GDP and occupies the majority of people in the province, contribution of this project is expected to be highly significant for sustainable and eco- friendly development planning in the agriculture sector.

By establishing a single platform at the next Investment Summit, the Provincial 2 Planning Commission (PPC) hopes to attract investment in a variety of initiatives, including agricultural projects. Large scale commercial farm based in Madhesh Province is one of the primary sites designated for investment. The research on the large scale commercial farm based in Madhesh Province is primarily intended to document the project's technical and financial feasibility. Both primary and secondary data gathering approaches were used in the study. Primary data was acquired from field-based research, which included a field visit and stakeholder consultations and group discussions. Secondary data was gathered from a variety of sources, including published papers, journal articles, and other verified and trustworthy online sources.

This project appears to be best suited for a Public Private Partnership (PPP) approach, in which GoN will assist in obtaining the necessary land for the project. The developer will then build all of the infrastructure required for the project's smooth execution and will run it for 30 years before handing it over to GoN in good working order.

The research examined the project's technical and financial elements and determined that it is technically and financially feasible, with a total anticipated cost of roughly NPR 233,200,000 (including interest component throughout the construction period) and an equity IRR of 24.49% percent.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SALIENT FEATURES OF THE PROJECT

Table 1: Salient features of the project

General information of the project		
1	Name of Project	Large Scale Commercial Cultivation of Fruits and Vegetables in Madhesh Province
2	Project Location	Province: 2 Districts: All eight districts with at least one pocket of large scale commercial cultivation in each district.
3	Project Implementation Modality	☐ Public ■ PPP ☐ Private ☐ Others/Please Specify
4	Category of Project	■ Short term: 5 years and below ☐ Mid term: 6 – 10 years ☐ Long term: 11 – 15 years
5	Sector as per 1st 5 years Provincial Plan	Agriculture
6	Type of Project (Sub Sector)	Agriculture - organic and commercial
7	Implementing/Facilitating Agencies	Private sector, facilitated by the Ministry of Land Management, Agriculture and Cooperatives, Madhesh Province and relevant Local Governments
8	Project Management (Implementation Mechanism)	• Training related to large scale commercial cultivation of fruits and vegetables to be provided by the government. • Land lease to be provided by the government where required. • Value chain development with the introduction of strengthened varieties if required.

Project specific information

1	Salient Features of Project	• Improvement of production of fruits, vegetables and legumes. • Decrease in imports and increase in domestic production as well as exports of fruits and vegetables. • Sustainable industry with high earning potential. • Adoption of improved technology for yield maximization.
2	Affected Population, Land Requirement, Acquisition & Resettlement, Materials and Ease of Access	
	Affected Population	Population of Madhesh Province, relevant farmers, benefited severe consumers of Nepal
	Land Requirement	N/A (variable) Estimated central farm size: 200 Ha. Material support for commercial farming and technology dissemination to farmers: around 300 ha in 8 Districts (in the long run).
	Acquisition & Resettlement	No issue of resettlement
	Materials and Ease of Access	The project can be done in areas where there is availability of materials and ease of access. The geographical terrain is such that the places in the province are easily accessible.
	Environmental and Social Management Plan (ESMP)	Environmental implications of unsustainable farming practices need to be considered. There is a possibility to promote sustainable fruits and vegetables farming practices.
3	Project Document Available	■ None (New/Rehabilitation) ☐ Concept Note/Desk Study ☐ Feasibility Study ☐ Detailed Engineering/DPR
4	Estimated Cost to Complete the Project	NPR 233,200,000
5	Estimated Time to Complete the Project	Feasibility/DPR: 3 months Approval and Financial closure: 9 months
6	Project Financing Options	Investment of the private sector; government to support leasing of land, and create a favorable and encouraging environment for farmers involved in fruits and vegetables farming to scale up and carry out activities at a commercial level.
7	Project Technology/Components	The project will include a number of technologies and components depending on its size. Typical technology and components will be related to farming, collecting, storing, cold storage, packaging and distribution.
8	Contribution to SDG and Green Growth	Encourages farmers and entrepreneurs to take up large scale commercial cultivation of fruits and vegetables in Madhesh Province by recognizing it as a sustainable and profitable business opportunity and contributes to regional development. The following SDG is directly related to the project: Goal No. 2: Zero hunger Goal No. 8: Decent work and economic growth
9	Project Capacity (at 100%)	N/A
10	Project IRR	16.49%
11	Benefit Cost Ratio	1.56 times

12	Private Sector/Consumer Committee /Beneficiary Roles	• Conduct market and feasibility research, conduct all the required operation. • Supply chain management. • Lead the project and drive its management.
13	Government's Roles	• Awareness, training and education programs. • Province Government will provide farmers with subsidies where suitable. • Facilitation in procuring land lease for a viable proposal. • Grant to be provided working together with the Local Government.

Other project information

1	Target Beneficiaries	Vegetable and fruit farmers, consumers and stakeholders engaged in the value chain of agriculture commodities.
2	Market of Project's Service/Product	Domestic as well as international markets.
3	Key Risks and Opportunities of Project Development & Operation	
	Strengths and Opportunities	• Nepal imports a huge amount of fruits and vegetables. Hence, there is an opportunity to replace imports and create a strong and self-reliant economy. • Fruits and vegetables cultivation is particularly important for Madhesh Province because of its potential. • Quality and certified food products are made availed with this project.
	Risks and Issues	• Farmers continue to follow traditional farming practices. • Lack of practical knowledge among farmers. • Marketing and scale difficulties. • Security issues.

1

BACKGROUND

1.1 Introduction

Agriculture is the largest economic sector that solely contributes more than 35% of national GDP. Nepal's agriculture represents a higher level of diversification due to the existence of varied climatic and geographic conditions. After the introduction of the new constitution, the country restructured into 7 provinces. These provinces have been divided mostly on the geographic basis. For agriculture development, all provinces have particular strengths and bear potential of producing diverse agricultural/livestock products.

Commercialization of agriculture is one of the major priorities of the Agriculture Development Strategy (ADS). ADS also has provisioned the provinces to set plans and develop strategies as per the contextual suitability. With the launching of the Federal System in country, Province Level Governments have encompassed through a series of responsibilities of developing the long-term plans along with planning for short to long term projects for execution of development programs. Hence, in recent years Province Governments are in the process of formulating policies, developing strategies and preparing the potential projects for short and long term development. This project is also designed to be included in the Project Bank of Madhesh Province. As agriculture is a major source of GDP and occupies the majority of people in the province, contribution of this project is expected to be highly significant for sustainable development planning.

Provinces 1, 3, 5 and 7 have both temperate and tropical climates and are more diverse in terms of agricultural crop production potentialities. Madhesh Province has a mostly tropical climate. The area of Terai region is 34019 Sq. k.m. which is 23% of the total area of the country includes 20 districts. Madhesh Province includes 8 core Terai districts- Parsa, Bara, Rautahat, Sarlahi, Dhanusha, Siraha, Mahottari, and Saptari of about 9661 sq km. Though being the smallest province of Nepal, Madhesh Province's contribution in the agriculture sector is higher in terms of quantity and yield. Livestock, fish, summer vegetables and grain legumes are major potential products grown in the province. The project has assessed the agricultural value chain system and proposed the large scale commercial farm project with probable components.

1.2 Objectives

Madhesh Province's Ministry of Land Management, Agriculture and Cooperative (MoLMAC) is intending to develop projects of different sectors to be run in Public Private Partnership (PPP) model. Out of them, this project is related to establishment of large scale commercial agriculture farms within province in a specified area. Also it aims to expand its periphery of farming in all districts of Madhesh Province as lease/contract basis supporting farmers with technology transfer for improved productivity.

Specific objectives of the project are to:

- Established an integrated central agriculture farm in 200 Ha. Areas with key components: fruits, vegetables, pulses and fish.
- Expand farm production by double (additional 200 Ha) within 3-4 years of operation through commercial farming on leased/contracted farms covering entire districts of province.
- Assessment of the overall farming practices, market chain and farming system for component identification and future potential of addition.
- Quality check and product certification system within the central farm.
- Support farmers with quality check, product marketing and technologies for better production.
- To study the technical and financial viability of the project in the proposed location.
- Recommend further potential projects and components for further development.

1.3 Scope of Work

The pre-feasibility study aims to develop and operationalize the large scale commercial farm based in Madhesh Province. The project has two major areas of operation:

1. Establishment of a model integrated agro farm and
2. Contract/lease or agreement based farming to enlarge the business by double in size in the long run. Ultimately, study will help to get an overall idea of possibilities of investment in this specific sector and area for commercial agriculture development in the province along with checking the technical and financial feasibility. Some of the major scope of the study are:
    - Improvement of production of fruits, vegetables, fish and legumes.
    - Decrease in imports and increase in domestic production as well as opportunity for export of fruits and vegetables and fish.
    - Sustainable industry with high earning potential
    - Adoption of improved technology for yield maximization.
    - Assessment of potential crops in Madhesh Province and selection of relevant commodities as key components of the project and to prepare a detailed business plan of operation.
    - Prepare the tentative structure design, the cost - revenue structure and financial viability of the proposed plants.
    - Develop the best suitable investment model i.e. Private or PPP or Blended Finance.
    - Develop the sustainable operational mechanism for the proposed commercial agriculture farm.

1.4 Project Relevance

Agriculture commercialization has been presented as a viable strategy for economic growth and poverty reduction. Agriculture has been a top focus since the creation of the Fifth Five Year Plan (1975–80). The government's emphasis on the agriculture sector and its commercialization was reflected in the approval of the 20 year Agriculture Perspective Plan (APP) in 1997. At present, Agriculture Development Strategy (ADS) 2015-2035 is the main plan document and directive for the agriculture development movement.

Also, agriculture has been a key priority for the Province Governments and are actively involved in documenting the policies and plans. Despite several efforts in the past, the sector's performance has been poor, with agriculture output estimates remaining unchanged. Institutional problems have been blamed for the poor performance, which have resulted in a lack of prioritizing, poor input delivery, inefficient human and financial resource usage, and land ownership fragmentation, among other things. However, there is significant room for agricultural output expansion, which might boost rural incomes and provide a multiplier effect for the growth of other sectors, in addition to reducing poverty.

Public investment in productivity-enhancing agricultural R&D has been declining in most of the world. Private investments and capability continue to grow in most of the developing nations in recent years. These trends open up the need and opportunities for joint effort for increased agricultural productivity and value chain through establishment of large scale commercial farms. Like other provinces, Madhesh Province has a competitive edge in agricultural output due to its location, water resources, and abundant labor supply. In this context, this project would be a pilot approach to establish a large scale agriculture production center in the PPP model and can open the door for further expansion in different places with varied components.

2

APPROACH AND METHODOLOGY

This pre-feasibility study has been prepared by a technical team of Invest and Infra Pvt. Ltd. The components of the project (vegetable, fruit, grain legumes and fish) were identified after a holistic analysis of Provincial agricultural production system, market demand and prospective of business expansion. The feedback received during consultation with province level ministries and related stakeholders were also considered for determination of project features/ components. The required data, information and facts for fulfilling the objectives of the study have been gathered from both secondary and primary sources.

Primary Data and Information

The primary data were gathered from the field survey. Stakeholders' consultation and group discussions conducted with producers, marketers, entrepreneurs and the government authorities (Provincial Ministries, Rural/Municipalities, etc.) of Madhesh Province.

Secondary Data and Information

Secondary data and information on Nepalese agriculture production and marketing systems have been collected by reviewing the relevant literature, documents and previous study reports at the central, regional and district levels. The published data of MoAD on the area and production were referred for the trend analysis and the province wise production status assessment. The key aspects considered during this pre-feasibility study include:

- Identification of production volume and commodity specific value chain status and market need.
- SWOT and market sector analysis for long term viability of operation.
- Financial and cost estimation for the proposed project.

During preparation of the Detailed Project Report (DPR), following additional aspects will be considered and analyzed:

- Level of production, yield and growth rate analysis (specific commodities).
- Population distribution, growth rate and projection of catchment areas (backyard linkage) and possible markets (forward linkage).
- Market prospects, marketing strategies, Operation plan and sustainability vision.
- Competitor analysis, project expansion and foreign trade prospective.
- Quality maintenance strategies.

2.1 Overview on Agriculture System in Madhesh Province for Components Identification

Madhesh Province is in the south eastern region of Nepal and is the smallest province in terms of area. The province lies entirely within the plain region (Terai). The southern side has an international border with the Indian state. This province bears the great potentiality of agricultural production. The area of Terai region is 34019 Sq. k.m. which is 23% of the total area of the country includes 20 districts. Madhesh Province includes 8 core terai districts- Parsa, Bara, Rautahat, Sarlahi, Dhanusha, Siraha, Mahottari, and Saptari of about 9661 sq. km area. 57400 hectares of land is considered as agricultural land in which 90% of it is cultivated and total food production is measured 19,86,300 metric ton as per the Province Profile 2077. Parsa to Saptari districts of Madhesh Province are taken as pocket areas of agriculture. 20.40% of Nepal's total population lives in this province. Major profession of the major population is agriculture.

The province is very important from the perspectives of agriculture, industry, and tourism with the least possibility of hydro-electricity development. Major cereal crops grown are paddy, maize, wheat, millet, barley and buckwheat, cash crops are potato, sugarcane, jute, and major pulses are lentil, chick pea, pigeon pea, black gram, grass gram, horse gram, soybean and others.

Summer fruit production and yield level at all provinces are given in the table below: In fact, the average tarai belts have somewhat similar kinds of yield level. For commercial farming, summer fruit like mango, banana and litchi can be grown commercially in the proposed project.

Figure 1: Project area (Madhesh Province Districts)

Table 2: Glance of the general status of Madhesh Province

S.No.	Particulars	State
1	Cultivated land out of cultivable land	90%
2	Population	20.4% of Nation's (second highest among Provinces)
3	Forest covered areas	27.29%
4	Food grains production	19,86,300 Mt.
5	Population density	559/sq. km.

Source: Province Profile, 2077

Table 3: Summer fruit production status and yield

Province	Area	Productive Area	Production	Yield
1	16,663	14,151	156,908	11.09
2	**43,074**	**36,398**	**429,586**	**11.80**
Bagmati	8,676	6,451	71,462	11.08
Gandaki	5,424	3,352	38,187	11.39
Lumbini	11,075	9,921	106,443	10.73
Karnali	2,957	1,627	13,618	8.37
Sudurpaschim	4,795	3,468	42,618	12.29
Nepal	92,664	75,368	858,822	11.40

Source: MOALD, 2077

Presence of higher productive areas with irrigation and other facilities, encourages the commercial production of specific summer fruits in this province. Also, districts with similar kinds of climatic conditions provide a favorable environment for business expansion covering entire districts.

Agricultural products are characterized by seasonality. The price during harvest season goes rock bottom while in the off-season they soar up. Fruits and vegetables are facing the problem of surplus production during the main seasons, leading to price retardation and during off season, inadequate supply to meet the demand within the country.

Rice, wheat, maize and pulses being major food crops produced in Nepal, the national requirements are found to be fulfilled by domestic production, however due to lack of proper storage facilities and fine milling/ packaging, raw products are exported and refined products are being imported at higher prices.

The Provincial Agriculture Ministry has prioritized the production of grains (rice, maize, wheat), milk, meat, vegetables and fruits like mango and litchi for commercial production. Out of total agriculture (including livestock) products, the province contribution is around 13%. Though being the smallest province in terms of area, agriculture production and productivity of tropical crops are higher in this province as compared to other provinces. Madhesh Province contributes around 22%, 21% and 26% to the country's total production of food grain/legumes, fruits and vegetables respectively.

Madhesh Province districts are highly productive zones for cereal and pulses. Lentil is the major pulse crop produced in this province and has potential for growing pigeon pea, which has high market value and demand. Fish productivity is higher in all districts within this province. National average productivity of fish is 4.9 Mt./ha and that of Madhesh Province is 5.1 Mt./ha.

Pulses are an important part of daily food/meals in Nepal. Intensifying the yield level of pulses with processing up to value added position along with year round fish production and storage facilities could be potential business components to be included in the project. Production status of pulses and fish are given in the table below:

Table 4: Area, production and yield status of major pulses in provinces

Province	Lentil			Pigeon Pea		
	Area	Production	Yield	Area	Production	Yield
1	12,698	16,127	1.27	1,257	1,247	0.99
2	**89,869**	**111,131**	**1.24**	**10,097**	**10,793**	**1.07**
Bagmati	3,849	4,304	1.12	170	180	1.06
Gandaki	5,110	5,938	1.16	351	246	0.70
Lumbini	67,576	82,678	1.22	4,856	4,405	0.91
Karnali	4,469	4,248	0.95	65	83	1.28
Sudurpaschim	29,305	38,408	1.31	99	110	1.11
Nepal	212,876	262,835	1.23	16,895	17,063	1.01

Source: MOALD, 2077

Terai regions are highly suitable for fish farming due to availability of adequate underground water resources and optimum water temperature level for normal temperature water fish species. Water surface area, total production and productivity is higher in Madhesh Province. Hence carp fishes can be farmed within this project taking advantage of the productive climate in the project areas.

Table 5: Water surface areas and production status of fish in provinces

Province	Pond's No.	Water Surface Area (Ha.)	Total Fish Production (Kg.)	Yield Kg./Ha.
1	9,499	1,819	8,538	4,693
2	**18,212**	**7,345**	**37,619**	**5,122**
Bagmati	4,194	687	3,190	4,640
Gandaki	2,153	313	1,261	4,030
Lumbini	11,251	2,865	14,446	5,043
Karnali	345	33	74	2,274
Sudurpaschim	2,715	414	1,778	4,300
Nepal	48,369	13,476	66,906	4,965

Source: MOALD, 2077

3

PROJECT DETAILS

3.1 Project Background and Description

Commercialization of agriculture is the main agenda of Agriculture Development Strategy (ADS) and priority of Provincial ministries. Provincial ministries' effort on the agriculture development in the specific zones/regions can encourage the promotion of site specific potential commodities. High value crops including vegetables, potatoes, fruits etc. can not only fulfill the food requirements of the Nepalese people but also contribute to increase the income of producer groups if balanced market conditions are made available.

In this instance a commercial farming project with public and private partnership based management, can result in yield maximization of the products and transfer of technology to rest of the areas where there lack commercial farming projects/programs. With this target, proposed project is focused in Province 2, where a large scale commercial integrated agriculture farm establishment is planned to develop with following different components:

i) **Potato and Summer Vegetables**: 2 season planting cropping pattern, summer vegetables: varied and based on the market demand at end market.

ii) **Summer Fruits** (banana, mango and litchi): adoption of technologies and high yielding cultivars.

iii) **Fish Farming** (Carp species): spread over 10 hectare areas, intensive fish farming system with water and product quality maintenance.

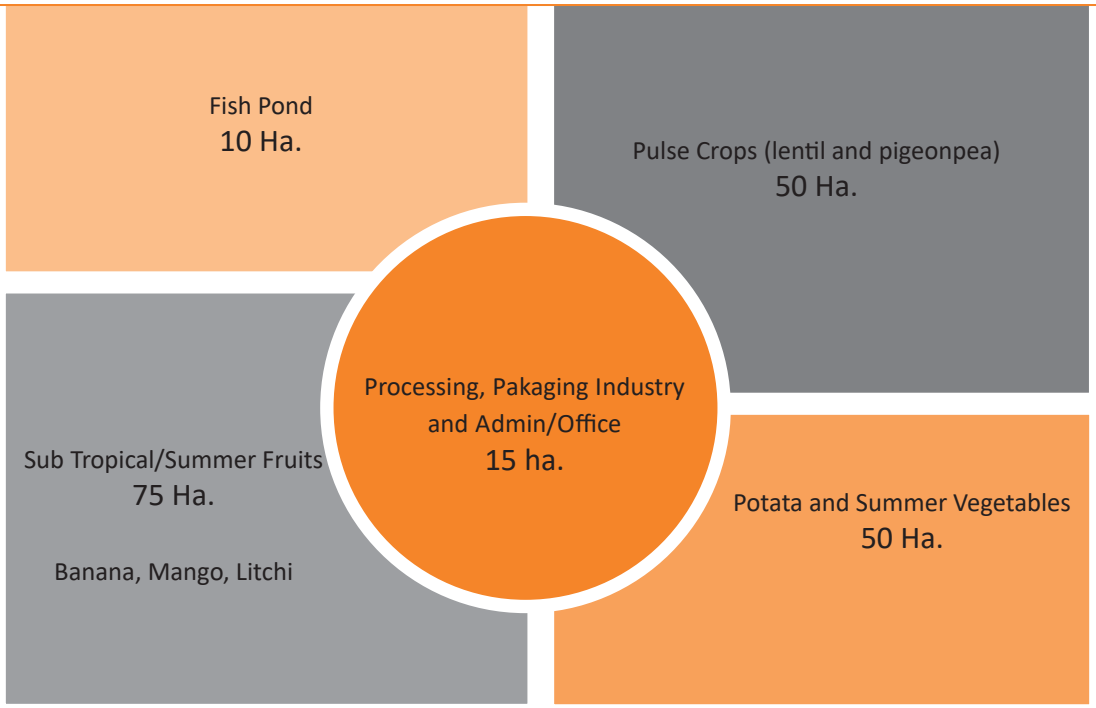
iv) **Pulse Crops** (lentil and pigeon pea): production at own farm and contact/lease in the long run. Processing (de stoning/polishing) within the farm to make available in ready to consume (value added) condition to consumers.

3.2 Project Features/Components

Madhesh Province districts are highly productive zones for agriculture commodities like vegetables, summer fruits and tropical cereal crops along with fish and livestock. Fish productivity is higher in all districts within this province.

Out of 8 districts within Madhesh Province, Dhanusha (Dhalkebar) is the main hub for agricultural production and marketing. Tropical fruits, vegetables and fish are the major agricultural commodities produced and marketed within the district. The proposed project components are defined here under:

Figure 2: Key project components and primary allocation of areas



Additional coverage: After initiation of project operation the gradual process for expanding the project will be initiated targeting to reach additional 200 Hecate of lands under commercial farming (either contract and/or lease basis). The contract /lease farming will be made more technology friendly and more farmers' benefit oriented where,

- Making buy back agreements with farmers and providing proper technologies and inputs.
- On-farm learning and demonstrations.
- Attempt to pay good price to the farm products.
- Engaging farmers and technicians in leased lands for employment generation.

3.2.1 Potato and Vegetables Farming

The proposed cropping pattern is planned for around 50 hectare in the central farm. There will be a winter and summer cropping system where potato sole will be planted in wither with special care and mixed summer vegetables in the summer season. The integration of crops reduces the risk of failure of soil property degradation and sudden yield loss. The yield level of vegetable and potato is estimated to have increased by at least 1.5 times than national average level. With preference to the organic fertilization in adequate amounts, integrated pest management system to use of safe pesticides will be practiced and certification units will authenticate the maintenance of minimum waiting period in the products and residue free food products at the end stage of harvesting/supply.

3.2.2 Commercial Fish Farming

Commercial fish farming will be done in 10 hectare areas at the central main farm. The feeding system will be made integrated types where there will be feed sources as below:

- **Natural Food:** Found naturally in the pond. It may include detritus, bacteria, plankton, worms, insects, snails, aquatic plants and fish. Their abundance greatly depends on water quality. Liming and fertilization (organic fertilization) can help to provide a good supply of natural food.
- **Supplementary Feeds:** Feeds regularly distributed to the fish in the pond. They usually consist of cheap materials locally available such as terrestrial plants, kitchen wastes or agricultural by-products. This project being an integrated type, there will be many food wastes, crop by products which can be used as supplementary feeds. Also, fish preferred plants like mulberry will be planted in the edges of the fish ponds.
- **Complete Feeds:** These are made from a mixture of carefully selected ingredients to provide all the nutrients necessary for the fish

to grow well. They are made in a form which the fish find easy to eat and digest. These feeds need to be bought from feed industries.

The fish farming system will be integrated. The semi-intensive and intensive both aspects will be practiced to rear fish commercially. In this system fish production depends on both natural food and supplementary feed and supplemented with complete feed (intensive system) as per the need. The major fish species will be Chinese carps (grass carp, common carp and bighead carp) and catfish. These fishes have different kinds of feeding behavior and feeding management will be applied accordingly.

There will be additional 1000 Mt. capacity fish cold storage system (both chilled and frozen storage)

3.2.3 Summer Fruits

Summer fruits (mango, banana and litchi) will be planted in 75 Hectare areas within the central/main farm 25 ha. Each kind of fruit is allocated for cultivation. The first harvesting of mango and litchi after plantation will be after 5-6th year whereas within 18 months, bananas can be harvested. Until the mango and litchi plants start bearing fruits, options of growing cash crops (annual to biennial) can be applied. However, the level of fertilizer dose requirement and inter crop competition should be avoided by proper care and management. Proper fertilization and maintaining good plant health status can help quicker plant growth and better fruit yield quality. Storage and packaging units for food will be planned to be established within 3 years of the project implementation. By then banana trade will be continued. The saplings for mango and litchi will be high yielding propagated saplings and for bananas will be stress resistant, dense fruit bearing tissue cultured planting materials. The source of saplings/planting materials will be the authentic seeding center or certified agro companies.

3.2.4 Farming and Processing of Pulses

Two important legume types: Pigeon pea (rahar) and lentil (masuro) pulses will be grown commercially in a total 50 hectare areas in the central farm. The expected yield would be at least 1.5 times higher than the national average. Together with farming, processing and storage structure will be made within the central farm. Also, it is expected that the project will be capable of processing pulses more than the existing capacity (i.e. during the expansion of farming (leased/contract) and even processing by purchasing the raw pulses from farmers). There will be two storage silos installed with a capacity of 1000 metric tons each. The processing unit is expected to be combined with a milling and fine packaging station and storage silo (table 6).

3.3 Developing a Business Case

Product Mix

The industry will primarily focus on producing fruit, vegetables, fish and pulses in the main central farm unit. Secondly there will be activities like product grading, processing, packaging and supply to the market centers. After 3 years of operation of the central farm, the commodities will be expanded to produce at farmers' fields or anywhere in contracted/leased farms. The capacity is targeted to increase by double sink size (production in 400 hectare from 200 ha. central farm). Collection and processing however will be done with a central farm unit even in the context of business expansion. It is targeted to expand to the entire 8 districts

Table 6: Specification of pulse storage and processing unit

S.No.	Specification	Application and Features	Capacity
1	Metal grain (pulse storage silo) 1000 Mt. capacity (total 2 numbers).	Storage of pulses. Features: loading and intake chain conveyor, cleaner, temperature and moisture screen etc.	Each Silo of 1000 Mt. capacity. Each with 10 tph loading and 5 tph discharge capacity
2	Mini Dal mill cum grain cleaning grading machinery capacity 5 tons/shift	All pulses (lentil, pigeon pea, black gram etc.) Elevator Machine, Grinding, Polishing, Roller and Packaging Machine	4-5 Metric Ton per hour
3	Automatic pulse packaging machine, Packaging type: Airtight Pneumatic	Packaging of Pulses 2 kg to 25 kg packs	12-14 pouch/per minute

within Madhesh Province and. In order to run the project unit in full capacity, addition of components as possible, purchase and processing of pulses and other possible industrial expansion options will be identified to adopt. The project unit will produce:

- Refined pulses (lentil and pigeon pea), other pulses possible in the long run.
- Quality summer fruits (graded, sorted and certified): mango, litchi and banana.
- Fresh summer vegetables (regular supply) and consumer preferred potato.
- Quality fishes (chilled and frozen) of different species and taste variety.
- Transportation and market outflow to various places of Nepal (in fresh condition) by using temperature controlled vehicles.

Quality assurance of the products and other services:
The project unit will be operated and managed by a unit which is planned to be developed with Public and Private Partnership.

Public

Provincial Agriculture Ministry, Municipality and (other possible)

Private

Private investor, wholesalers, commercial farmers and other members.

In order to maintain the product quality and sustainability of project operation, government units will be regularly monitoring the product quality and handling & processing standards. Subsidies for production increment, linkage establishment and international market assurance are expected to be facilitated by government bodies. The role of private sectors will be to make an attempt for regularization of operation in full capacity with extended linkage networks.

3.4 Market Assessment

Dhalkebar is the major market center of Madhesh Province, to where different commodities are introduced from connecting districts and out flows too. Also, major hub for importing goods (agricultural and non agricultural) i.e. Birgunj is situated in the south western side of Madhesh Province.

In order to make in and outflow of the plant regular, projects will have their own supply units in different accessible areas. These might be completely a new structure or refinement/restructuring of the existing agriculture market/collection center (based on the need and consent of the Local Authority/Province Government.

Existing market networks and trade flow status of the various products indicate that the future potential market of fresh, stored, and processed products is incredible within this province and already there is huge prospect to supply to major national market hubs being located at the central point with accessible road networks to those areas. Proposed project's operation strategy will be to make strong connections with the major market hubs of vegetable, fruits, pulses and fish around the country and Kathmandu. For the transportation, own vehicles can be utilized with available GoN's subsidies in fuel and vehicle related taxes.

3.5 SWOT Analysis

This SWOT analysis is made for the Public Private Partnership (PPP) model. During the DPR, the SWOT analysis for additional options of the operation model will also be explored and presented.

SWOT Analysis for Large Scale Commercial Cultivation of Fruits and Vegetables in Madhesh Province Project

Strength	Weakness	Opportunities	Threats
• Increasing commercialized concept among farmers and stakeholders. • Well accessed domain connected with potential markets (e.g. Kathmandu) and other urban/peri-urban areas. • Increased awareness of people on quality food consumption. • Effective monitoring and quality control system (PPP). • Integrated large scale farming might have lower chance of failure in business.	• Crop varieties' performance at field level against research outcomes. • Seed and fertilizer quality, availability • Land availability and acquisition problem for agriculture purpose. • Existing middle men based market interventions. • Time management challenges.	• Interest of respective stakeholders. • Increased Involvement in commercial farming, development of distant marketing and information system. • Surrounding infrastructures being improved. • Potential of expansion of project covering various products with international market demand. • Increased interest of investor in agriculture sector.	• Widespread private owned production, processing and marketing system. • High cost of production leading to higher price than imported commodities. • Low economic status of Nepalese buyers for quality stored and processed products. • Quality vs Consumers' awareness.

4

FINANCIAL ANALYSIS

4.1 Pre-Feasibility Approaches & Assumptions

Project Cost

Total cost of the project amounted to NPR 223,800,000 excluding interest during construction. The total cost including interest amounted to NPR 233,200,000. Costs are assumed to occur evenly in the construction period.

Particulars	Amount in NPR
Infrastructure	42,500,000
Other	20,000,000
Building & Civil Work	74,500,000
Furniture & Fixture	86,800,000
Interest During Construction	9,400,000
Total Project Cost	**233,200,000**

The portion of the interest during construction is capitalized in the individual assets on a proportionate basis.

Capital Structure

The project is proposed to be financed in a 70:30 debt equity ratio on the total cost of the project including Interest During Construction (IDC). The requirement of working capital would be financed by internal resources itself. Based on the structure, The total investment pattern has been tabulated below:

Component	Percentage	Amount in NPR
Equity	30.00%	163,240,000
Debt	70.00%	69,960,000
	Total	**233,200,000**

Collection Efficiency

Based on the various studies conducted by international agencies and prevailing market tendency, collection of the solid waste has been assumed as follows:

From	To	Efficiency
0 year	1 year	0%
2 years	9 years	30%
15 years	24 years	40%

Project Construction and Operation Period

The project is assumed to be built in the period of 1 year and the total operation period after the construction period would be 30 years. The project would be handed over to the government after the completion of the operation period.

Tax, Staff Bonus, and Depreciation Assumptions

The tax rate for the project is assumed at 25% on profit earned during the year. Further the loss carry forward has been taken for 12 years in due consonance with the provision of Income Tax Act 2058. Further, the Staff bonus is assumed at 10% on taxable income earned during any year of the operation as required by the Bonus Act.

Also, the rate depreciation and basis of depreciation is in due adherence to the provisions of the Income Tax Act as follows:

Particulars	Depreciation Method	Rate of Depreciation
Furniture & Fixtures	WDV	25%
Civil Structure	WDV	5%
Vehicle	WDV	20%
Infrastructure	WDV	3.33%
Other	WDV	20%

However, 1/3 of the additional depreciation has not been taken into consideration as facilitated by income tax Act.

The Operational Efficiency

The operational efficiency of each component in various years has been estimated as below:

From	To	Overhead and Salary Charging	Direct Sales
0 year	1 year	-	0%
2 years	9 years	60%	30%
10 years	14 years	70%	35%
15 years	24 years	80%	40%
25 years	32 years	100%	60%

Direct Income and Direct Expense

The total units, rates and associated direct cost percentage in 100% capacity has been detailed below table:

Particulars	Category	100% Capacity	Rate per Event/Person Amount in NPR 1000	Unit of Measurement
Fish Yield (recovery 95%)	Direct Sales	16625 Kg	0.20	Kg (av. 0.7kg*23750)
Lentil Pulse 25 Ha.	Direct Sales	63 Mt	100.00	Mt (@2.5 mt/ha)
Pigeon Pea Pulse 25 Ha.	Direct Sales	50 Mt	130.00	Mt (@2 mt/ha)
Potato (50Ha)	Direct Sales	1250 Mt	25.00	Mt (@25mt/ha)
Summer Vegetables 50 Ha.	Direct Sales	375 Mt	30.00	Mt (@15mt/ha)
Banana 25 Ha.	Direct Sales	500 Mt	30.00	Mt (@20mt/ha)
Mango 25 Ha.	Direct Sales	375 Mt	65.00	Mt (@15mt/ha)
Litchi 25 Ha.	Direct Sales	300 Mt	70.00	Mt (@12mt/ha)
By products/husk/veg stuff	Direct Sales	50 Mt	1.00	Mt

Direct Expenses

The details of Direct Expense is as below:

Details of Direct Cost	Amount in NPR"000
NPK Fertilizer Fruits	648.00
FYM/Compost Fruits	750.00
Seed Potato@1500kg/ha	4,500.00
Summer Vegetable Seed @average 15kg/ha	3,750.00
NPK Fertilizer Potato and Summer Veg (2 seasons)	3,200.00
NPK for Legumes/Pulses (50Ha)	500.00
FYM/Compost for Pulses	500.00
FYM/Compost for Veg	300.00
Fish Fingerlings	250.00
Fish Feed (2.5% of expected body weight gain @700 gm in average)	600.00
Water Management/Operations (fish pond)	300.00
Pigeon Pea Seed 25 Ha.	48.75
Lentil Seed 25 Ha.	225.00
Labour Cost (for overall 200Ha)	35,000.0
Electricity and Fuel	500.00
Technical Labor	4,500.00
Total	**55,571.75**

Details of Employee Cost on 100% capacity is as below:

Department	Total Number of Employees	Total Cost Amount in NPR('000)
Administration	18	14,252.28
Total	**18**	**14,252.28**

The overhead is charged based on the following modality for employee cost and overhead charging is as below:

From	To	Overhead and Salary Charging
0 year	4 years	0%
5 years	9 years	60%
10 years	14 years	70%
15 years	24 years	80%
25 years	34 years	100%

Other Cost of Operations

The operations costs are inclusive of all staff salary, vehicle maintenance but don't include Interest cost and depreciation cost component It is further assumed that the total operating expense is likely to increase at the rate of 2% with the cap of 200%. As discussed in an earlier paragraph, the project would be financed by 70% debt. The interest rate that has been taken into the calculation is 12% which would be repaid in four equal installments In the period of 12 years.

Working Capital and Other Assumptions Used

It has been assumed that the overall working capital requirement would be financed by the equity holders. The working capital has been assumed on the following basis.

Receivable & Advance	30	Days
Payable and Liabilities	15	Days

4.2 Financial Analysis

4.2.1 Financial Results

The project cost for large scale commercial farming has been taken from a desk study report prepared by IBN. It is assumed that all the costs presented are in line with current cost structure. It is also assumed that the project development cost was prepared based on the district rates and prevailing market rates.

The total cost of the project is 233,200,000 NPR of which 9400000 NPR is interest component during construction. The total project excluding working capital has been financed by 70% debt and remaining by equity. In analysis of the pre-feasibility of the project, projections were made using different techniques. Based on the analysis, project Net Present Value (NPV) was calculated to 210,187.59 NPR. Also, the project IRR is calculated to be 16.49% which exceeds the required rate of return of the project. Equity IRR of the project is computed at 24.49%. Project IRR & Equity IRR substantiate the feasibility of the project.

Project Benefit Cost Ratio (BCR) is 1.56 times. The project payback period & equity payback period are 7.77 years and 14.06 years respectively. Considering the specific nature of business and overall industry, the pay-back period seems to be satisfactory. The average DSCR is computed at 3.53 times. Although DSCR is low in initial years, it has gradually increased.

Indicators	Results
Firm IRR	16.49%
Equity IRR	24.49%
NPV- Equity ('000)	210,187.59
Debt Equity Service Ratio (average)	3.53
Project BCR	1.56
Simple Payback Period	7.77
Discounted Payback Period	14.06

4.2.2 Sensitivity Analysis

Sensitivity Analysis has been carried out on three different components: Interest Rate, O & M Cost and Project Cost.

Interest Rate Increase/Decrease by 5%

Percentage of Change Project Cost	Impact on Project IRR	% of Change
0.00%	24.49%	-
5.00%	24.33%	-0.67%
-5.00%	24.66%	0.67%

O & M Increase/Decrease by 5%

O&M Cost	Impact on Project IRR	% of Change
0.00%	24.49%	-
5.00%	24.49%	0%
-5.00%	24.49%	0%

Project Cost Increase/Decrease by 5%

Project Cost	Impact on Project IRR	% of Change
0.00%	24.49%	-
5.00%	23.99%	-2.06%
-5.00%	25.01%	2.10%

Based on the analysis, It seems that the project cost is highly sensitive as compared with O & M Expenses and Interest rates. The special focus to provide to project cost ensures the cost remains as projected.

The financial statement of the first 10 years of operation has been separately annexed in the report.

5

PRELIMINARY ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

5.1 Socio Economic Aspects

This project can be reflected in terms of multi-dimensional positive changes to producers, traders, consumers and other people who are directly or indirectly related to agro based industries. By this time, a considerable portion of regional demand for some summer vegetables, fruits, fish, and pulses is met by the import from across the border as well as transporting from other parts of the country.

Producers, traders, consumers, and anyone who are directly or indirectly involved in the sector will see multi-dimensional positive improvements as a result of the initiative.

The proposed project's poverty-reduction effects are envisaged to originate from three sources:

(i) Job creation,
(ii) Social mobilization and grouping of small holder farmers, and
(iii) Increased income options in a more dynamic rural economy. Increased and variety of employment possibilities, both on-farm and in the post production system, will be used to reduce poverty through job creation. Increased demand for agricultural goods will result in more job possibilities for the poor.

The project will have an impact on social and gender development by

(i) Increasing opportunities for poor and disadvantaged groups, as well as women, to participate in commercial activities;
(ii) Reducing the vulnerability of disadvantaged groups
(iii) Improving the capabilities of poor, disadvantaged groups, and women to participate directly in or benefit indirectly from commercialized agriculture farm project.

5.2 Environmental Impact Assessment

According to the planned project's environmental study, some negative consequences may be caused. These consequences might result from greater usage of land and water resources, increased use of agrochemicals (fertilizers and pesticides), and infrastructural development (agricultural roads, and rehabilitation of small irrigation systems). In order to increase productivity and protect products from insects and pests, production farms utilize chemical fertilizers, insecticides, and other chemicals, according to the proposed project's backward linkage. However, as the project is aiming at using more organic inputs avoiding hazardous chemicals and controlled use of agro chemicals minimizing the risk to consumers and environment the mitigation measures would be comfortably applied.

While expanding the project on a leased/contract basis, the production farms might use chemical fertilizers, pesticides and other chemicals to enhance yield and to protect products from insects and pests. These practices over the years may lead to environmental degradation and declining soil conditions unless ameliorating practices are promoted. So, the right use of fertilizers and agrochemicals in production processes should be propagated to producers, which can be a part of mentoring service to be provided by this project unit. Less use of chemicals and to the extent possible, no use will be encouraged by the proposed project unit.

The dry and cold/frozen storage units with limited use of ammonium gas as mentioned in international standard is an environmentally friendly industry which does not produce hazardous industrial pollutants nor creates any noise pollution. Thus the industry does not have significant negative environmental effects in the industry area.

6

PRELIMINARY RISK ANALYSIS

The key challenges to the functional unit will be to encourage high technology based production, processing, storage and market linkage network development of associated products. The proposed central commercial farm of area: 200 hectare being considered as a central point, backward and forward enterprises can be strengthened with improved practices and adoption of integrated development model. The price of different storable agronomic, aquatic and horticultural products differ from place to place and time to time depending on harvesting (Season) and non-harvesting (Off-season) periods. Some possible risks and mitigating strategies would be as provided below (Table 7).

Table 7: Possible risk factors and mitigation measures

S.No.	Possible Risk/Issues	Mitigating Strategies
1	Commodities produced/stored/supplied below than the capacity and price of products.	Strategies to produce early and late (by a few months) than the peak production season from every possible production sites and crop rotation.
2	Electricity (power cut), transportation facilities and fuel crisis.	Power backup (200 Kv generator), fuel efficient transportation vehicles, timely maintenance and subsidy arrangement.
3	Pulse storage and supply volume.	Storage in full capacity even by importing commodities, fine processing and demand oriented mass scale processing and packing.
4	Sudden loss in crop productivity, pest/disease abundance etc.	Interlinkage with price determination unit, AMIS and Insurance system.
5	Farmers continue to follow traditional farming practices.	Awareness, field based observation and guiding, TOT, Monitoring and result demonstration.
6	Security issues.	Additional arrangement and reporting system.

7

PROJECT STRUCTURE AND IMPLEMENTATION MODEL

Public Private Partnerships (PPP)

A Public Private Partnership (PPP) is an agreement between public and private entities for a certain length of time in which private businesses agree to take on the risk of all or part of the funding, construction, operation, repair, and maintenance of projects under the PPP model. Such an entity may generate a fair profit by providing public services directly or indirectly through the building, operation, repair, and maintenance of public or private assets. Through legislative, legal, institutional, and economic arrangements, public institutions must establish an environment that encourages private sector investment[1] .

It will be suitable to develop a project using the PPP model, which involves both public and private entities. When national treasury resources are insufficient, assets of public utility and less expensive operation of public services, as well as resources, skills, and technology accessible in the private sector, must be drawn to nation-building projects based on the PPP idea.

The PPP model is appropriate in the current environment of Madhesh Province and its neighboring districts. According to the preliminary research done in these towns, the Local Government would give land for the construction of large scale commercial cultivation of fruits and vegetables in Madhesh Province.

1 World Bank, 2072, Public-Private Partnership Policy

8

FINDINGS AND RECOMMENDATIONS

8.1 Findings

The following are some of the study's significant findings:

1. The large-scale commercial cultivation of fruits and vegetables in Madhesh Province project will provide.
2. According to the study, Madhesh Province is an attractive place for developing the large-scale commercial cultivation of fruits and vegetables because of its climate, proximity to the border, accessibility, and other factors.
3. The project's business model was determined to be a Public Private Partnership.
4. With a total cost of NPR 233,200,000 (including interest component throughout construction period). The project's Internal Rate of Return (IRR) is assessed to be 16.49%, while the project's equity IRR is calculated to be 24.49%. The project's IRR and equity IRR prove the project's viability.
5. Payback period has been determined as 7.77 years.

8.2 Recommendations

The project appears to be technically and financially viable for a developer to invest, based on the findings. In the following step, however, environmental and social aspects, as well as a thorough examination of all other components, must be addressed.

Disclaimer

This project profile is based on preliminary study to facilitate prospective developers to assess possible scope. It is, however, advisable to get a detailed feasibility study prepared before taking a final investment decision.

9

ANNEX

Financial Report

Projected Profit and Loss Statement for Initial 10 years

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Direct Sales	35,700	36,771	93,770	96,582	99,479	102,463	105,537	108,702	30,624	134,542
Total Direct Income	**35,700**	**36,771**	**93,770**	**96,582**	**99,479**	**102,463**	**105,537**	**108,702**	**130,624**	**134,542**
Less: Direct Expenses	-									
Direct Sales	16,672	17,005	17,345	17,692	18,046	18,407	18,775	19,150	22,789	23,245
Total Direct Expenses	**16,672**	**17,005**	**17,345**	**17,692**	**18,046**	**18,407**	**18,775**	**19,150**	**22,789**	**23,245**
Gross Profit	19,028	19,766	76,425	78,891	81,434	84,057	86,762	89,552	07,835	111,297
Add: Other Income	4,641	4,780	12,190	12,556	12,932	13,320	13,720	14,131	16,981	17,490
Profit before Overhead and Interest	**23,669**	**24,546**	**88,615**	**91,446**	**94,366**	**97,377**	**100,482**	**103,683**	**24,816**	**128,788**
Operating Expenses										
Depreciation	32,137	26,290	21,866	18,511	15,960	9,845	8,354	7,205	6,315	5,620
Salary Expenses	8,551	8,722	8,897	9,075	9,256	9,441	9,630	9,823	11,689	11,923
Overhead Expenses	8,551	8,722	8,897	9,075	9,256	9,441	9,630	9,823	11,689	11,923
O & M Expenses	23,786	24,262	24,747	25,242	25,747	26,262	26,787	27,323	27,870	28,427
Operating Profit	**(49,357)**	**(3,451)**	**24,208**	**29,543**	**34,146**	**42,387**	**46,080**	**49,510**	**67,253**	**70,894**
Interest Expenses	8,272	7,920	7,524	7,079	6,577	6,012	5,377	4,662	3,857	2,951
Profit	**(57,629)**	**(51,371)**	**16,683**	**22,465**	**27,569**	**36,374**	**40,703**	**44,848**	**63,396**	**67,944**
Provision for Staff Bonus	-	-	1,517	2,042	2,506	3,307	3,700	4,077	5,763	6,177
Income Tax	-	-	-	-	-	-	4,345	8,154	11,527	12,353
Net profit	**(57,629)**	**(51,371)**	**15,167**	**20,422**	**25,063**	**33,068**	**32,658**	**32,617**	**46,106**	**49,414**

Projected Balance Sheet for Initial 10 years

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Sources of Fund										
Shareholders Fund										
Share Capital	163,240	163,240	163,240	163,240	163,240	163,240	163,240	163,240	163,240	163,240
Reserve and Surplus	(57,629)	(109,000)	(93,833)	(73,411)	(48,348)	(15,280)	17,378	49,995	96,102	145,515
Loan Fund										
Term Loan	67,157	64,001	60,450	56,454	51,955	46,892	41,194	34,780	27,561	19,437
Short Term Loan	-									
Total	**172,768**	**118,241**	**129,857**	**146,283**	**166,847**	**194,852**	**221,812**	**248,015**	**286,902**	**328,191**
Fixed Assets (Net)	**201,063**	**174,772**	**152,906**	**134,395**	**118,435**	**108,590**	**100,236**	**93,031**	**86,716**	**81,096**
Investment	-									
Current Assets	(27,304)	55,520)	(22,018)	12,939	49,485	87,356	122,692	156,122	201,347	248,280
Sundry Debtors	1,972	2,046	7,385	7,621	7,864	8,115	8,373	8,640	10,401	10,732
Inventory		-		-		-		-		-
Cash & Bank Balance	**(29,276)**	**(57,566)**	**(29,403)**	**5,319**	**41,621**	**79,241**	**114,318**	**47,482**	**90,946**	**237,548**
Less: Current Liabilities	991	1,011	1,031	1,052	1,073	1,094	1,116	1,138	1,161	1,184
Net Current Assets	(28,295)	(56,531)	(23,049)	11,887	48,412	6,262	121,576	154,984	200,186	247,095
Total	**172,768**	**118,241**	**129,857**	**146,283**	**166,847**	**194,852**	**221,812**	**48,015**	**86,902**	**328,191**

Projected Cash Flow Statement

Amount in NPR '000

Particulars	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years	12 years	13 years
Cash Flow from Operating Activity	-									
Net Profit before Interest and Tax	**(57,629)**	**(51,371)**	**15,167**	**20,422**	**25,063**	**33,068**	**37,003**	**40,771**	**57,633**	**61,767**
Add: Depreciation	32,137	26,290	21,866	18,511	15,960	9,845	8,354	7,205	6,315	5,620
Add: interest	8,272	7,920	7,524	7,079	6,577	6,012	5,377	4,662	3,857	2,951
Operating Cash Flow before Working Capital Change	**(17,220)**	**(17,161)**	**44,557**	**46,012**	**47,600**	**48,925**	**50,734**	**52,638**	**67,805**	**70,338**
Increase/Decrease in Current Assets	(1,972)	(73)	(5,339)	(236)	(243)	(251)	(259)	(267)	(1,761)	(331)
Increase/Decrease in Current Liabilities	991	20	20	21	21	21	(2,150)	(1,882)	(1,663)	(390)
Payment of Tax	-	-	-	-	-	-	(2,172)	(6,249)	(9,840)	(11,940)
Net Cash Flow from Operating Activity	18,201)	17,214)	39,238	45,797	47,378	48,696	46,152	44,239	54,540	57,677
Cash Flow from Investing Activity	-									
Purchase of Fixed Assets	**(233,200)**	**-**	**-**	**-**	**-**	**-**	**-**	**(0)**	**-**	**0**
Increase/Decrease in Investment	-									
Less: Payment of Dividend		-								
Net Cash Flow from Investing Activity	(233,200)	-	-	-	-	-	-	(0)	-	0
Cash Flow from Financing Activity										
Increase in Share Capital	163,240	-	-	-	-	-	-	-	-	-
Increase in Borrowing Fund (Long Term Loan)	69,960									
Increase in short Term Loan	**-**									

Amount in NPR '000

Particulars	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years	12 years	13 years
Less: Repayment of Long Term Loan	(2,803)	(3,155)	(3,551)	(3,997)	(4,498)	(5,063)	(5,698)	(6,414)	(7,219)	(8,125)
Less: Payment of Interest on Short Term Loan	-									
Less: Payment of Interest on Long Term Loan	(8,272)	(7,920)	(7,524)	(7,079)	(6,577)	(6,012)	(5,377)	(4,662)	(3,857)	(2,951)
Net Cash Flow from Financing Activity	222,124	(11,075)	(11,075)	(11,075)	(11,075)	(11,075)	(11,075)	(11,075)	11,075)	(11,075)
Increase/Decrease in Cash and Cash Equivalent	29,276)	(28,289)	28,163	34,721	36,302	37,620	35,077	33,164	43,464	46,601
Cash & Bank Balance at the Beginning of the Period	-	(29,276)	(57,566)	(29,403)	5,319	41,621	79,241	114,318	147,482	190,946
Cash Balance At the End of the Period	**(29,276)**	**(57,566)**	**(29,403)**	**5,319**	**41,621**	**79,241**	**114,318**	**147,482**	**90,946**	**237,548**

The Equity shareholders need to inject additional cash for serving Working capital in initial years as assumed in the report Earlier

PRE-FEASIBILITY STUDY OF

ESTABLISHMENT OF AGRICULTURAL MACHINERY AND TOOLS INDUSTRY PROJECT

EXECUTIVE SUMMARY

Agricultural machinery as we know refers to the mechanical instrument or vehicles used in agricultural activities such as farming. There are several types of agricultural machinery equipment, some of them are power tools and hand tools such as tractors, harvesters, hay and forage machines, and numerous other kinds of farm equipment that help to operate easily. Further, the increased demand in food cultivation which is further sustained by the use of semiautomatic and automatic agricultural machinery is expected to drive the growth of the market.

This project seems best suited to be developed in a Public Private Partnership (PPP) model where GoN will help in facilitating getting the necessary land for the project. The private sector shall be involved in developing all the infrastructure and install the required tools and machineries for production of tools and machinery equipment suitable to local crops and farming practices. The industry shall also assist in repairs, maintenance and improvement facilities for the agriculture machinery. By developing agriculture with modern technology, the agricultural machinery and tools industry will help Nepal's traditional agrarian economy to transition into a high-yield, capital-intensive modern economy.

The establishment of the industry is expected to enhance the farm mechanization and thus improve labor productivity and production efficiency. Till date almost all the machines are imported from neighboring and other countries where required. But with the establishment of our own industry, the intention is to use local technology to innovate new convenient tools and machinery suitable to local farming practices, farm size, availability of manual and machine yielding labor force and local crops. The industry with the required available expertise will also provide technical service in terms of efficient use of machines and technical service to the farmers during production and post-harvest management.

As the project is developed under the PPP model, the government sector is expected to provide the required support to the private sector in various aspects as follows for facilitating the establishment of the industry:

- Facilitating various legal approvals/permits for the smooth operations of the project.
- Setting up the institutional framework for review & monitoring.
- Provide subsidy for purchasing machinery/ equipment.
- Promote branding and marketing of the machinery produced.

- Provide training to the operational technician.
- Partnership of development partners for enhancing the technical skills
- The Provincial Government will provide rent-free land for up to 20 years and provide tax holidays.

The study looked into the technical and financial aspects of this project and concluded that the project is technically and financially viable with the total estimated cost to be around 812,760,000 NPR (including interest component during construction period) and Equity IRR of more than 23.54%.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SALIENT FEATURES OF THE PROJECT

Table 1: Salient features of the project

General information of the project		
1	Name of Project	Establishment of Agricultural Machinery and Tools Industry
2	Project Location	Province: 2 District: Bara Municipality/Rural Municipality: Jeetpursimara Sub-metropolitan City
3	Project Implementation Modality	☐ Public ■ PPP ☐ Private ☐ Others/Please Specify
4	Category of Project	■ Short term: 5 years and below ☐ Mid term: 6 – 10 years ☐ Long term: 11 – 15 years
5	Sector as per 1st 5 years Provincial Plan	Economic
6	Type of Project (Sub Sector)	Agriculture
7	Implementing/Facilitating Agencies	Private sector facilitated by the Provincial Ministry of Land Management, Agriculture and Cooperatives in coordination with Local Governments.
8	Project Management (Implementation Mechanism)	Private sector will manage the project with support from the Federal, Provincial, and Local Governments and local stakeholders. Separate Company shall be formed with joint investment of the Provincial Government and private sector with majority investment of the private sector.

Project specific information

1	Salient Features of Project	
	Modern but Locally Relevant Tools, Machineries and Facilities	• Production of tools and implements suitable to local crops and farming practices. • Repairs, maintenance and improvement facilit.
	Knowledge and Technology Based Operation	• IT enabled operation model. • Technical service to farmers. • Focus on research and development ecosystem.
	General Features of the Project	• Enhance the farm mechanization. • Provide access to the small framers. • Improve labour productivity. • Improve production efficiency.
2	Materials and Ease of Access	Tools and machineries for developing new tools available in Nepal shall be used where available. Some will be imported from neighboring and other countries where required. The intention is to use local technology to innovate new convenient tools and machinery suitable to local farming practices, farm size, availability of manual and machine-yielding labor force and local crops.
3	Environmental and Social Management Plan (ESMP)	Use of efficient technology will reduce environmental pollution. Natural gasses can also be introduced to reduce the environmental hazards.
4	Project Document Available	■ None (New/Rehabilitation) ☐ Concept Note/Desk Study ☐ Feasibility Study ☐ Detailed Engineering/DPR
5	Estimated Cost to Operate the Project	NPR 812,760,000
6	Estimated Time to Complete the Project	Feasibility Study/DPR: 6 months Approval and Financial Closure: 6 months Setup Period: 1 year
7	Project Financing Options	Majority investment of the private sector; Government to contribute for required infrastructure development. Government to be given minority equity stake.
8	Project Technology/Components	• Assembly and manufacturing of tools. • Tools and machinery equipment necessary for tools production, maintenance and repair and research and innovation. • An IT-enabled operation model shall be carved that ensures demand and supply management. • Repairs and maintenance facility . • Technical service to the farmers during production and post-harvest management. • Research and development ecosystem by connecting agricultural and technical education and research centers such as AMRTC. • Strengthening of agriculture mechanization program in the province. • Training and demonstration on large scale farms to promote large scale farming. • Connecting with agriculture research centers and close collaboration for research and development.

9	Contribution to SDG and Green Growth	By developing agriculture with modern technology, the agricultural machinery and tools industry will help Nepal's traditional agrarian economy to transition into a high-yield, capital-intensive modern economy. This will help in the attainment of the following sustainable goals: Goal No. 1: No poverty Goal No. 2: Zero hunger Goal No. 8: Decent work and economic growth Goal No 11: Sustainable cities and communities
10	Project Capacity (at 100%)	TBD
11	Project IRR and NPV	13.41%
12	Benefit Cost Ratio	1.12 Times
13	Private Sector / Consumer Committee /Beneficiary Roles	Planning, designing, building and financing the project.
14	Government's Role	• Facilitating various legal approvals/permits for the smooth operations of the project. • Setting up the institutional framework for review & monitoring. • Provide subsidy for purchasing machinery/equipment. • Promote branding and marketing of the machinery produced. • Provide training to the operational technician. • Partnership of development partners for enhancing the technical skills . • The Provincial Government will provide rent-free land for up to 20 years and provide tax holidays.

Other project information

1	Target Beneficiaries	Farmers of Province 2 and all over Nepal
2	Market of Project's Service/Product	Farmers of Province 2 and all over Nepal
3	Key risks and Opportunities of Project Development & Operation	
	Strengths and Opportunities	• Intensify production by reducing cost of production. • Tax concession/ VAT exempted and subsidies provided in current policy. • Small and medium farmers can access the service of agricultural machineries. • Province 2 is the largest producer of food grains which ascertains a local market for the industry's products.
	Risks and Issues	• Undeveloped markets. • Lack of organized service providers. • High cost of machinery and equipment. • Highly capital-intensive industry which requires an abundance of workforce with strong technical know-how. • Unstable policy related to agriculture mechanization. • Lack of training, operation and maintenance of agro based machinery. • Lack of proper knowledge about technology.

1

BACKGROUND

1.1 Introduction

Agricultural machinery as we know refers to the mechanical instrument or vehicles used in agricultural activities such as farming. There are several types of agricultural machinery equipment, some of them are power tools and hand tools such as tractors, harvesters, hay and forage machines, and numerous other kinds of farm equipment that help to operate easily. Further, the increased demand in food cultivation which is further sustained by the use of semi automatic and automatic agricultural machinery is expected to drive the growth of the market.

The increased mechanization of several farming activities such as harrowing, plowing, harvesting, planting, and tilling is anticipated to drive the demand for agriculture equipment, which eventually influences the growth of the global agriculture machinery industry. Some of the benefits due to the adoption of mechanical equipment such as harvesters, tractors, and several other instruments such as increased efficiency, less human interaction, and less time consumed in the process are expected to boost the demand for agricultural machinery.

Further, increased demand in food cultivation which is further sustained by the use of semi automatic and automatic agricultural machinery is accepted to drive the growth of the market. However, the lack of awareness about the benefits and advantages of using agricultural machinery among small scale farmers is one of the major factors hampering the growth of the market.

In the context of Nepal, where the human population is growing and to feed them we require sustainable food production. This can be realized by increasing land and labour efficiency in agriculture through farm mechanization and other modern inputs. Modernization and mechanization have two separate meanings; so while modernization is beneficial for the industrialized countries, developing countries need mechanization for which they have to rely mostly on imported farm machines, which are often not suitable for the small farms of the developing countries.

Madhesh Pradesh is considered the breadbasket of the country with the highest crop yield and largest agriculture sector. Agricultural mechanization has been improving in recent years in the terai region with wide adoption of mechanical power operated machinery. But due to the domination of small farmers and small farm size in most of the areas, the capacity for modernization has been limited. Appropriate mechanization technologies addressing the needs of the farmers & agro-ecological zone & cropping system is also required for wide use

and adoption. Moreover lack of technical knowledge in O & M of the farm machinery, limited facility for servicing and repair and difficulty in availability of spare parts have also affected the growth of the industry.

So, an industry dedicated to the agriculture machinery and tools providing an overall support to the agriculture sector with the appropriate machinery and tools will be beneficial to the overall improvement of agriculture in the country.

1.2 Agricultural Machinery & Tools Industry in Nepal

Human power and animal power occupy 36.3 and 40.5 percent of the total farm power available in the country respectively. The available mechanical power in the country is only 23 percent. Most of the mechanical power is concentrated in Terai, the share of available mechanical power in terai is 92.28% of that of the total available mechanical power of Nepal. (FCB, 2006). Nepal imports around NRs. 20 billion worth of agriculture and equipment annually including tractors, mini thrillers, power tillers, threshers etc.

The Agriculture Tools Industry in Simara which was established with support from Russia has been shut since 2002. The factory, which is the only factory of its type in the country, used to be producing very useful agriculture tools and equipment relevant to the agriculture requirement of the country.

The traditional wooden tools and implements have continued to remain in use in the hills and mountains. There has been some improvement in their design and performance capabilities over time. Due to the lack of physical facilities (viz. road networks and electricity) and cultivation in narrow terraces in hilly areas; hill agriculture is mainly dependent upon human and animal power. In Terai, agricultural mechanization related tools used are manual tools, animal-drawn implements and mechanical power-operated machinery. Traditional farm tools and equipment are still found to be widely used in Terai. Spade, hoe, sickle, etc. are major hand tools used. Animal-drawn traditional power, as well as improved implements, are found to be used in agricultural operations in Terai. Traditional wooden plow, iron moldboard plow, disc harrow, wooden plank, etc, are major animal-drawn implements. More than 51 percent of holdings in terai own and use animal-drawn iron plow due to increased field efficiency than a traditional plow and easy availability in border towns.

Blacksmiths are the primary suppliers of agricultural traditional hand tools in the country. It is estimated that more than 85% of tools/implements used by the farmers, especially in hilly areas are made/repaired by the blacksmiths/rural artisans (Manandhar, 1998). Major problems of the blacksmiths are lack of capital, good quality raw material, coal, and knowledge on improved technology. There are several small metal working industries in Nepal mainly involved in the production of small tools & implements and the tractor attachments, milling equipment, etc. hand hoe, plough, threshers, feed mill, feed mixture, tractor/power tiller trailer, case wheel, oil expeller, sheller mill, treadle, etc. are found to be fabricated by these small metal working industries on-demand basis. Even though there is a demand for agricultural tools and implements in the country, they are not in the position to supply due to the lack of favorable policy, technical capability, and financial constraints. Like tractors dealers with different brands of tractors are promoting their tractors and attachments among farmers through their marketing network in Nepal. Only a few dealers have their own service workshop for after-sales service. High-interest rates on agricultural machinery, lack of awareness on the benefit of agricultural machinery, insurgency situation in terai are major problems faced by agricultural machinery deals and retainers. The importers have also raised problems regarding the high customs duty and Value Added Tax (VAT) during the import of agricultural equipment.

1.3 Objectives

One of the most prominent issues in the country is ensuring food security of the country and one of the measures include the increase in agricultural production through direct investment in agriculture. In these circumstances, the objectives of this project is the promotion of investment by the private sector in the agribusiness in the province through the introduction of agricultural machinery, as well as increasing farm incomes and reducing regional poverty.

1.4 Scope of Work

The pre-feasibility study helps to analyze the need for new convenient tools and machinery of agricultural equipment in Nepal & to document the technical and financial feasibility of the project. Ultimately, the

study will help to get an overall idea of manufacturing and assembling of agricultural machinery & tools for developing new tools which will be available all over the nation. Some of the major scopes of the study are:

- To collect secondary data and all the required information for the establishment of agricultural tools.
- Carry out the analysis of the gathered information for different aspects such as technical, financial, social, and environmental.
- Develop the best suitable investment model i.e. Private or PPP or Blended Finance.
- And provide recommendations based on the findings.

1.5 Approach & Methodology

The study included secondary data collection methods. Secondary data was collected from different sources like published reports, Journal articles, and other verifiable and credible internet sources. Also, financial, technical, social, and environmental analysis were carried out, and based on the analysis, a suitable investment model has been recommended.

2

PROJECT DETAILS

2.1 Project Background and Description

Nepal is a small landlocked country situated between India and China. Agriculture is the backbone of the national economy, means of livelihood for the majority of the population, the main source of GDP, income, and employment opportunities in Nepal. Agriculture contributes about 34.7% to the national GDP and provides part and full-time employment opportunities to 73.9% of its population (MOF 2011 & NLFS 2008). The average landholding per family across Nepal is found to be less than 0.8 hectare. Because of the small land size and unavailability of other employment opportunities in the country, the majority of farmers in the country are compelled to adopt subsistence agriculture.

Due to low investment capacity and lack of infrastructure & market opportunities majority of farmers are adopting traditional technology in their production system. Due to the unavailability of attractive employment opportunities in the country, the majority of young people are going abroad (mainly in the Gulf and Malaysia) in search of jobs. In the first eight months of F Y 2010/11, about 0.21 million youth formally went to various countries (mainly Malaysia and Gulf) to work as labor with the formal approval of the government. The trend of young people leaving Nepal for foreign employment is increasing every year. The number of people visiting abroad through unauthorized means taking undue advantage of open borders with India is assumed to remain at large. Hence agriculture has become the job of old people and that of women farmers in the village. In this context, there is an urgent need for appropriate agriculture.

Agricultural sector is important for economic development and to create full-time employment opportunities for Nepalese people. So modernization in the agriculture sector is important and for that, the latest technology should be introduced in the agricultural sector. The establishment of an agricultural machinery industry plays a crucial part in the modernization process. This project is introduced to make available most relevant agricultural tools in our own county so that we get rid of importing expensive agricultural tools from other countries. It will create employment opportunities in our own country which will reduce young people from going abroad to search for employment. The project will change the living standard of people also.

2.2 Project Features

The major features of the project are:

- Establishment of civil structures and machinery equipment for the Agriculture Machinery Industry

- Manufacture of agriculture tools and equipment as per the requirement of the agriculture sector.
- Availability of spare parts for the agriculture tools and equipments.
- Technology transfer and assistance to farmers and entrepreneurs.
- Repair and maintenance of tools and equipments.

2.2.1 Equipment Requirements

The various machinery equipment required for the establishment of agriculture machinery and tools will vary according to the design and functionality of the tools and equipment . Some of the major machinery equipments are:

1. Lathe Machine
2. Drilling Machine
3. Milling Machine
4. Welding Machine
5. Furnace
6. Grinding Machine
7. Roll Bending and Roll Shifting in Hot Steel Mill Finishing
8. Broaching Machines
9. Drill Press Machine

Some other equipment as required may also be required. The civil structures and other supporting facilities like water supply, electricity and material handling equipment shall be required.

2.3 Overview of the Area

The project incorporates the district as part of Madhesh Province. Madhesh Province is a province in the south eastern region of Nepal that was formed after the adoption of the Constitution of Nepal. It is Nepal's second most populous province and smallest province by area. It borders Province No. 1 to the east, Bagmati Province to the north, and India to the south. It has an area of 9,661 km2 (3,730 sq mi)-about 6.5% of the country's total area. It has a population of 5,404,145 as per the 2011 census of Nepal, making it the most densely populated province of Nepal.

The province includes eight districts from Saptari District in the east to Parsa district in the west. The majority of the province's population speaks Maithili, Bhojpuri, Bajjika, and Nepali.

The capital city, a Sub-Metropolitan city of Janakpur, also known as Janakpurdham is a center for religious and cultural tourism. It is also thought to have been the capital of the Videha dynasty that ruled the Mithila region in ancient times.

The first urban planned municipality of Nepal, Rajbiraj, is also the oldest municipality of the Terai belt of Nepal. The town is believed to have been named after the ancient Rajdevi temple, which dates back to the 1700s. The metropolitan city of Birgunj is an economically important industrial center and the only metropolitan city in the province (fig 1).

2.4 Developing a Business Case

Business Structure

Agricultural machinery and tools industry which will be established in Province 2, Nepal. We will ensure that we hire people that are qualified, hardworking, creative, customer centric, and are ready to work to help us build a prosperous business that will benefit all the stakeholders. As a matter of fact, a profit sharing arrangement will be made available to all our senior management staff and it will be based on their performance for a period of five years or more as agreed by the board of trustees of the company. In view of that, we have decided to hire qualified and competent hands to occupy the following positions:

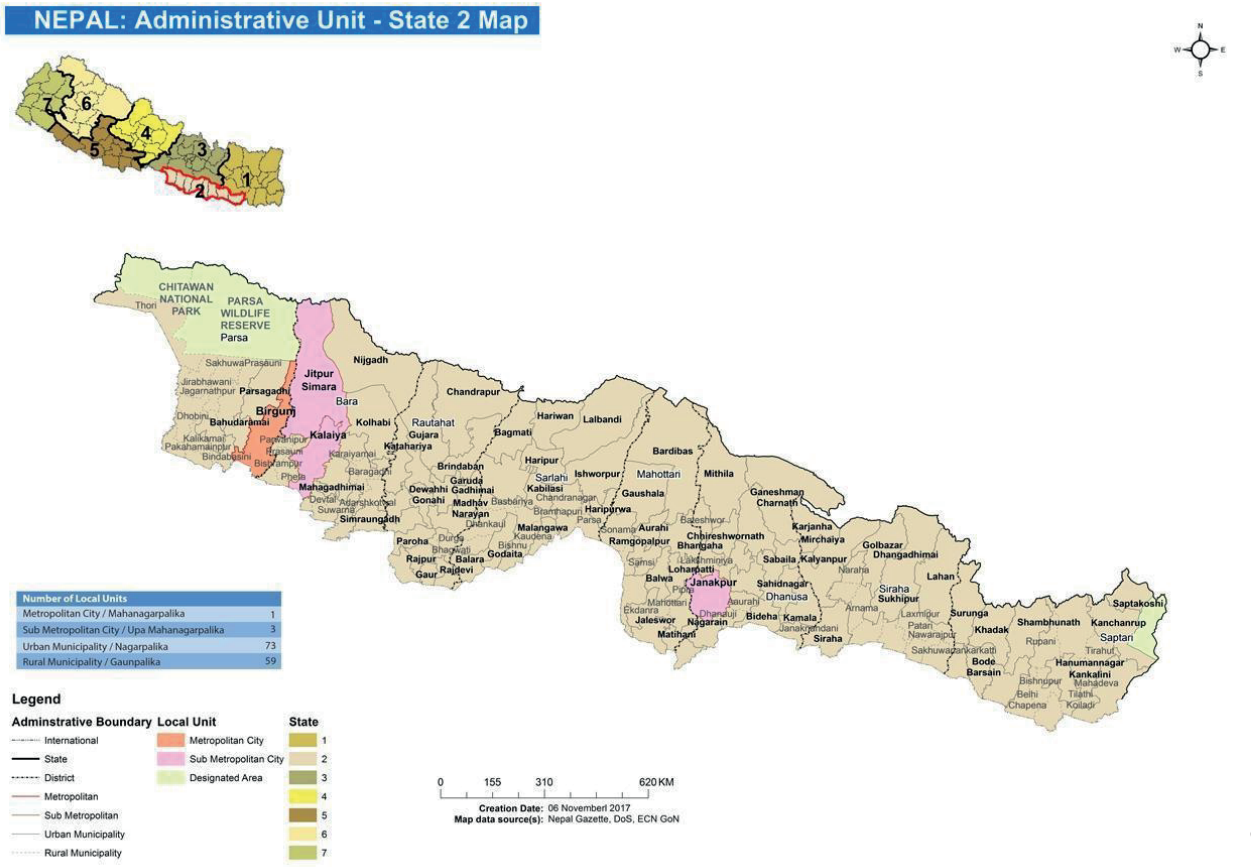
- Chief Executive Officer (Owner)
- Plant Manager
- Human Resources and Admin Manager
- Sales and Marketing Manager
- Engineers and Technologists
- Accountants/Cashiers
- Customer Services Executive/Front Desk Officer

Product & Services

Our Products & Services are as follows:

Plowing Machines: These machines are used to plow land. It will be of different types which are Power Tiller, Rotary Tiller, and Compact Tractor, etc. Power tiller has complete attachments necessary to prepare muddy land paddy fields of varying soil conditions. About 2.25 acres of muddy land paddy field with average soil can be prepared (i.e. plowed, harrowed and leveled) ready for planting in one day. For dry land crops like corn, wheat, tobacco, vegetables etc. Approximately one acre of land per day can be prepared ready for planting. It is durable, easy to operate & also durable.

Fig 1: Location map of Province 2



Seeding and Plantation Machineries: These machines are used for seeding and plantation purposes. It will be of different types which are Drum Seeder, Bed Planter, Versatile Multi-crop Planter, Power Tiller Operated Seeder, FLW Riding Type Rice Transplanter, FLW Walking Type Rice Transplanter etc. With the help of drum seeder farmers can save 50% - 80% seeds compared to broadcast seeding. It could be used for wetland seeding, made from light and durable material, rice and grains are seeded in straight rows and easy adjustable mechanism from 20 to 60 kg hector seed rate. Versatile multi crop planter is multi functional and multi crop planter powered by 12/16 hp power tiller. It helps to improve flexibility for multi crop planting.

Irrigation, Fertilizer & Insecticides Applying Machineries: Low Lift Pump, Centrifugal Pump & Axial Flow Pump are irrigation machines which can be used by a single person, easy to operate and durable also. Machineries to apply fertilizer & insecticides are USG Applicator, Foot Pump Spray & Hand Sprayer. These fertilizer applying machinery i.e: USG Applicator are easy to operate, two rows of granular urea could be applied and reaches up to 6-7 cm deep in muddy land. Foot pump spray is high pressure spray suitable for foliar fertilizer and pesticides spraying in mango, lichi, banana and rubber garden. Hand Sprayer is one the portable machinery to apply fertilizer which is made of heavy plastic made, long life which can be used in spraying different chemicals and pesticides in vegetables and crops.

Harvesting & Post Harvesting Machineries: Hand Reaper, Lucky Maize Harvester, Power Reaper, Power Tiller operated Reaper Header, Mini Combine Harvester, Daedong Full Feed Harvester, Lucky Star Full Feed Harvester are different types of harvesting machineries. Where Hand Reaper is used especially for grass trimming. Power Reaper is easy to attach and remove from the power tiller & helps to speed up the harvesting process. Mini Combine Harvester (Walking type) is useful machinery which is light in weight made with advanced technology, can be operated both in dry and muddy land, suitable for BORO crop rice/wheat can be reaped, threshed, cleaned and bagged at the same time.

Threshers: Threshers machines are used for large scale threshing and winnowing facilities. It is easy to operate and maintenance made up of high quality material. Above all products will be manufactured and assembled in the Industry and not only that there will be separate maintenance and service center for those equipment will also be available. Technical service to farmers will also be given and focus on the research and development ecosystem.

2.5 Market Assessment

The agrarian structures of the country are characterized by very small land holdings scattered to different plots, where irrigation availability is very limited and seasonal. The average size of land owned by the household currently in Nepal is about 0.68 ha, which is highly fragmented, averaging 3.1 parcels with 1 exception exists in Karnali region, where rice is grown up to 3,000 msl in Chumchur of Jumla district. 98 agricultural and rural mechanization in Nepal: status, issues and options for future average size of 0.21 ha per parcel (CBS, 2013). At present, about half (52%) of the farm households own less than 0.50 ha land with low farm labor productivity, and low level of intensification. Area under farming is declining over the years as a result of conversion of prime agricultural land into non-agricultural uses (e.g. housing, industries and infrastructure development) through rapid urbanization and rural-urban migration. Hence, in the last 10 years, net cultivated area has declined by 5% from 2.65 million ha in 2001 to 2.52 ha million in 2010 (CBS, 2013). Average farm size has also declined over the years from 1.11 ha in 1961/62 to 0.68 ha in 2011/12.

The number of households with 2 ha or more of land has decreased from 12 percent in 1995/96 to 4 percent in 2010/11. Moreover, two thirds of the cultivated area is rained, where agricultural production is risk-prone and marginal. A large proportion of farm households (30%) are employed only partially. About 60% of the households in Nepal have only six months of food sufficiency from their own production. Population density on cultivated land is high where more than 10 people are dependent on a hectare of land for their livelihood. Agricultural productivity and profitability from farming are low due to low use of modern and mechanized technologies, high cost of production, limited commercialization and diversification of agriculture. Labor scarcity is chronic in agriculture as a result of massive youth migration from rural areas.

2.6 SWOT Analysis

SWOT analysis enables the identification of factors characterizing an entity or enterprise under consideration in the context of a specified purpose, as well as classification of such factors into four groups. Two of these comprise positive, and the other two negative elements as shown in the table:

SWOT Analysis for Establishment of Agricultural Machinery & Tools Industry

Strength	Weakness	Opportunities	Threats
- Modernization in agriculture. - Agriculture Production will increase. - National GDP will increase. - Employment is created. - Small and medium farmers can access the service of agricultural machineries.	- Underdeveloped markets. - Lack of organized service provider. - High Cost of Machinery & Equipment. - Lack of Training, operation and maintenance of agro based machinery. - Lack of Proper knowledge about technology. - Unstable policy related to agriculture.	- Intensify production by reducing the cost of production. - Province 2 is the largest producer of food-grains which ascertains a local market for the industry's products.	- Lack of skills to operate machinery equipment could cause human casualties. - The high rise in completion with existing amusement parks in the near periphery.

2.7 Examination and Evaluation of Alternatives

Province 2 lies in terai region which has high potential in the agricultural sector. Establishment of Agricultural Machinery & Tools Industry in this province will be feasible & beneficial for the whole agricultural industry than other provinces.

2.8 Relevant Case Studies

Case Study 1

Project Name: Alim Industries Limited
Location: Industrial Estate, Gutatikor Kodomtoli, Bangladesh

Alim Industries Limited was established in 1396 Bengali Year (1990 AD) in the South Surma, BSCIC Industrial Estate. To provide complete machinery Based Agricultural solutions to our farmers, to improve, research, develop and manufacture better agro machinery, Alim Industries Limited has always strived to achieve the very best. We have performed and demonstrated with our machineries throughout the whole country, round the year. To get the farmers acquainted with all sorts of field machinery, we arrange field demonstrations, fairs, road shows, free servicing and campaigns. Through these activities we show and train the farmers how to get the best result using our machines and methods, how to minimize the cultivation cost, how to keep the land fertile, use surface water, reduce the use of artificial chemicals, pesticides and fertilizer. By transforming the traditional farming methods into farm mechanization system we have been developing, improving, manufacturing our different machineries such as power tiller, paddy-wheat power thrasher, maize power thrasher, power reaper, Winnower, Drum Seeder, Power Tiller Operated Seeder, Dryer Machine. Alim Industries Limited has been manufacturing its own developed and designed products, at the same time we have been manufacturing machines designed by different government research organizations such as BARI, BRRI, IRRI.

Its products are:

1. Seeding Machines
2. Plowing Machines
3. Irrigation Machineries
4. Fertilizer and Insecticides Applying Machineries
5. Harvesting Machineries
6. Thresthers
7. Post Harvesting Machinery
8. Aquaculture Machineries

Alim Industries Limited has been manufacturing all the agro machinery to meet all the needs from seeding, weeding, applying fertilizer-pesticides, irrigation, harvesting, thrashing, winnowing, drying and preserving. As a part of the ongoing activity Alim Industries Limited have been conducting following activities.

1. Alim Industries Limited has been exporting to different countries, after meeting the country's internal requirements.
2. Beside creating expert labor force , Alim Industries Limited is being developed as an export alternative industry.
3. Using machineries produced by Alim Industries Limited, farmers can be benefitted both individually and commercially.
4. Saving huge labor cost, investment and time farmers are being self dependent.
5. By using high quality locally manufactured machineries we can reduce the dependency on imported items.

Case Study 2

Project Name: Darren Stanley Agricultural Equipment Manufacturing Company
Location: Lake Tahoe – Nevada, USA

Darren Stanley Agricultural Equipment Manufacturing Company, Inc. is a U.S based agricultural machinery manufacturing company. They have been able to secure a standard production facility in a conducive environment in Lake Tahoe – Nevada. They chose to start in Lake Tahoe because the city has continued to be a major center for venture capital investment. It was involved in the manufacturing of agricultural machinery and equipment such as tractors, harvesting and seeding machinery, grinders, mixers, wool presses, windmills and other hardware. In 1995 park was bought by six flags and added many more attractions such as a sky coaster, miniature golf course, food stand etc. Its business goal is to become one of the leading agricultural machinery manufacturing companies in the United States and will make sure that every agricultural machinery that leaves their production facility can favorably compete with the best in the industry.

It was involved in the following agricultural sectors:

- Manufacturing farm tractors and attachments.
- Manufacturing harvesting equipment and machinery.
- Manufacturing irrigation equipment.
- Manufacturing seeders.
- Manufacturing sprayers and spreaders.
- Manufacturing windmills.
- Manufacturing powered agricultural mowers.
- Manufacturing livestock feeding and watering equipment.

3

FINANCIAL ANALYSIS

3.1 Pre-Feasibility Approaches & Assumptions

Project Cost

Total cost of the project amounted to 780,000,000 NPR excluding interest during construction. The total cost including interest amounted to 812,760,000 NPR.

Particulars	Amount in NPR
Machinery & Equipments	500,000,000
Office Equipment	30,000,000
Building and Civil Work	120,000,000
Vehicle	50,000,000
Other	80,000,000
Interest During Construction	32,760,000
Total Project cost	**812,760,000**

The portion of the interest during construction is capitalized in the individual assets on a proportionate basis.

Capital Structure

The project is proposed to be financed in a 70:30 debt equity ratio on the total cost of the project including Interest During Construction (IDC). The requirement of working capital would be financed by internal resources itself. Based on the structure, the total investment pattern has been tabulated below:

Component	Percentage	Amount in NPR '000
Equity	30.00%	568,932
Debt	70.00%	243,828
	Total	**812,760**

Project Construction and Operation Period

The project is assumed to be built in the period of 1 year. And the total operation period after the construction period would be 30 years. The project would be handed over to the government after the completion of the operation period.

Tax, Staff Bonus, and Depreciation Assumptions

The tax rate for the project is assumed at 20% on profit earned during the year. Further the loss carry forward has been taken for 12 years in due consonance with the provisions of Income Tax Act 2058. Further, the staff bonus is assumed at 10% on taxable income earned during any year of the operation as required by the Bonus Act.

Also, the rate depreciation and basis of depreciation is in due adherence to the provisions of the Income Tax Act as follows:

Particulars	Depreciation Method	Rate of Depreciation
Office Equipments	WDV	25.00%
Building and Civil Work	WDV	5.00%
Machinery and Equipment	WDV	15.00%
Vehicle	WDV	20.00%

However, 1/3 of the additional depreciation has not been taken into consideration as facilitated by the Income Tax Act.

Direct Income and Direct Expense

The income is mainly from the sale of agricultural machinery.

The total units, rates and associated direct cost percentage in 100% capacity has been detailed below:

Particulars	Category	100% Capacity	Rate per Event/person Amount in NPR 1000	Unit of Measurement	% of Direct Cost
Maize Thresher	Direct Sales	1500 Pcs	25.00	Pcs	70%
Paddy Thresher	Direct Sales	1500 Pcs	25.00	Pcs	70%
Rice Mill Machine	Direct Sales	500 Pcs	100.00	Pcs	70%
Mini Tiller	Direct Sales	500 Pcs	100.00	Pcs	70%
Power Tiller	Direct Sales	200 Pcs	150.00	Pcs	70%
Ripper Machine	Direct Sales	200 Pcs	300.00	Pcs	70%
Bed Maker	Direct Sales	200 Pcs	225.00	Pcs	70%
Rice Transplanter	Direct Sales	1000 Pcs	100.00	Pcs	70%
Pit Digger	Direct Sales	1000 Pcs	120.00	Pcs	70%
Others	Direct Sales	100000 Pcs	1.00	Pcs	70%
Spares Parts	Direct Sales	100000 Pcs	2.00	Pcs	50%

The Operational Efficiency

The operational efficiency of each component in various years has been estimated as below:

From	To	Overhead and Salary Charging	Direct Sales
0 year	1 year	-	0%
3 years	9 years	60%	50%
10 years	14 years	70%	60%
15 years	24 years	80%	70%
25 years	32 years	100%	80%

Salary Expenses

Details of employee cost on 100% capacity is as below:

Department	Total Number of Employees	Total Cost Amount in NPR 1000
Administration	8	4468.80

The overhead is charged based on the following modality for employee cost and overhead charging is as below:

From	To	Overhead and Salary Charging
0 year	4 years	0%
5 years	9 years	60%
10 years	14 years	70%
15 years	24 years	80%
25 years	34 years	100%

Other Assumptions

Besides salary cost and overhead cost, the total operating expense is likely to incur at the rate of 4% of total project cost which is likely to increase at the inflation of 3% with the cap of 180%. As discussed in the earlier paragraph, the project would be financed by 70% debt. The interest rate that has been taken into calculation is 12% which would be repaid in four equal installments in the period of 12 years.

Also, the revenue has been estimated to be inflated at the rate of 4% per annum which is capped at 200%. The income tax rate for the project is 20% and the loss carryforward period for the project is 12 years. Further, the project is expected to give the additional income of 10% of the total direct revenue.

It is assumed that the government would provide required land for the project. Total operation period of the project is estimated to be 30 years and 4 years is considered as the period of pre operation.

Working Capital

It has been assumed that the overall working capital requirement would be financed by the equity holders. The working capital has been assumed on the following basis.

Receivable & Advance	30	Days
Payable and Liabilities	15	Days

Total number of working days has been assumed to be 360 days and 12 working months.

3.2 Financial Analysis

3.2.1 Financial Results

The project cost for large scale commercial farming has been taken from a desk study report prepared by IBN. It is assumed that all the costs presented are in line with current cost structure. It is also assumed that the project development cost was prepared based on the district rates and prevailing market rates.

The total cost of the project is 812,760,000 NPR of which 3,27,60,000 NPR is interest component during construction. The total project excluding working capital has been financed by 70% debt and remaining by equity. In analysis of the pre-feasibility of the project, projections were made using different techniques. Based on the analysis, project Net Present Value (NPV) was calculated to 372,850.97NPR ('000).

Also, the project IRR is calculated to be 13.41% which exceeds the required rate of return of the project. Equity IRR of the project is computed at 23.54%. Project IRR & Equity IRR substantiate the feasibility of the project. Project Benefit Cost Ratio (BCR) is 1.12 times whereas equity BCR is 2.53.

The project payback period & equity payback period are 10.59 years and 22.06 years respectively. Considering the specific nature of business and overall industry, the pay-back period seems to be satisfactory. The average DSCR is computed at 2.49 times. Although DSCR is low in initial years, It has gradually increased.

Major Financial Indicators

Indicators	Rate
Firm IRR	13.41%%
Equity IRR	23.54%
NPV- Equity (Amount'000)	372850.97
Debt Equity Service Ratio (average)	2.49 Times
Project BCR	1.12
Equity BCR	2.53
Simple Payback Period	10.59 years
Discounted Payback Period	22.06 years

3.2.2 Sensitivity Analysis

Sensitivity Analysis has been carried out on three different components: Interest Rate, O & M Cost and Project Cost.

Interest Rate Increase/Decrease by 5%

Percentage of Change	Impact on Project IRR	% of Change
0.00%	23.54%	-
5.00%	23.25%	-1.26%
-5.00%	23.84%	1.26%

O & M Increase/Decrease by 5%

O & M Cost	Impact on Project IRR	% of Change
0.00%	23.54%	-
5.00%	23.54%	0%
-5.00%	23.54%	0%

Project Cost Increase/Decrease by 5%

Project Cost	Impact on Project IRR	% of Change
0.00%	23.54%	-
5.00%	22.83%	-3.02%
-5.00%	24.26%	3.05%

Based on the analysis, It seems that interest rate is highly sensitive as compared with O & M Expenses and Project Cost. The special focus to provide to project cost ensuring the cost remains as the as projected.

4

STATUTORY AND LEGAL FRAMEWORK

4.1 Statutory and Legal Framework

Before forming a corporation or conducting business in Nepal, foreign investors must first get clearance. Depending on the magnitude of the investment, an application should be filed to the Department of Industry or the Investment Board Nepal.

5

PRELIMINARY ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

A preliminary desktop-based environmental and social impact assessment has been done, which is described in the table below. It includes some of the possible impacts which could occur during pre-construction, construction and operation phases of the project as well as possible mitigation measures associated with each impact. A comprehensive assessment, through Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) will be conducted during later phases of the project cycle, as per applicable laws.

Table 2: Glance of the general status of Madhesh Province

Activity	Possible Environment Impact	Possible Mitigation Measure
Pre-Construction Phase.	1. Natural habitats of animals will be disturbed. 2. Land will lose its fertility due to concrete foundation.	1. Natural habitat should not be disturbed and natural vegetation present on the site shall be kept in mind while preparing the architectural and landscape designs of the project. Plantation should be done in case of deforestation.
Construction Phase- Construction Activities for the Development of the Project.	1. Air pollution due to earth work excavation and other construction activities.	1. Frequent spraying of water at construction sites to suppress dust emission. Soil, muck and other construction materials should be covered during transport by vehicles.
	2. Soil contamination.	2. Preventive measures should be taken to minimize spillage of oil/ diesel from the construction equipment. Appropriate measures should be taken in case of accidental contamination.
	3. Water pollution/ contamination- Impact on lake.	3. It should be ensured that the water bodies- surface and groundwater, are not polluted due to the project. Appropriate measures should be taken in case of accidental contamination. Particular attention should be given to avoid pollution in the lake due to the project.

Activity	Possible Environment Impact	Possible Mitigation Measure
	4. Disposal of excess to earth surface.	4. The excess during land excavation should be transported to a designated place and shall be used for filling and covers.
	5. Disturbance in Residential Areas.	5. Any shifting of cable/utility lines should be attended to with a minimum period of disturbance.
	6. Safety of road users in the project area.	6. Warning signs wherever necessary to facilitate normal movement.
	7. Noise pollution due to the use of machinery and movement of traffic.	7. Use of less noise generating equipment and avoiding activities during night.
	8. Impacts due to hazardous waste.	8. Hazardous waste will be managed as per applicable laws of Nepal.
	9. Impacts due to construction waste.	9. Construction waste will be managed/disposed properly.
Operation Phase	1. Impact on ozone layer due to Carbon dioxide emission during manufacturing process.	1. Efforts will be taken to offset carbon emissions by incorporating a green/sustainable building design, including installation of solar power and energy-efficient equipment, as well as ensuring that natural light is received for maximum duration.
	2. Contribution to GHG emissions from use of machines and equipment (heating, air conditioning, etc) in the building, etc.	2. Segregate wastes and ensure they are collected frequently by waste collection companies/ facilities. Build a compost facility, if feasible, and use the compost in the green spaces/plants inside the project compound.
	3. Impact directly on the health of those peoples living near the project area.	3. Manufacturing factories should be made far from residential areas.
	4. Water & land pollution due to byproducts of machinery factories.	4. Ensure that the water bodies/flowing adjacent are not contaminated. Appropriate measures should be taken in case of accidental contamination. Install a wastewater treatment plant if feasible.

The project will create long-term employment for the local people and other Nepalese. It will directly benefit the agricultural sector and help in increasing the living standard of local farmers. A fair compensation, based on the market price, shall be ensured for the acquisition of land. As per the feasibility study, the project will not involve any resettlement of households; however, in case there are households to be resettled at the time of project initiation, this shall be done through a fair compensation package and by adopting national and international best practices

6

PRELIMINARY RISK ANALYSIS

Some of the major risks associated with projects with PPP modality are listed below:

1. Risks associated with delays in construction and project completion which could result in cost overruns.
2. This project could possess commercial risk as the demand and market trend would need to be assessed suitably to make the project financially and commercially profitable.
3. The project would require to conduct either an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) as per applicable law, which would identify potential environmental and socio-economic impacts along with appropriate measures to minimize the risks.
4. Some of the other risks associated with the project could be risk associated with change in the legal framework and political risk.
5. The project is subjected to financial risks which could arise from change in interest and currency exchange rates and tax laws.

7

PROJECT STRUCTURE AND IMPLEMENTATION MODEL

Public Private Partnerships (PPP)

Public-Private Partnership is an agreement between public and private entities for a fixed period, private entities shall make arrangements to own the potential risks that may arise partially or fully from all or some portion of the financing, building, operation, repair and maintenance of projects under the PPP model. Such an entity provides public services directly or indirectly through construction and/or operation and/or repair and maintenance and/or use of public or private assets and shall be entitled to earn a reasonable profit. Public entities shall create an environment that facilitates the private sector's investments through policies, legal, institutional and economic arrangements.

It will be appropriate to design a project based on the PPP model where public and private entities are involved. When resources allocated from the national treasury fall short, assets of public utility and operation of public services less costly, as well as resources, skills, and technology available with the private sector, must be attracted towards development works of the nation based on the concept of PPP.

In the present context the Establishment of Agricultural Machinery and Tools Industry Project PPP model is suitable. The preliminary study conducted in this province gave the information that rent-free land will be provided for up to 20 years and tax holidays by the Local Government for the project.

8

FINDINGS AND RECOMMENDATIONS

8.1 Findings

Some of the major findings of the study are listed as follow:

1. Establishment of Agricultural Machinery & Tools will provide farmers an efficient & convenient way from seeding to post harvesting of any types of crops.
2. The Public Private Partnership business model was found to be suitable for the project.
3. The project can be completed with the total cost of NPR 812,760,000 (including interest component during construction period) and equity IRR 23.54%.
4. Payback period has been calculated as 10.59 years.

8.2 Recommendations

Based on the findings, the project sounds to be technically as well as financially viable for developers to invest. Whereas, the study of the environmental and social aspects, as well as in-depth study of all other components, needs to be further considered in the next stage.

Disclaimer

This project profile is based on preliminary study to facilitate prospective developers to assess possible scope. It is, however, advisable to get a detailed feasibility study prepared before taking a final investment decision.

9

ANNEX

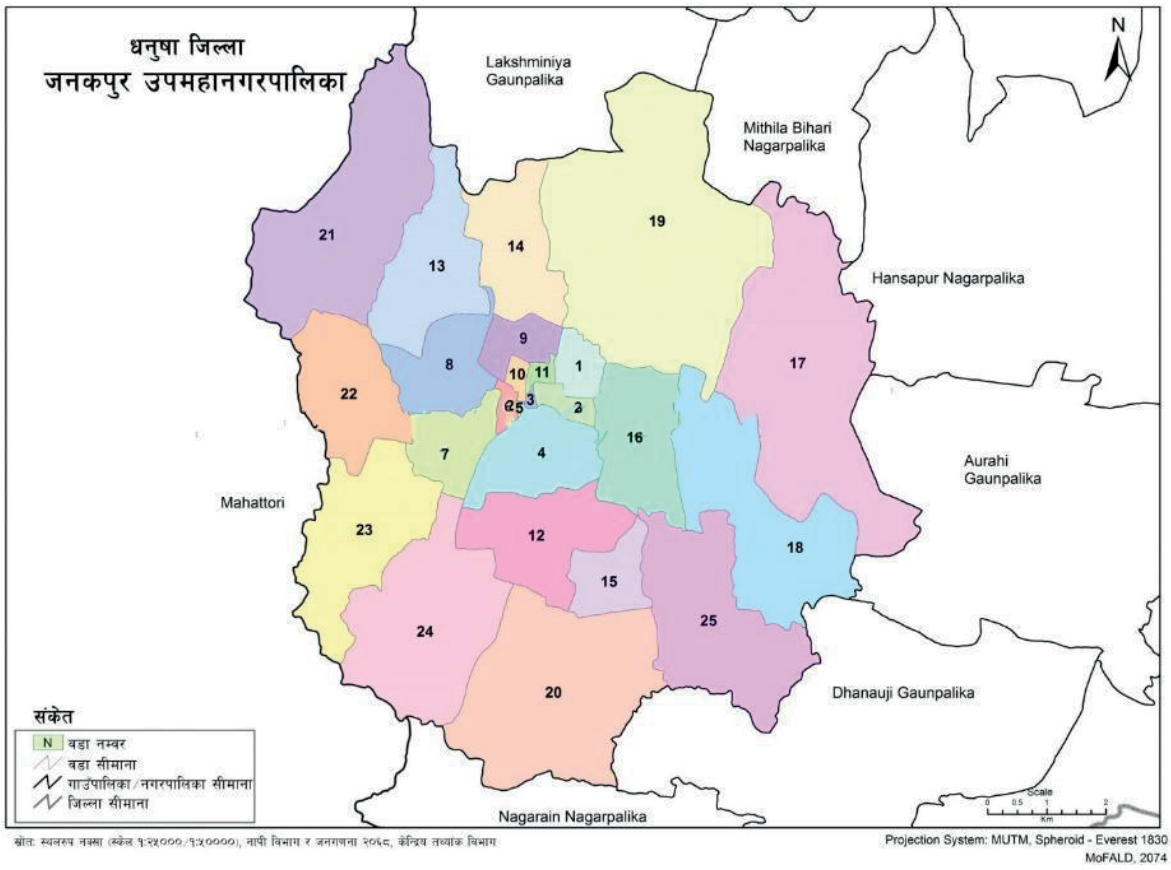
9.1 Next Steps and Useful Contacts

As part of the further development of the project, the potential developer who might be interested to develop this project will be identified. Afterward, a communication channel will be formulated for the effective execution of this project. The useful contacts of all the organizations incorporated in this are highlighted as follows;

Table 3: Useful contact information

S.No.	Organization	Address	Number	Email
1	Ministry of Agricultural & Livestock Development	Singha Durbar, Kathmandu	+977- 1-421190	info@moald.gov.np
2	Ministry of Land Management, Agriculture & Cooperative, Province 2	Province -2 , Dhanusha	+977-41-522350	info@molmac.p2.gov.np

9.2 Map of Janakpur Sub-Metropolitan City



Source: https://www.nepalarchives.com/

9.3 Satellite map of Janakpur City, Dhanusha

Source: Google map

9.4 Annex- Financial Report

Projected Profit and Loss Statement for Initial 10 years of Operation

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Direct Sales	305,000	317,200	329,888	343,084	356,807	371,079	385,922	401,359	500,896	520,932
Total Direct Income	305,000	317,200	329,888	343,084	356,807	371,079	385,922	401,359	500,896	520,932
Less: Direct Expenses	-									
Direct Sales	213,500	222,040	230,922	240,158	249,765	259,755	270,146	280,951	350,627	364,652
Total Direct Expenses	213,500	222,040	230,922	240,158	249,765	259,755	270,146	280,951	350,627	364,652
Gross Profit	**91,500**	**95,160**	**98,966**	**102,925**	**107,042**	**111,324**	**115,777**	**120,408**	**150,269**	**156,280**
Add: Other Income	42,700	44,408	46,184	48,032	49,953	51,951	54,029	56,190	70,125	72,930
Profit before Overhead & Interest	134,200	139,568	145,151	150,957	156,995	163,275	169,806	176,598	220,394	229,210
Operating Expenses	-									
Depreciation	102,637	100,240	98,276	96,660	87,510	86,402	59,427	6,551	5,896	5,339
Salary Expenses	2,681	2,762	2,845	2,930	3,018	3,108	3,202	3,298	3,963	4,082
Overhead Expenses	-	-	-	-	-	-	-	-	-	-
O & M Expenses	58,600	60,358	62,169	64,034	65,955	67,933	69,971	72,071	74,233	76,460
Operating Profit	(29,718)	(23,792)	(18,139)	(12,667)	512	5,831	37,205	94,679	136,303	143,330
Interest Expenses	28,831	27,604	26,224	24,671	22,922	20,955	18,740	16,247	13,442	10,284
Profit	**(58,549)**	**(51,396)**	**(44,363)**	**(37,338)**	**(22,410)**	**(15,124)**	**18,465**	**78,431**	**122,861**	**133,046**
Provision for Staff Bonus	-	-	-	-	-	-	1,679	7,130	11,169	12,095
Income Tax	-	-	-	-	-	-	-	-	-	18,310
Net profit	**(58,549)**	**(51,396)**	**(44,363)**	**(37,338)**	**(22,410)**	**(15,124)**	**16,787**	**71,301**	**111,692**	**102,641**

Projected Balance Sheet for Initial 10 years of Operation

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Sources of Fund										
Shareholders Fund										
Share Capital	568,932	568,932	68,932	568,932	568,932	568,932	568,932	568,932	568,932	568,932
Reserve and Surplus	(58,549)	(109,945)	(154,308)	(191,646)	(214,057)	(229,180)	(212,394)	(141,092)	(29,400)	73,240
Loan Fund										
Term Loan	234,058	223,061	210,685	196,755	181,077	163,431	143,570	121,217	96,058	67,741
Short Term Loan	-									
Total	744,441	682,048	625,309	574,041	535,952	503,182	500,108	549,056	635,589	709,914
Fixed Assets (Net)	**626,763**	**526,523**	**428,246**	**331,586**	**244,076**	**157,674**	**98,246**	**91,695**	**85,799**	**80,460**
Investment	-									
Current Assets	120,120	158,041	199,653	245,123	294,625	348,339	404,778	460,364	552,883	632,639
Sundry Debtors	11,183	11,631	12,096	12,580	13,083	13,606	14,150	14,717	18,366	19,101
Inventory	-	-	-	-	-	-	-	-	-	
Cash & Bank Balance	**108,936**	**146,410**	**187,557**	**232,543**	**281,542**	**334,733**	**390,627**	**445,648**	**534,517**	**613,538**
Less: Current Liabilities	2,442	2,515	2,590	2,668	2,748	2,831	2,915	3,003	3,093	3,186
Net Current Assets	117,678	155,526	197,062	242,455	291,876	345,509	401,862	457,361	549,790	629,453
Total	**744,441**	**682,048**	**625,309**	**574,041**	**535,952**	**503,182**	**500,108**	**549,056**	**635,589**	**709,914**

Cash Flow Statement for Initial 10 years of Operation

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Cash Flow from Operating Activity	-									
Net Profit before Interest and Tax	**(58,549)**	**(51,396)**	**(44,363)**	**(37,338)**	**(22,410)**	**(15,124)**	**16,787**	**71,301**	**111,692**	**120,951**
Add: Depreciation	102,637	100,240	98,276	96,660	87,510	86,402	59,427	6,551	5,896	5,339
Add: Interest	28,831	27,604	26,224	24,671	22,922	20,955	18,740	16,247	13,442	10,284
Operating Cash Flow before Working Capital Change	**72,919**	**76,448**	**80,137**	**83,993**	**88,022**	**92,233**	**94,954**	**94,100**	**131,030**	**136,574**
Increase/Decrease in Current Assets	(11,183)	(447)	(465)	(484)	(503)	(523)	(544)	(566)	(3,650)	(735)
Increase/Decrease in Current Liabilities	2,442	73	75	78	80	82	85	87	90	(9,062)
Payment of Tax	-	-	-	-	-	-	-	-	-	(9,155)
Net Cash Flow from Operating Activity	64,177	6,074	79,748	83,587	87,599	91,792	94,495	93,621	127,470	117,622
Cash Flow from Investing Activity	-									
Purchase of Fixed Assets	**(729,400)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
Increase/Decrease in Investment	-									
Less: Payment of Dividend	-									
Net Cash Flow from Investing Activity	(729,400)	-	-	-	-	-	-	-	-	-
Cash Flow from Financing Activity	**-**									
Increase in Share Capital	568,932	-	-	-	-	-	-	-	-	-
Increase in Borrowing Fund (Long Term Loan)	243,828									
Increase in Short Term Loan	**-**									

Cash Flow Statement for Initial 10 years of Operation

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Less: Repayment of Long Term Loan	(9,770)	(10,996)	(12,377)	(13,930)	(15,678)	(17,646)	(19,861)	(22,353)	(25,159)	(28,317)
Less: Payment of Interest on Short Term Loan										
Less: Payment of Interest on Long Term Loan	**(28,831)**	**(27,604)**	**(26,224)**	**(24,671)**	**(22,922)**	**(20,955)**	**(18,740)**	**(16,247)**	**(13,442)**	**(10,284)**
Net Cash Flow from Financing Activity	774,159	(38,601)	(38,601)	(38,601)	(38,601)	(38,601)	(38,601)	(38,601)	(38,601)	(38,601)
Increase/Decrease in Cash and Cash Equivalent	108,936	37,474	41,147	44,986	48,999	53,191	55,894	55,020	88,869	79,021
Cash & Bank Balance at the Beginning of the Period	**-**	**108,936**	**146,410**	**187,557**	**232,543**	**281,542**	**334,733**	**390,627**	**445,648**	**534,517**
Cash Balance At the End of the Period	**108,936**	**146,410**	**187,557**	**232,543**	**281,542**	**334,733**	**390,627**	**445,648**	**534,517**	**613,538**

PRE-FEASIBILITY STUDY OF

FISH AND LIVESTOCK FEED INDUSTRY IN MADHESH PROVINCE

EXECUTIVE SUMMARY

Commercialization of agriculture is one of the major priorities of the Agriculture Development Strategy (ADS). ADS has also provided the provinces with the ability to set plans and develop strategies as per the contextual suitability. This project is designed to be included in the Project Bank of Madhesh Province. As agriculture is a major source of GDP and occupies the majority of people in the Province, contribution of this project is expected to be highly significant for sustainable and eco-friendly development planning in the agriculture sector.

By establishing a single platform at the next Investment Summit, the Provincial 2 Planning Commission (PPC) hopes to attract investment in a variety of initiatives, including agricultural projects. Fish and livestock feed industry in Madhesh Province is one of the primary sites designated for investment. The research on the Fish and livestock feed industry in Madhesh Province is primarily intended to document the project's technical and financial feasibility. Both primary and secondary data gathering approaches were used in the study. Primary data was acquired from field-based research, which included a field visit and stakeholder consultations and group discussions. Secondary data was gathered from a variety of sources, including published papers, journal articles, and other verified and trustworthy online sources.

This project appears to be best suited for a Public Private Partnership (PPP) approach, in which GoN will assist in obtaining the necessary land for the project. The developer will then build all of the infrastructure required for the project's smooth execution and will run it for 30 years before handing it over to GoN in good working order.

The research examined the project's technical and financial elements and determined that it is technically and financially feasible, with a total anticipated cost of roughly 59,843,000 NPR (including interest component throughout the construction period) and an equity IRR of 31.16% percent.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SALIENT FEATURES OF THE PROJECT

Table 1: Salient features of the project

General information of the project		
1	Name of Project	Fish and Livestock Feed Industry in Madhesh Province
2	Project Location	Province: 2 Districts: In the middle of eight districts, Province 2
3	Project Implementation Modality	☐ Public ■ PPP ☐ Private ☐ Others/Please Specify
4	Category of Project	☐ Short term: 5 years and below ☐ Mid term: 6 – 10 years ■ Long term: 11 – 15 years
5	Sector as per 1st 5 years Provincial Plan	Agriculture and Livestock
6	Type of project (Sub Sector)	Agriculture - Manufacturing
7	Implementing/Facilitating Agencies	Private sector, facilitated by the Ministry of Land Management, Agriculture and Cooperatives, Madhesh Province and relevant Local Governments
8	Project Management (Implementation Mechanism)	• Promoting an improved practice involving a complete ration formula for province livestock and fisheries. • Land for industry area and other market/collection center (if need to lease/own) to be provided by the government where required. • Value chain integration.

Project specific information

1	Salient Features of Project	● Improvement of Livestock and commercial fish production. ● Decrease in imports of inputs. ● Sustainable industry with high earning potential. ● Adoption of improved technology for yield maximization.
2	Affected Population, Land Requirement, Acquisition & Resettlement, Materials and Ease of Access	
	Affected Population	Population of Madhesh Province, relevant farmers, benefited severe consumers of Nepal.
	Land Requirement	(variable) Estimated size: 1-2 Ha.
	Acquisition & Resettlement	No issue of resettlement
	Materials and Ease of Access	The project can be done in areas where there is availability of materials and ease of access. The geographical terrain is such that the places in the province are easily accessible.
	Environmental and Social Management Plan (ESMP)	Environmental implications of unsustainable practices need to be considered.
3	Project Document Available	■ None (New/Rehabilitation) ☐ Concept Note/Desk Study ☐ Feasibility Study ☐ Detailed Engineering/DPR
4	Estimated Cost to Complete the Project	NPR 59,843,000
5	Estimated time to Complete the Project	Feasibility/DPR: 3 months Approval and Financial closure: 9 months
6	Project Financing Options	Investment of the private sector; Government to support leasing of land, and create a favorable and encouraging environment.
7	Project Technology/Components	The project will include a number of technologies and components depending on its size. Typical technology and components will be considered.
8	Contribution to SDG and Green Growth	The following SDG is directly related to the project: Goal No. 2: Zero hunger Goal No. 8: Decent work and economic growth
9	Project Capacity (at 100%)	15,000 Tons
10	Project IRR	24.04%
11	Benefit Cost Ratio	2.84
12	Private Sector/Consumer Committee/Beneficiary Roles	● Supply chain research and management.
13	Government's Roles	● Awareness, training and education programs. ● Province Government will provide farmers with subsidies where suitable. ● Facilitation in procuring land lease for a viable proposal. ● Grant to be provided working together with the Local Government.

Other project information		
1	Target Beneficiaries	Farmers, consumers and stakeholders engaged in the value chain of agriculture and livestock.
2	Market of Project's Service/Product	Domestic as well as international markets.
3	Key risks and opportunities of Project Development & Operation	
	Strengths and Opportunities	• There is an opportunity to replace imports and create a strong and self-reliant economy.
	Risks and Issues	• Farmers continue to practice Ad-hoc rationing. • Lack of practical knowledge among farmers. • Marketing and scale difficulties. • Security issues.

1

BACKGROUND

1.1 Introduction

Agricultural shares are more than 35% and livestock sector alone contributes around 10% of the total Gross Domestic Product (GDP) of Nepal. Livestock rearing, management and processing of products are the major aspects of production of meat, milk and milk products. Forest and grazing lands provide more than 50% of fodder and forages to the livestock in Nepal.

Though Nepalese agriculture and livestock husbandry system is known to be focused on rural enterprise followed by small holding farmers, commercial agriculture farms and livestock husbandry practices are nowadays found to be practiced in peri-urban areas and villages with better market access. Dairy purpose cow farming and meat pig farming have increased in recent years. The majority of people still follow the traditional livestock farming system and feed in conventional ways. However in recent years, with availability of concentrated feeds and increased trend of commercial farming, use of improved feeds has been increasing over the years. Pork meat has a rich nutrient content with possibilities of development of various processed products. Poultry meat consumption is very intensive especially in urban areas. Also, meat and meat products are getting better market value in recent years.

The Agriculture Development Strategy (ADS) has provided the provinces with the ability to set, plan and develop strategies as per the contextual suitability. With the launching of the federal system in the country, Province Level Governments have encompassed a series of responsibilities of developing the long-term plans along with planning for short to long-term projects for execution of development programs. Hence, in recent years Province Governments are in the process of formulating policies, developing strategies and preparing the potential projects for short and long term development. This project is also designed to be included in the Project Bank of Madhesh Province. As agriculture including livestock is a major source of GDP and the occupation of the majority of people in the province, contribution of this project is expected to be highly significant for sustainable livestock development planning.

1.2 Objectives

Madhesh Province's Ministry of Land Management, Agriculture and Cooperative (MoLMAC) intends to develop projects of different sectors to be run in the Public Private Partnership (PPP) model. Out of them, this project is related to the establishment of a fish and livestock feed industry project.

Specific objectives of the project are to:

- Collection of raw materials (farm products) and other sources from all possible communities of Madhesh Province and Nepal.
- High quality nutrition rich feed production for fish (both sinker and floating type pellets).
- High quality nutrition rich feed production for livestock feeding (cattle, poultry and pig).
- Support farmers with feed quality check, testing and nutrition analysis of their livestock feed (local and fermented) and providing technologies for better production.
- To study the technical and financial viability of the project in the proposed location .

1.3 Scope of Work

The pre-feasibility study aims to develop and operationalize a livestock and fish feed industry project in Madhesh Province. The project has two major areas of operation:

1. Establishment of floating and sinking type fish feed plant.
2. Livestock feed (cattle, poultry and pig) production plant. Ultimately, study will help to get an overall idea of possibilities of investment in this specific sector and development in the province along with marking the technical and financial feasibility. Some of the major scope of the study are:
    - Improvement of production of livestock and fisheries.
    - Decrease in imports and increase in domestic production
    - Sustainable industry with high earning potential.
    - Adoption of improved technology for yield maximization.
    - Prepare the tentative structure design, the cost-revenue structure and financial viability of the proposed plant.
    - Develop the best suitable investment model i.e. Private or PPP or Blended Finance.

1.4 Project Relevance

Livestock sector development in Nepal has remained in the primary phase of enterprise development. The lower milk, milk products, and meat and processed meat products consumption rate in Nepal is mainly due to lack of awareness in nutritive value of milk, meat and refined/processed meats (controlled fats, skins and hard tissue free etc.), balanced diet consumption and reaching the nutrition requirement through consumption of varied food items. In recent years, increased private sector's effort has encouraged commercial livestock farms and fresh and packed chilled meats along with milk and milk products are reaching local and domestic distant consumers.

Also, livestock and fisheries have been a key priority for the Province Governments and are actively involved in documenting the policies and plans. There is significant room for livestock system expansion, which might boost rural incomes and provide a multiplier effect for the growth of other sectors, in addition to reducing poverty. Public investment in productivity enhancing agricultural R&D has been declining in most of the world. Private investments and capability continue to grow in most of the developing nations in recent years. These trends open up the need and opportunities for joint effort for increased livestock and fish productivity and value chain through establishment of large-scale feed units. Like other provinces, Madhesh Province has a competitive edge in livestock and feed output due to its location, water resources, and abundant labor supply. In this context, this project would be a pilot approach to establish a large-scale livestock and fish feed production center in the PPP model and can open the door for further expansion in different places with varied components.

2

APPROACH AND METHODOLOGY

This pre-feasibility study has been prepared by a technical team of Invest and Infra Pvt. Ltd. with the holistic analysis of provincial agricultural production system, market demand and prospective of business expansion. The feedback received during consultation with province-level ministries and related stakeholders were also considered for determination of project features/components. The required data, information and facts for fulfilling the objectives of the study have been gathered from both secondary and primary sources.

Primary Data and Information

The primary data were gathered from the field survey. Stakeholders' consultation and group discussions were conducted with producers, marketers, entrepreneurs and the government authorities (Provincial Ministries, Rural/Municipalities, etc.) of Madhesh Province.

Secondary Data and Information

Secondary data and information on Nepalese agriculture/ livestock production and marketing systems have been collected by reviewing the relevant literature, documents and previous study reports at the central, regional and district levels. The published data of MoAD on the area and production were referred to for the trend analysis and the province-wide production status assessment. The key aspects considered during this pre-feasibility study include:

- Identification of production volume and commodity specific value chain status and market need
- SWOT and market sector analysis for long term viability of operation
- Financial and cost estimation for the proposed project

During preparation of the Detailed Project Report (DPR), following additional aspects will be considered and analyzed:

- Level of production, yield and growth rate analysis
- Livestock and fish production system distribution, growth rate and projection of catchment areas (backyard linkage) and possible markets (forward linkage)
- Market prospects, marketing strategies, operation plan and sustainability vision
- Competitor analysis, project expansion and foreign trade prospective
- Quality maintenance strategies

2.1 Overview on Agriculture System in Madhesh Province for Components Identification

Madhesh Province is located in the southeastern region of Nepal and is the smallest province in terms of area. The province lies entirely within the plain region (Terai). Parsa to Saptari districts of Madhesh Province are taken as a pocket area of agriculture. 20.40% of Nepal's total population lives in this province. Major profession of the major population is agriculture.

Complete ration has various benefits to attain production targets, a risk free option. Nepal's annual feed production stands at nearly 600,000 tonnes with 20 pellet feed mills in a combined capacity of around 2700 TPD. Province 2 has three feed mills of 900 TPD of capacity. These are basically dedicated for poultry feed but none for the fisheries. The domestic output falling short of supply out of abundance of fisheries resources and relatively high consumption of fish indicates the level of productivity seems far below the carrying capacity of the ponds. Underlying one of the reasons for this is the Lack of quality feed. Livestock based commodities - dairy, meat and eggs are the most important livestock products enhancing food security and are also the major source of nutrition requirements.

The policy recommendation priorities as: achieving the constitutional targets of food sovereignty and food and nutritional security; increase production of fish for export specially to Kathmandu valley; special package of support for development of commercial farms of agriculture and livestock; livestock Innovation Project and upcoming Agriculture Food Security Project and provide synergies with prioritized program of Provincial Government.

The province is very important from the perspectives of agriculture, industry, and tourism with the least possibility of hydro-electricity development. Major cereal crops grown are paddy, maize, wheat, millet, barley and buckwheat, cash crops are potato, sugarcane, jute, and major pulses are lentil, chick pea, pigeon pea, black gram, grass gram, horse gram, soybean and others (table 2).

Presence of higher productive areas with irrigation and other facilities encourages the commercial feed production in this province due to easy availability of raw materials. Also, districts with similar kinds of climatic conditions provide a favorable environment for business expansion covering entire districts.

Figure 1: Project area (Madhesh Province Districts)

Table 2: Glance of the general status of Madhesh Province

S.No.	Particulars	State
1	Cultivated land out of cultivable land	90%
2	Population	20.4% of Nation's (second highest among Provinces)
3	Forest covered areas	27.29%
4	Food grains production	19,86,300 Mt.
5	Population density	559/sq. km.

Source: Province Profile, 2077

Major livestock species reared in Nepal are cattle, buffalo, pig, poultry and goat/sheep. Some of the databases are presented hereunder:

Table 3: Major livestock number by provinces and Nepal (2075/2076)

Province	Cattle	Buffaloes	Pigs
1	1,955,096	861,251	660,038
2	**1,111,055**	**794,555**	**104,816**
Bagmati	1,045,119	891,707	120,194
Gandaki	551,162	699,095	193,482
Lumbini	1,141,280	1,191,317	321,620
Karnali	550,981	344,482	49,750
Sudurpaschim	1,030,344	526,257	38,437
NEPAL	7,385,035	5,308,664	1,488 ,338

Source: MOALD, 2077

The Provinces that include Terai districts are more rich in four legged livestock species. Poultries are distributed over inner terai to foothill areas of various Provinces and more in Bagmati Province and Gandaki followed by other provinces. Hence the proposed integrated type of livestock industry will have a good market within the country.

Terai regions are highly suitable for fish farming due to availability of adequate underground water resources

Table 4: Water surface areas and production status of fish in provinces

Province	Pond's No.	Water Surface Area (Ha.)	Total Fish Production (Kg.)	Yield Kg./Ha.
1	9,499	1,819	8,538	4,693
2	**18,212**	**7,345**	**37,619**	**5,122**
Bagmati	4,194	687	3,190	4,640
Gandaki	2,153	313	1,261	4,030
Lumbini	11,251	2,865	14,446	5,043
Karnali	345	33	74	2,274
Sudurpaschim	2,715	414	1,778	4,300
Nepal	48,369	13,476	66,906	4,965

Source: MOALD, 2077

and optimum water temperature for normal temperature water fish species. Water surface area, total production and productivity is higher in Madhesh Province followed by other Provinces. Instead, various private sectors have practiced rearing the cold water fishes in hill districts commercially. Hence Fish feed can be successfully produced and marketed over the entire parts of the country.

Table 5: Major livestock/fish feed producing companies of Nepal

Producer	Province
Probiotech Industries	Madhesh
0m Chao Biro Feed Industries	Madhesh
Nepal Wellhope Agritech	Bagmati
Budhanilkantha Feed Industries	Bagmati
Triveni Feed Industries	Madhesh
Daaunne Feed Industries	Lumbini
Pancharatna Feed Industries	Bagmati
Sagar Feed Industries	Province 1
Siddhartha Feed Industries	Bagmati
Quality Feed Industries	Bagmati
Fine Feed Industries	Bagmati

Source: Sharma et. Al. 2012. Feed milling capacity boosted in Nepal

3

PROJECT DETAILS

3.1 Project Background and Description

With the view of commercialization of the agriculture and livestock sector, province has approached to develop various kinds of projects that support the growth of the sector through improvement in different stages of the value chain. In this instance a project with public and private partnership based management can result in maximization of the products and transfer of technology to rest of the areas where there is a lack of projects/ programs. With this target, the proposed project is focused in Province 2 and aims to establish an integrated feed company which will produce the quality products with certification and packaging/branding. The major products will be Livestock (cattle, poultry and pig) feed and fish feed.

3.2 Project Features/Components

Madhesh Province districts are highly productive zones for grains and pulse crops like soybeans which are the key ingredients for the livestock and fish feed industry. Fish productivity is higher in all districts within this province. Out of 8 districts within Madhesh Province, Dhanusha (Dhalkebar) is the main hub for agricultural production and marketing.

The proposed project location would be placed in an appropriate location to where the raw materials supply would be well accessible (both from national sources and import) and from where dispatch will be easy and well accessible. A manufacturing unit will be set up with PPP to materialize it as well as bridge the gap of livestock and fish feed supply in the entire nation. Expansion of the unit area will be considered as per stock and feeding trials. The proposed project features would be as Fig 2.

The use of integrated mechanized plants has been proposed for this purpose. The plant has the capacity to process livestock, poultry and fish feed. Considering the availability of raw materials and other infrastructure, Parsa District is assumed to be an appropriate location to establish the industry.

The major operations involved in the production of animal feed are: raw materials preparation, primary crushing, assorting and measuring, molasses mixing, fine crushing, pellet making, and packaging. Raw and auxiliary materials are first charged into silos and tanks where they are made ready for further processing. They are then processed by a primary crusher. Crushed materials are further separated by means of a sifter, and then stored in the assorting tanks according to the kind of raw materials. In the assorting and measuring operation, small amounts of additives are charged into the bins containing different assortments of raw materials. The raw materials stored in the assorting tanks are used in accordance with the desired proportion.

Fig 2: Major features of the project

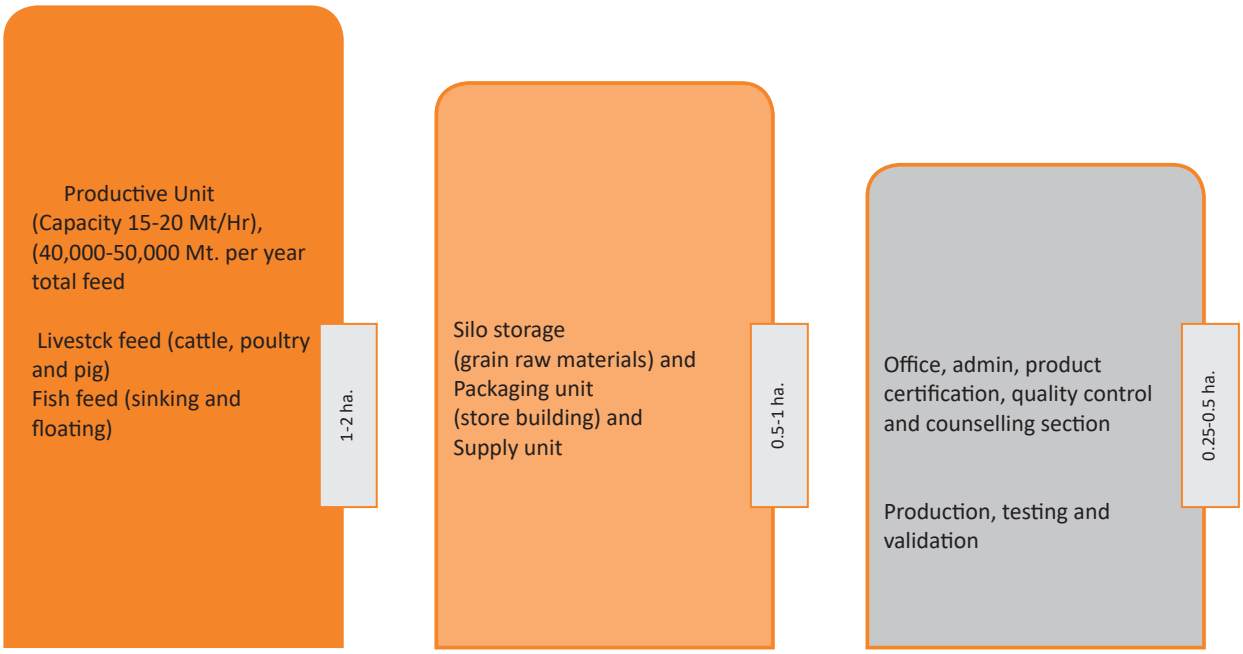
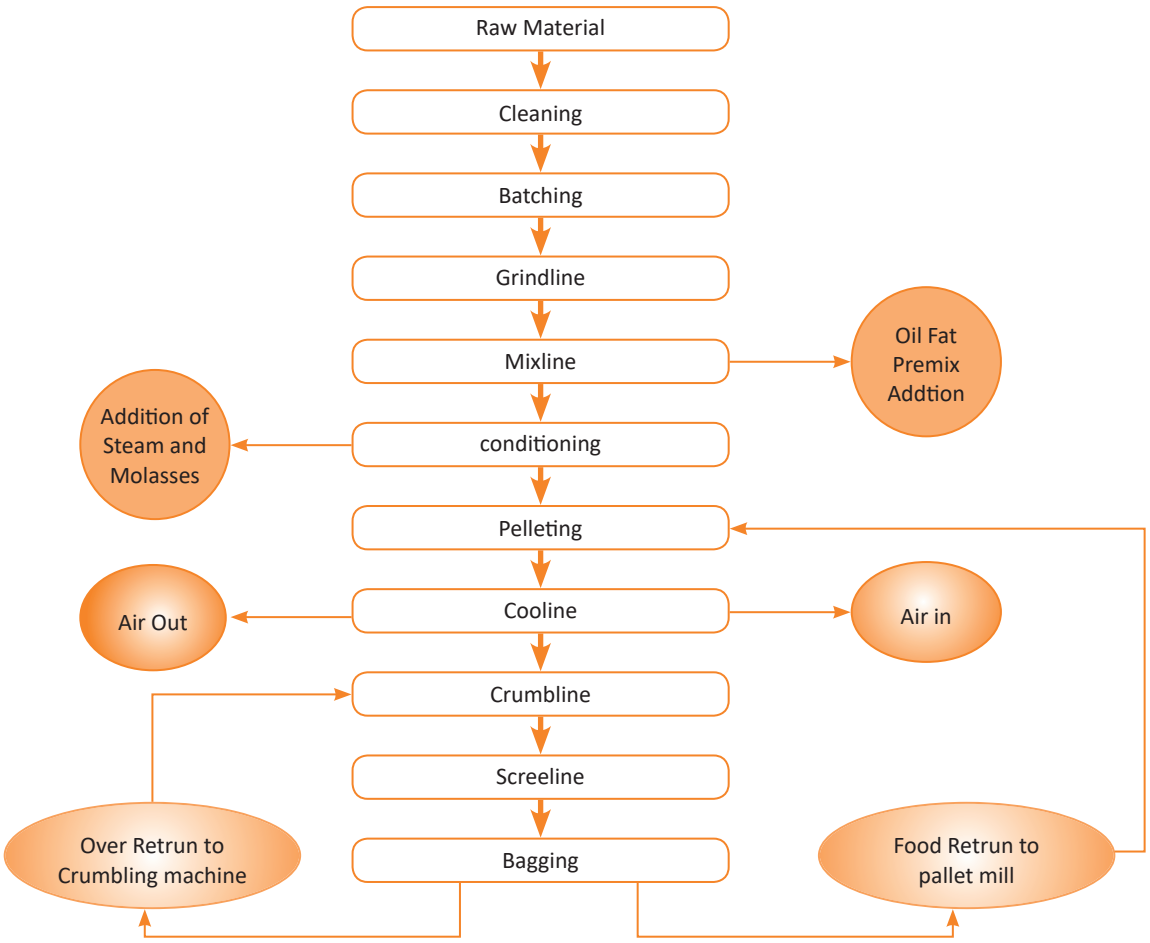


Fig 3: Production flow chart



3.2.1 Major Products and Production Unit

3.2.1.1 Livestock Feed

The concentrated livestock feeds are mixed types and provide the appropriate nutrition requirement with a defined volume of ingestion. Livestock feeds are a balanced source of essential nutrients required for body maintenance, growth and milk production. It is manufactured using good quality grains, oil cakes/meals, brans, molasses, common salt, minerals and vitamins. The fortification of minerals and vitamins differ with:

- Supplementing target (e.g. milk inducing (cattle), attaining body weight (pig, male buffalo fattening) and growth in poultry

Concentrated feeds are comparatively cheaper and highly palatable to the animals. The major nutritional contents that are obtained from mixed ingredients are as below:

CP: Crude Protein
DCP: Digestible Crude Protein
TDN: Total Digestible Nutrients
DE: Digestible Energy
ME: Metabolizable Energy

Cattle feed contains protein, energy, minerals and vitamins required for the growth, maintenance and milk production of animals. It is advantageous to feed extra cattle to pregnant animals for proper development of the foetus. It increases reproductive efficiency, milk production as well as fat content of milk.

Pigs in different growth stages have different requests for nutrition. In this case, the crushing of raw materials will be calculated as per the need. The final pig feed pellets work well in pig growth. Hence the proportion of mixing and fortification of additional nutrition might be changed in pig feed pellets.

Poultry feeds are produced in different forms. The major process of production should mix and proportionate the following major ingredients:

- Grains and seeds
- Milling by-products
- Molasses
- Roots and tubers

Different forms of poultry feed produced by the industry are:

- Mash: Mash refers to nutritionally complete poultry feed in a ground form.
- Pellets: Pellets consist of a mash that has been pelletized; that is, compressed and molded into pellets in a pellet mill.
- Crumbles: Crumbles are pellets that have been broken into granules. This is often used for chick feed.
- Scratch: Scratch grain (or scratch feed) consists of one or more varieties of whole, cracked, or rolled grains.

3.2.1.2 Fish Feed

The industry will produce both kinds of fish feeds: Floating fish feed and sinking fish feed. Floating fish feed production will follow the given steps:

Material crushing → Material mixing → Extruding process → Pellets drying → Oil spraying process → Pellets cooling → Pellet packing.

Sinking fish feed pellets will be made with Fish feed extruder, which is the main manufacturing equipment for extruding and sinking fish feed. Feed ingredients such as starch and ground raw materials are mixed with a certain amount of water and steam thoroughly sent to the extruder. When the raw materials of high temperature and under high pressure are extruded from the die mold, the pressure is decreased instantaneously and under the influence of pressure difference, the moisture content in raw materials is vaporized rapidly to make raw materials inflate. At the same time, the fish feeds are cut into suitable sizes by the knife of the fish feed extruder.

3.2.1.3 Management of Raw Materials

Major raw materials required for the manufacture of all feeds are: oil cake, grain of cereals, molasses, maize, soybean, salt, limestone (ground), other grains (wheat, barley, etc.), meal (bone or flesh or blood). The feed consists of three major groups of substances: carbohydrates, oils and proteins together with smaller amounts of minerals and vitamins.

Sourcing raw material relies heavily on raw materials such as grains and protein meals from imports or from domestic sources (as available). Maize and other grains would be collected from local sources (country's farmers) to the extent possible. Buy back agreement, input support for production etc. approaches will be followed by the project unit.

Maize & wheat are the major raw materials for the production of animal feed. Limestone, another raw material required for production of animal feed, is readily available in local domains. Import of other raw materials from India would be easy as the project site has close proximity to the Indian border.

3.2.2 Seed Storage, Certification and Marketing Unit

The following are the major plant and machinery required for the project:

S.N.	Description	Quantity
1	Silos for raw and auxiliary materials storage	5
2	Metal screen and shaker	1
3	Hammer mill	2
4	Blender	1
5	Weighing scale(5 Tons)	4
6	Bagging machine	1
7	Dust collector	2
8	Product tank	2
9	Pellet producing machine	1
10	Tanks for oil cakes and molasses	2
11	Boiler	1
12	Fish feed extruder	1
13	Mixer	1
14	Carrying vehicles	5

Machinery of the plant is equally applicable for livestock feed, fish feed and poultry feed where batching differs on purpose. The estimated total feed production will be around 40000-50000 Mt/year. Of which, the proportion of livestock and fish feed would be estimated based on the market demand. For efficiency of production, one type of feed will be produced in a significant amount before initiating for another kind of feed (changes in ingredients and proportion of mixing).

3.3 Developing a Business Case

Product Mix

The industry will primarily focus on producing livestock feed, fish feed in a solid state. Secondly, there will be activities like producing small ruminant high protein concentrate ready to mix in a local ingredient, if preference surges up along with packaging and supply to the input market centers.

Quality Assurance of the Products and Other Services

The project unit will be operated and managed by a unit which is planned to be developed with Public and Private Partnership.

Public

Provincial Agriculture Ministry, Municipality and (other possible)

Private

Private investor, wholesalers, commercial farmers and other members.

In order to maintain the product quality and sustainability of project operation, government units will be regularly monitoring the product quality and handling & processing standards. Subsidies for production increment, linkage establishment and international market assurance are expected to be facilitated by government bodies. The role of private sectors will be to make attempts for regularization of operation in full capacity with extended linkage networks.

Good manufacturing practice should be adopted by the producers and processors to meet the product quality of international standards. There will be proper adoption of newly introduced technologies, skills and inputs for the overall improvement of the end products. There will be one unit within the project area for certification, validation and quality check and recommendations/ guidelines preparation for use of each product.

3.4 Market Assessment

Dhalkebar is the major market center of Madhesh Province, where different commodities are introduced from connecting districts and outflow. Also, major hubs for importing goods (agricultural and non agricultural) i.e. Birgunj is situated in the south western side of Madhesh Province.

In order to make in and outflow of the plant regular, projects will have their own supply units in different accessible areas. There might be a completely new structure or refinement/restructuring of the existing agriculture market/collection center (based on the need and consent of the Local Authority/Province Government.

Existing market networks and trade flow status of the various products indicate that the future potential market of fresh, stored, and processed products is incredible within this province and already there is huge prospect to supply to major national market hubs being located at the central point with accessible road networks to those areas. Proposed project's operation strategy will be to make strong connections with the major market hubs of vegetable, fruits, pulses and fish around the country and Kathmandu. For transportation, own vehicles can be utilized with available GoN's subsidies in fuel and vehicle related taxes.

3.5 SWOT Analysis

This SWOT analysis is made for the Public Private Partnership (PPP) model. During the DPR, the SWOT analysis for additional options of the operation model will also be explored and presented.

SWOT Analysis for Fish and Livestock Feed Industry in Madhesh Province

Strength	Weakness
• Increasing commercialized concept among livestock farmers and stakeholders • Well accessed domain connected with potential markets (e.g. Kathmandu) and other urban/peri-urban areas • Increased awareness of farmers on quality feed for higher outcomes. • Effective monitoring and quality control system (PPP) • Dedicated single player for fish feed	• Unavailability of raw materials in appropriate quantity in right time • Livestock feeding system and established connection with local industries • Time management challenges • Techno economical size matters in operations • Competition in subsector
Opportunities	**Threats**
• Interest of respective stakeholders • Increased Involvement in commercial livestock and fish farming, development of distant marketing and information system • Surrounding infrastructures being improved • Potential of expansion of project covering various products with international market demand • Increased interest of investor in livestock and fisheries sector	• High cost of production leading to higher price than imported commodities • Low economic status of Nepalese buyers for quality stored and processed products • Quality vs Consumers' awareness • Imported products available in cheaper price

4

FINANCIAL ANALYSIS

4.1 Pre-Feasibility Approaches & Assumptions

Project Cost

Total cost of the project amounted to NPR 5,74,31,000 excluding interest during construction. The total cost including interest amounted to NPR 5,98,43,000. Costs are assumed to occur evenly in the construction period.

Particulars	Amount in NPR
Infrastructure	62,50,000
Others	64,38,000
Building and Civil Work	148,75,000
Plant and Machinery	29,869,000
Interest During Construction	24,12,000
Total Project Cost	**59,843,000**

The portion of the interest during construction is capitalized in the individual assets on a proportionate basis.

Capital Structure

The project is proposed to be financed in a 70:30 debt equity ratio on the total cost of the project including Interest during construction (IDC). The requirement of working capital would be financed by internal resources itself. Based on the structure, the total investment pattern has been tabulated below:

Component	Percentage	Amount in NPR
Equity	30.00%	17,953,000
Debt	70.00%	41,890,000
	Total	**59,843,000**

Collection Efficiency

Based on the various studies conducted by international agencies and prevailing market tendency, fish and livestock has been assumed as follows-

From	To	Efficiency
0 year	1 year	0%
2 years	9 years	30%
10 years	14 years	40%
15 years	24 years	50%
25 years	31 years	60%

Project Construction and Operation Period

The project is assumed to be built in the period of 1 year and the total operation period after the construction period would be 30 years. The project would be handed over to the government after the completion of the operation period.

Tax, Staff Bonus, and Depreciation Assumptions

The tax rate for the project is assumed at 20% on profit earned during the year. Further the loss carryforward has been taken for 12 years in due consonance with the provisions of Income Tax Act 2058. Further, the staff bonus is assumed at 10% on taxable income earned during any year of the operation as required by the Bonus Act.

Also, the rate depreciation and basis of depreciation is in due adherence to the provisions of the Income Tax Act as follows:

Particulars	Depreciation Method	Rate of Depreciation
Infrastructure	SLM	3.33%
Building and Civil Works	WDV	5%
Plant & Machinery	WDV	15%
Others	SLM	20%

However, 1/3 of the additional depreciation has not been taken into consideration as facilitated by the Income Tax Act.

Other Assumptions

Besides salary cost and overhead cost, the total operating expense is likely to incur at the rate of 10% of total project cost which is likely to increase at the inflation of 3% with the cap of 200%. As discussed in the earlier paragraph, the project would be financed by 70% debt. The interest rate that has been taken into calculation is 12% which would be repaid in four equal installments in the period of 12 years.

Also, the revenue has been estimated to be inflated at the rate of 2% per annum which is capped at 180%. The income tax rate for the project is 20% and the loss carry forward period for the project is 12 years. Further, the project is expected to give the additional income of 3% of the total direct revenue.

It is assumed that the government would provide required land for the project. Total operation period of the project is assumed to be 30 years and 1 year is considered as the pre-operative period.

Working Capital and Other Assumptions used

It has been assumed that the overall working capital requirement would be financed by the equity holders. The working capital has been assumed on the following basis.

Receivable & Advance	60 Days
Payable and Liabilities	45 Days

4.2 Financial Analysis

4.2.1 Financial Results

The project cost for the Fish and Livestock Feed Industry has been taken from a desk study report prepared by IBN. It is assumed that all the costs presented are in line with the current cost structure. It is also assumed that the project development cost was prepared based on the district rates and prevailing market rates.

The total cost of the project is 59,843,000 NPR of Which 2,412,000 NPR is interest component during construction. The total project excluding working capital has been financed by 70% debt and the remaining by equity.

In analysis of the pre-feasibility of the project, projections were made using different techniques. Based on the analysis, project Net Present Value (NPV) was calculated to 109,373.68NPR. Also, the project IRR is calculated to be 24.04% which exceeds the required rate of return of the project. Equity IRR of the Project is computed at 31.32%. Project IRR & Equity IRR substantiate the feasibility of the project. Project Benefit Cost Ratio (BCR) is 2.84 times whereas Equity BCR is 7.09 times.

The Project Payback Period & Discounted Payback Period are 6.30 years and 8.25 years respectively. Considering the specific nature of business and overall industry, the pay-back period seems to be satisfactory.

The average DSCR is computed at 2.24 times. Although DSCR is low in initial years, It has gradually increased.

Indicators	Results
Firm IRR	24.04%
Equity IRR	31.32%
NPV- Equity	109,373.68
Debt Equity Service Ratio (average)	2.24 Times
Project BCR	2.84
Equity BCR	7.09
Simple Payback Period	6.30 years
Discounted Payback Period	8.25 years

4.2.2 Sensitivity Analysis

Sensitivity Analysis has been carried out on three different components: Interest Rate, O & M Cost and Project Cost.

Interest Rate Increase/Decrease by 5%

Percentage of change Project Cost	Impact on Project IRR	% of Change
0.00%	31.32%	-
5.00%	30.87%	-1.45%
-5.00%	31.77%	1.43%

O & M Increase/Decrease by 5%

O & M Cost	Impact on Project IRR	% of Change
0.00%	31.32%	-
5.00%	31.32%	0%
-5.00%	31.32%	0%

Project Cost Increase/Decrease by 5%

Project Cost	Impact on Project IRR	% of Change
0.00%	31.32%	-
5.00%	30.66%	-2.10%
-5.00%	31.96%	2.02%

Based on the analysis, It seems that the project cost is highly sensitive as compared with O & M Expenses and Interest Rates. The special focus on project cost ensures the cost remains as projected.

The financial statement of the first 10 years of operation has been separately annexed in the report.

5

PRELIMINARY ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

5.1 Socio Economic Aspects

This project can be reflected in-terms of multi-dimensional positive changes to producers, traders, consumers and other people who are directly or indirectly related to agro based industries. Producers, traders, consumers, and anyone who are directly or indirectly involved in the sector will see multi-dimensional positive improvements as a result of the initiative.

The proposed project's poverty-reduction effects are envisaged to originate from three sources:

(i) Job creation,
(ii) Social mobilization and grouping of smallholder farmers, and
(iii) Increased income options in a more dynamic rural economy. Increased and variety of employment possibilities, both on-farm and in the post production system, will be used to reduce poverty through job creation. Increased demand for agricultural goods will result in more job possibilities for the poor.

5.2 Environmental Impact Assessment

Animal feeding operations produce several types of air emissions, including gaseous and particulate substances, and Concentrated Animal Feeding Operations (CAFOs) produce even more emissions due to their size. The primary cause of gaseous emissions is the decomposition of animal manure, while particulate substances are caused by the movement of animals. It is expected that there might be the requirements of initial Environmental Information (EI), which will be arranged and managed by a public authority (Province Government).

According to the planned project's environmental study, some negative consequences may be caused. However, as the project is aiming at using more organic inputs avoiding hazardous chemicals and controlled use minimizing the risk to consumers and environment the mitigation measures would be comfortably applied. The dry storage units with limited use of ammonium gas as mentioned in international standards is an environmentally friendly industry which does not produce hazardous industrial pollutants nor creates any noise pollution. Thus the industry does not have significant negative environmental effects in the industry area. Hence, the production of animal feed may cause air and water pollution but this may be reduced up to a great extent by following the recommended measures.

6

PRELIMINARY RISK ANALYSIS

The key challenges to the functional unit will be to encourage high technology-based production, processing, storage and market linkage network development of associated products.

Table 6: Possible risk factors and mitigation measures

S.No.	Possible Risk/Issues	Mitigating strategies
1	Produced/stored/supplied below than the capacity and price of products	Strategies to produce early and late (by a few months) than the peak production season from every possible production sites and crop rotation
2	Electricity (power cut), transportation facilities and fuel crisis	Power backup (15 KVA generator), fuel efficient transportation vehicles, timely maintenance and subsidy arrangement.
3	Storage and supply volume	Storage is at full capacity even by importing commodities, fine processing and demand oriented mass scale processing and packing.
4	Sudden loss in crop productivity, pest/disease abundance etc.	Interlinkage with price determination unit.
5	Farmers continue to follow traditional farming practices/ad-hoc rationing	Awareness, field based observation and guiding, TOT, Monitoring and result demonstration
6	Security issues	Additional arrangement and reporting system

7

PROJECT STRUCTURE AND IMPLEMENTATION MODEL

Public Private Partnerships (PPP)

A Public Private Partnership (PPP) is an agreement between public and private entities for a certain length of time in which private businesses agree to take on the risk of all or part of the funding, construction, operation, repair, and maintenance of projects under the PPP model. Such an entity may generate a fair profit by providing public services directly or indirectly through the building, operation, repair, and maintenance of public or private assets. Through legislative, legal, institutional, and economic arrangements, public institutions must establish an environment that encourages private sector investment[1].

It will be suitable to develop a project using the PPP model, which involves both public and private entities. When national treasury resources are insufficient, assets of public utility and less expensive operation of public services, as well as resources, skills, and technology accessible in the private sector, must be drawn to nation-building projects based on the PPP idea.

The PPP model is appropriate in the current environment of Madhesh Province and its neighboring districts. According to the preliminary research done in these towns, the Local Government would give land for the fish and livestock feed industry in Madhesh Province.

1 World Bank, 2072, Public-Private Partnership Policy

8

FINDINGS AND RECOMMENDATIONS

8.1 Findings

The following are some of the study's significant findings:

1. The fish and livestock feed industry in Madhesh Province project will provide
2. According to the study, Madhesh Province is an attractive place for the fish and livestock feed industry because of its climate, proximity to the border, accessibility, and other factors.
3. The project's business model was determined to be a Public Private Partnership.
4. With a total cost of NPR 59,843,000 (including interest component throughout the construction period) and an equity IRR of 31.32%%, the project may be completed.
5. Payback period has been determined as 6.30 years.

8.2 Recommendations

The project appears to be technically and financially viable for a developer to invest, based on the findings. In the following step, however, environmental and social aspects, as well as a thorough examination of all other components, must be addressed.

Disclaimer

This project profile is based on preliminary study to facilitate prospective developers to assess possible scope. It is, however, advisable to get a detailed feasibility study prepared before taking a final investment decision.

9

ANNEX

Financial Report

Projected Profit and Loss Statement for Initial 10 years

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Sales	90,000	91,800	93,636	95,509	97,419	99,367	101,355	103,382	140,599	143,411
Total Direct Income	**90,000**	**91,800**	**93,636**	**95,509**	**97,419**	**99,367**	**101,355**	**103,382**	**140,599**	**143,411**
Less: Direct Expenses	-									
Cost of Sales	59,100	60,873	62,699	64,580	66,518	68,513	70,569	72,686	74,866	77,112
Total Direct Expenses	**59,100**	**60,873**	**62,699**	**64,580**	**66,518**	**68,513**	**70,569**	**72,686**	**74,866**	**77,112**
Gross Profit	30,900	30,927	30,937	30,928	30,901	30,854	30,786	30,696	65,733	66,299
Add: Other Income	2,700	2,754	2,809	2,865	2,923	2,981	3,041	3,101	4,218	4,302
Profit before overhead and interest	**33,600**	**33,681**	**33,746**	**33,794**	**33,824**	**33,835**	**33,827**	**33,797**	**69,951**	**70,601**
Operating Expenses	-									
Depreciation	10,114	8,131	6,635	5,506	4,652	2,663	2,172	1,797	1,510	1,290
Salary Expenses	15,714	16,186	16,671	17,171	17,686	18,217	18,764	19,327	23,224	23,921
O & M Expenses	6,164	6,349	6,539	6,735	6,937	7,146	7,360	7,581	7,808	8,042
0perating Profit	**1,607**	**3,016**	**3,900**	**4,381**	**4,548**	**5,809**	**5,531**	**5,093**	**37,408**	**37,384**
Interest Expenses	4,953	4,742	4,505	4,239	3,938	3,600	3,220	2,791	2,309	1,767
Profit	**(3,346)**	**(1,727)**	**(605)**	**143**	**610**	**2,209**	**2,312**	**2,302**	**35,099**	**35,581**
Provision for Staff Bonus	-	-	-	13	55	201	210	209	3,191	3,235
Income Tax	-	-	–	–	-	–	-	242	6,382	6,469
Net profit	**(3,346)**	**(1,727)**	**(605)**	**130**	**554**	**2,008**	**2,102**	**1,851**	**25,527**	**25,877**

Projected Balance Sheet for Initial 10 years

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Sources of Fund	-									
Shareholders Fund	-									
Share Capital	17,953	17,953	17,953	17,953	17,953	17,953	17,953	17,953	17,953	17,953
Reserve and Surplus	**(3,346)**	**(5,073)**	**(5,678)**	**(5,548)**	**(4,994)**	**(2,985)**	**(884)**	**967**	**26,494**	**52,371**
Loan Fund	-									
Term Loan	40,212	38,323	36,196	33,803	31,110	28,078	24,666	20,825	16,503	11,638
Short Term Loan	-									
Total	**54,819**	**51,203**	**48,472**	**46,208**	**44,069**	**43,046**	**41,735**	**39,745**	**60,950**	**81,962**
Fixed Assets (Net)	49,729	41,598	34,964	29,458	24,806	22,143	19,971	18,175	16,664	15,375
Investment	-									
Current Assets	5,860	10,398	14,326	17,592	20,130	21,796	22,684	22,519	45,216	67,593
Sundry Debtors	5,600	5,613	5,624	5,632	5,637	5,639	5,638	5,633	11,658	11,767
Inventory			-		-					
Cash & Bank Balance	261	4,785	8,701	11,960	14,493	16,157	17,046	16,886	33,603	55,826
Less: Current Liabilities	**770**	**794**	**817**	**842**	**867**	**893**	**920**	**948**	**976**	**1,005**
Net Current Assets	5090	9,605	13,508	16,750	19,263	20,903	21,764	21,571	44,285	66,588
Total	**67,310**	**72,793**	**77,940**	**82,235**	**85,196**	**87,530**	**88,022**	**85,730**	**152,448**	**218,153**

Cash Flow Statement for Initial 10 years of Operation

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Cash flow from operating activity										
Net profit before interest and tax	(3,346)	(1,727)	(605)	130	554	2,008	2,102	2,093	31,908	32,347
Add: Depreciation	10,114	8,131	6,635	5,506	4,652	2,663	2,172	1,797	1,510	1,290
Add: interest	4,953	4,742	4,505	4,239	3,938	3,600	3,220	2,791	2,309	1,767
Operating cash flow before working capital change	11,722	11,146	10,535	9,874	9,144	8,271	7,493	6,681	35,728	35,403
Increase/Decrease in Current Assets	(5,600)	(13)	(11)	(8)	(5)	(2)	1	5	(6,026)	(108)
Increase/Decrease in Current Liabilities	770	23	24	25	25	26	27	(93)	(3,042)	(15)
Payment of Tax	-	-	-	-	-	-	-	(121)	(3,312)	(6,425)
Net Cash flow from operating activity	6,892	11,156	10,548	9,890	9,164	8,296	7,521	6,472	23,349	28,855
Cash flow from Investing Activity	-									
Purchase of Fixed Assets	59,843)	-	-	-	-	-	-	-	-	-
Increase/Decrease in Investment	-									
Less: Payment of Dividend	-									
Net Cash flow from Investing Activity	59,843)	-	-	-	-	-	-	-	-	
Cash flow from Financing Activity	-									
Increase in Share Capital	17,953	-	-	-	-	-	-	-	-	-
Increase in Borrowing Fund (Long Term Loan)	41,890									
Increase in short Term Loan	-									
Less: Repayment of Long Term Loan	(1,679)	(1,889)	(2,126)	(2,393)	(2,694)	(3,032)	(3,412)	(3,840)	(4,322)	(4,865)

Amount in NPR '000

Particulars	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years
Less: Payment of Interest on Long Term Loan	(4,953)	(4,742)	(4,505)	(4,239)	(3,938)	(3,600)	(3,220)	(2,791)	(2,309)	(1,767)
Net Cash flow from Financing Activity	53,212	(6,632)	(6,632)	(6,632)	(6,632)	(6,632)	(6,632)	(6,632)	(6,632)	(6,632)
Increase/Decrease in Cash and Cash Equivalent	261	4,524	3,916	3,259	2,533	1,664	889	(160)	16,717	22,223
Cash & Bank Balance at the beginning of the period	-	261	4,785	8,701	11,960	14,493	16,157	17,046	16,886	32760
Cash Balance At the End of the Period	261	4,785	8,701	11,960	14,493	16,157	17,046	16,886	33,603	55,826

PRE-FEASIBILITY STUDY OF

BIO-FERTILIZER AND ORGANIC FERTILIZER INDUSTRY IN MADHESH PROVINCE

EXECUTIVE SUMMARY

Commercialization of agriculture is one of the major priorities of the Agriculture Development Strategy (ADS). ADS also has provisioned the provinces to set plans and develop strategies as per the contextual suitability. This project is designed to be included in the Project Bank of Madhesh Province. As agriculture is a major source of GDP and occupies the majority of people in the Province, contribution of this project is expected to be highly significant for sustainable and eco- friendly development planning in the agriculture sector.

By establishing a single platform at the next Investment Summit, the Provincial 2 Planning Commission (PPC) hopes to attract investment in a variety of initiatives, including agricultural projects. Bio-fertilizer and Organic Fertilizer Industry in Madhesh Province is one of the primary sites designated for investment. The research on the bio-fertilizer and organic fertilizer industry in Madhesh Province is primarily intended to document the project's technical and financial feasibility. Both primary and secondary data gathering approaches were used in the study. Primary data was acquired from field-based research, which included a field visit and stakeholder consultations and group discussions. Secondary data was gathered from a variety of sources, including published papers, journal articles, and other verified and trustworthy online sources.

This project appears to be best suited for a Public Private Partnership (PPP) approach, in which GoN will assist in obtaining the necessary land for the project. The developer will then build all of the infrastructure required for the project's smooth execution and will run it for agreed years before handing it over to GoN in good working order.

The research examined the project's technical and financial elements and determined that it is technically and financially feasible, with a total anticipated cost of roughly NPR.6,37,58,000.00 (including interest component throughout the construction period) and an equity IRR of 26.73 percent.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SALIENT FEATURES OF THE PROJECT

Table 1: Salient features of the project

General information of the project		
1	Name of Project	Bio-Fertilizer and Organic Fertilizer Industry in Madhesh Province
2	Project Location	Province: 2 (Anywhere in accessible domain) All eight districts are covered for raw material collection.
3	Project Implementation Modality	☐ Public ■ PPP ☐ Private ☐ Others / Please Specify
4	Category of Project	☐ Short term: 5 years and below ☐ Mid term: 6 – 10 years ■ Long term: 11 – 15 years
5	Sector as per 1st 5 years Provincial Plan	Agriculture
6	Type of project (Sub Sector)	Agriculture - Organic and Commercial
7	Implementing/Facilitating Agencies	Private sector, facilitated by the Ministry of Land Management, Agriculture and Cooperatives, Madhesh Province and relevant Local Governments
8	Project Management (Implementation Mechanism)	• Promoting an improved practice involving use of bio-fertilizers along with fertilizers. • Land lease to be provided by the government where required • Value chain integration.

Project specific information

1	Salient Features of Project	● Improvement of crop production. ● Decrease in imports of inputs ● Sustainable industry with high earning potential ● Adoption of improved technology for yield maximization
2	Affected Population, Land Requirement, Acquisition & Resettlement, Materials and Ease of Access	
	Affected Population	Population of Madhesh Province, relevant farmers of entire nation, benefited severe consumers of Nepal
	Land Requirement	N/A (variable) Estimated size: 1-2 Ha.
	Acquisition & Resettlement	No issue of resettlement
	Materials and Ease of Access	The project can be done in areas where there is availability of materials and ease of access. The geographical terrain is such that the places in the province are easily accessible
	Environmental and Social Management Plan (ESMP)	Environmental implications of unsustainable practices need to be considered
3	Project Document Available	■ None (New/Rehabilitation) ☐ Concept Note/Desk Study ☐ Feasibility Study ☐ Detailed Engineering/DPR
4	Estimated Cost to Complete the Project	NPR 6,37,58,000.00 (6.37 core)
5	Estimated Time to Complete the Project	Feasibility/DPR: 3 months Approval and Financial closure: 9 months
6	Project Financing Options	Investment of the private sector; Government to support leasing of land, and create a favorable and encouraging environment for farmers involved in fruits and vegetables farming to scale up and carry out activities at a commercial level
7	Project Technology/Components	The project will include a number of technologies and components depending on its size. Typical technology and components will be considered.
8	Contribution to SDG and Green Growth	The following SDG is directly related to the project: Goal No. 2: Zero hunger Goal No. 8: Decent work and economic growth
9	Project Capacity (at 100%)	4000 MT
10	Project IRR	17.32%
11	Benefit Cost Ratio	1.21
12	Private Sector/Consumer Committee/ Beneficiary Roles	Supply chain research and management
13	Government's Roles	● Awareness, training and education programs ● Province Government will provide farmers with subsidies where suitable ● Facilitation in procuring land lease for a viable proposal ● Grant to be provided working together with the Local Government

Other project information		
1	Target Beneficiaries	Farmers, consumers and stakeholders engaged in the value chain of agriculture and livestock
2	Market of Project's Service/Product	Domestic as well as international markets
3	Key risks and opportunities of Project Development & Operation	
	Strengths and opportunities	• There is an opportunity to replace imports and create a strong and self-reliant economy
	Risks and Issues	• Farmers continue to practice full chemical fertilizer • Lack of practical knowledge among farmers • Marketing and scale difficulties • Security issues

1

BACKGROUND

1.1 Introduction

Nepal being an agrarian country contributing more than 35% of national GDP, the associated positive and negative impacts should be well analyzed during commercial development of the sector. The major environmental impacts associated with the agriculture system is use of agro chemicals and emission due to nutrient rich fertilizers. The provinces are more aware of the development of a sustainable plan for all sectors after the introduction of the new constitution and restructuring 7 provinces. For agriculture development, all provinces have particular strengths and bear potential of producing diverse agricultural/livestock products.

The Commercial Agriculture Development Vision intends to support inclusive, competitive and sustainable agricultural growth within the target area to increase income of the rural poor households' through market-driven productivity improvements intervention to contribute to overall agriculture-led economic growth.

Bio-fertilizer contains living microorganisms which, when applied to seeds, plant surfaces, or soil, colonize the rhizosphere or the interior of the plant and promote growth by increasing the supply or availability of primary nutrients to the host plant. Bio-fertilizers add nutrients through the natural processes of nitrogen fixation, solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances. Increased usage of organic fertilizers has become the sole option for farmers to meet plant nutrient demands and maintain soil fertility due to the inability to get appropriate amounts of chemical fertilizers in a timely manner and the resultant increase in the price of chemical fertilizers. In a nation like Nepal, where transportation is difficult and chemical fertilizer supply is totally reliant on imports, the manufacturing and use of organic fertilizer at the local level is critical for sustainable agricultural practices.

Commercialization of agriculture is one of the major priorities of the Agriculture Development Strategy (ADS). ADS also has provisioned the Provinces to set plans and develop strategies as per the contextual suitability. This project is designed to be included in the Project Bank of Madhesh Province. As agriculture is a major source of GDP and occupies the majority of people in the province, contribution of this project is expected to be highly significant for sustainable and eco-friendly development planning in the agriculture sector.

1.2 Organic Fertilizer Industry in Nepal

Increased usage of organic fertilizers has become the sole option for farmers to meet plant nutrient demands and maintain soil fertility due to the inability to get appropriate quantities of chemical fertilizers in a timely manner and the resultant rise in the price of chemical

fertilizers. For nations like Nepal, where transportation is difficult and chemical fertilizer supply is fully reliant on imports, organic fertilizer manufacturing and use at the local level is critical for following sustainable agricultural practices. Farmers, on the other hand, do not follow the scientific approach of composting. Most farmers refer to collecting trash and putting it in a pit as composting. Because the manure is not turned over, nutrients are lost via leaching and runoff. Sharma, 1983, as reported by Khadka and Chanda 1987, calculated that compost piles lose 50 percent nitrogen and 90 percent potash during the wet season.

Various causes have harmed soil health, including indiscriminate use of chemical fertilizers/pesticides, frequent cultivation of crops that need more nutrients, lack of crop rotation, and low/unmanaged usage of Farm Yard Manure (FYM). The improper/unmanaged usage of FYM results in nutritional loss. As a result, MoAD has created a program to encourage organic fertilizer usage in order to decrease losses, reduce the risk factor of soil health degradation, and boost soil environment. Vermiculture technology, cattle shed renovation program, organic fertilizer production plant setup program, and price subsidy in organic fertilizer buying programs are among the different organic practices that have been adopted in the nation. In Nepal, there is no chemical fertilizer facility, and the current total demand for urea, DAP, and MoP is 785,000 tons per year, resulting in a significant demand and supply mismatch. This explains MoAD's strong desire to promote organic fertilizers (MoAD, 2015/16).

Agriculture contributes the majority of Nepal's GDP, and fertilisers play a critical role. In Nepal, the average yearly fertiliser needed to replace soil nutrition is 310 kg per hectare, yet only 29 kilogram of fertiliser is applied[1]. During the early monsoon, 50% of nutrient loss from the soil occurs. Fertilizer usage is very recent in Nepal. Chemical fertilizers were not utilized in Nepal until the 1950s, and all fertilizers were organic and made locally. Both organic and chemical fertilizers are now employed.

Locally, organic fertilisers are made by recycling agricultural and animal waste. Compost and farm yard manure are the typical sources of fertilizer on steep farms. The usage of organic fertilizer is encouraged by the government. It has made it a policy to encourage the use of organic fertilizers. Farmers who purchase organic fertilisers get a subsidy from the Ministry of Agriculture of NPR 10 per kg or 50% of the sales price, whichever is lower[2]. Similarly, the organic fertilizer manufacturing facility is subsidized by supplying half of the cost.

There are 25 organic fertiliser production centers with a combined yearly capacity of 100,600 MT (2015 AD)[3].

1.3 Rationale of the Project

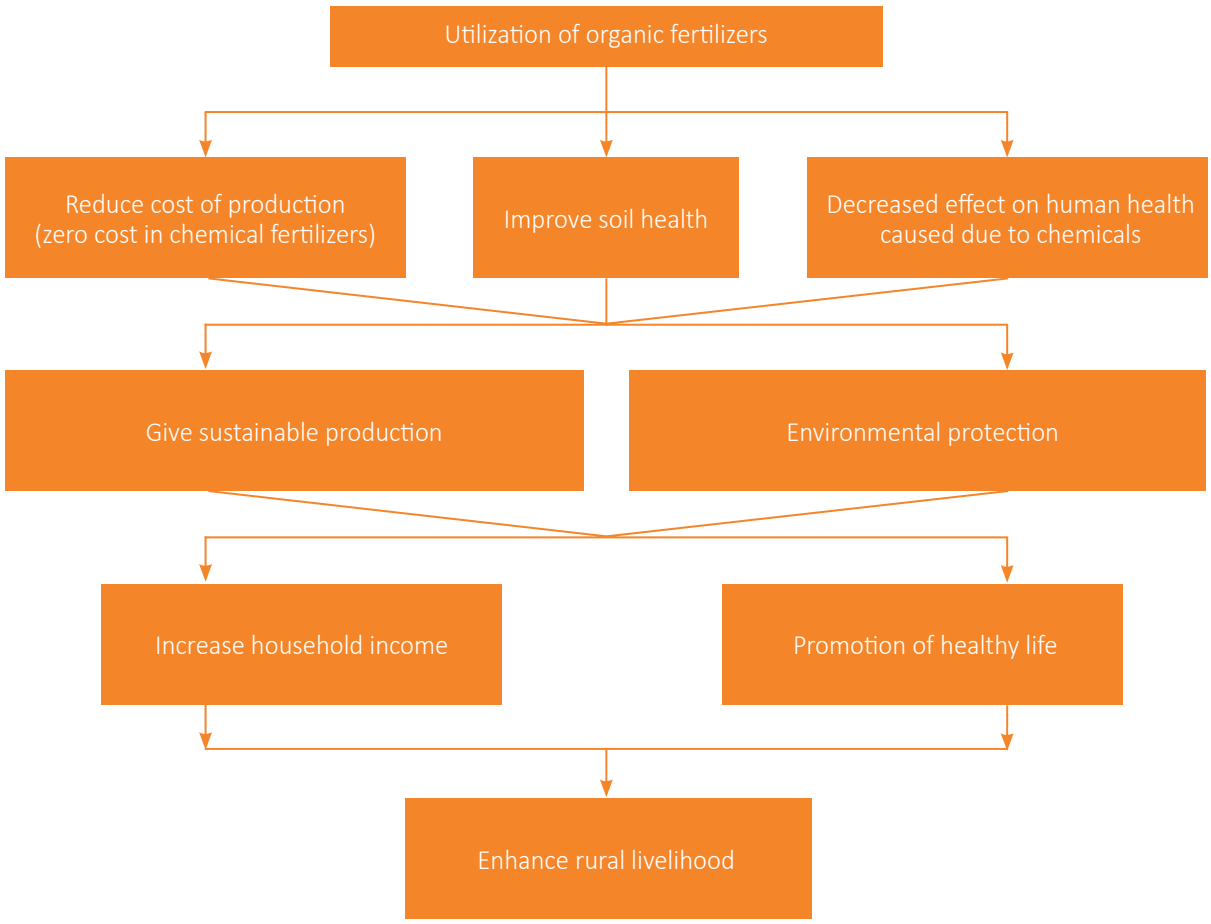
There are several negative impacts on environment, soil health and food quality due to indiscriminate use of chemical fertilizers/pesticides, frequent cultivation of crops that require more nutrients, lack of crop rotation, and low/unmanaged usage of Farm Yard Manure (FYM). The improper/unmanaged usage of FYM results in nutritional loss. So, in order to limit losses and reduce the danger of soil health degradation while also promoting soil environment, the MoAD has created a program encouraging the use of organic fertilizers. Vermiculture technology, cattle shed renovation program, organic fertilizer production plant setup program, and price subsidy in organic fertilizer buying programs are among the different organic practices that have been adopted in the nation.

An organic fertilizer production line can not only meet the needs of local fertilizer, but also meet the needs of the surrounding market. Biological organic fertilizer is widely used in fields such as farmland, fruit trees, flowers, landscaping, high grade lawn, soil improvement and so on, which have a good effect. Our country subsidizes agriculture, and it is very supportive of the industry, so investing in these industries is a good choice.

Domestic production and marketing of organic fertilizers minimizes reliance on foreign fertilizers while also lowering chemical fertilizer costs. Organic manure usage lowers environmental pollution caused by chemical fertilizer use and aids in the creation of healthy soil and environment, which leads to long-term crop

1 Journal of Agriculture and Environment- https://doi.org/10.3126%2Faej.v9i0.2115
2 Journal of Agriculture and Environment-https://en.wikipedia.org/wiki/Fertiliser_use_in_Nepal#cite_note-amgai01-6
3 International organic fertiliser in Nepali market. (2015, August 8). The Himalayan Times. https://en.wikipedia.org/wiki/Fertiliser_use_in_Nepal#cite_note-tht15-7

Figure 1: Significance of organic fertilizer use for sustainable development



production, boosting household income and reducing rural poverty.

Other rationale of the project are:

- Reduce agricultural fossil fuel usage, which will ultimately result in increased soil fertility.
- As organic fertilizers play a significant role in building and maintaining the production capacity of soil indefinitely, they help to build and preserve it.
- As the organic fertilizers sector is focused on physical labor by men, it creates employment on farms while also improving the economic, health, and living standards of all those involved.
- This initiative may help to combat global warming by reducing carbon usage, stabilizing the soil, and reducing the greenhouse effect and negative environmental impact.
- Organic fertilizer usage may assist to safeguard water quality, while synthetic fertilizer and pesticide use affect water flowing through the top soil and into the groundwater.
- Local organic fertilizers are less expensive than synthetic fertilizers.

1.4 Objectives

Madhesh Province's Ministry of Land Management, Agriculture and Cooperative (MoLMAC) is intending to develop projects of different sectors to be run in Public Private Partnership (PPP) model. Out of them, this project is related to establishment of a bio-fertilizer and organic fertilizer industry project.

Specific objectives of the project are to:

- Establish and operationalize the bio-fertilizer and organic fertilizer industry in the accessible domain of Madhesh Province.
- Promote nutrient rich safe fertilizer production and promotion of use at farmers' fields for safe

agriculture production and consumer welfare.
- Farm level extension and promotion programs.
- Stimulate financial assistance to investors in setting up units.
- Direct production in public sector and cooperative organizations.
- Support farmers with quality check, product marketing and technologies for better production.
- To study the technical and financial viability of the project in the proposed location.

1.5 Scope of Work

The pre-feasibility study aims to develop and operationalize bio-fertilizer and organic fertilizer industry projects in Madhesh Province. The project has two major areas of operation:

1. Establishment production unit and
2. Value chain improvement and integration of bio-fertilizer and organic fertilizers. Ultimately, study will help to get an overall idea of possibilities of investment in this specific sector and development in the Province along with marking the technical and financial feasibility. Some of the major scope of the study are:
   - Improvement of production of crops.
   - Contribute to Environment friendly production system and consumers' health
   - Decrease in imports and increase in domestic production.
   - Sustainable industry with high earning potential.
   - Adoption of improved technology for yield maximization.
   - Prepare the tentative structure design, the cost - revenue structure and financial viability of the proposed plant
   - Develop the best suitable investment model i.e. Private or PPP or Blended Finance.

1.6 Approach & Methodology

This pre-feasibility study has been prepared by a technical team of Invest and Infra Pvt. Ltd. with the holistic analysis of provincial agricultural production system, market demand and prospective of business expansion. The feedback received during consultation with province level ministries and related stakeholders were also considered for determination of project features/components. The required data, information and facts for fulfilling the objectives of the study have been gathered from both secondary and primary sources.

Primary Data and Information

The primary data were gathered from the field survey. Stakeholders' consultation and group discussions conducted with producers, marketers, entrepreneurs and the government authorities (Provincial Ministries, Rural/Municipalities, etc.) of Madhesh Province.

Secondary Data and Information

Secondary data and information on Nepalese agriculture production and marketing systems along with assessment of input use have been collected by reviewing the relevant literature, documents and previous study reports at the central, regional and district levels. The published data of MOAD on the area and production were referred for the trend analysis and the province wise production status assessment. The key aspects considered during this pre-feasibility study include:

1. Identification of production volume, fertilizer use trend, bio/organic fertilizer use value chain status and future need assessment.
2. SWOT and market sector analysis for long term viability of operation.
3. Financial and cost estimation for the proposed project.

During preparation of the Detailed Project Report (DPR), following additional aspects will be considered and analyzed:

1. Level of production, yield and growth rate analysis.
2. Population distribution, growth rate and projection of catchment areas for input use assessment.
3. Market prospects, marketing strategies, operation plan and sustainability vision.
4. Competitor analysis, project expansion and foreign trade prospective.
5. Quality maintenance strategies.

2

PROJECT DETAILS

2.1 Project Background and Description

Agriculture commercialization has been presented as a viable strategy for economic growth and poverty reduction. The key focus of the existing plans are to ensure sustainability of agriculture production with balanced use of inputs and technology. Environment sustainability is also an important part for the development of a sustainable system contributing to eco-friendly approaches. In this instance a project with public and private partnership based management, can result in maximization of the products and transfer of technology to rest of the areas where there is a lack of projects/ programs. With this target, the proposed project is focused in Madhesh Province. The project has the main target to produce, certify and supply the biological fertilizers along with nutrient rich compost fertilizers.

A manufacturing unit within the accessible center of the province will be set up with PPP to materialize it as well as bridge the gap of supply of bio fertilizer and organic fertilizer in the province and the entire nation. Expansion of unit area will be considered as per stock grows and market demand/need in the future. The major microbes used at initial stage as bio-fertilizer will be:

1. Nitrogen Fixing Bacteria
2. Plant Growth Promoting Rhizobacteria (PGPR)
3. Bio-fertilizers available in 2 forms (Solid and Liquid).
4. Addition of Effective Micro-organism (EM unit) and expansion of additives as per the need assessment at farm research.

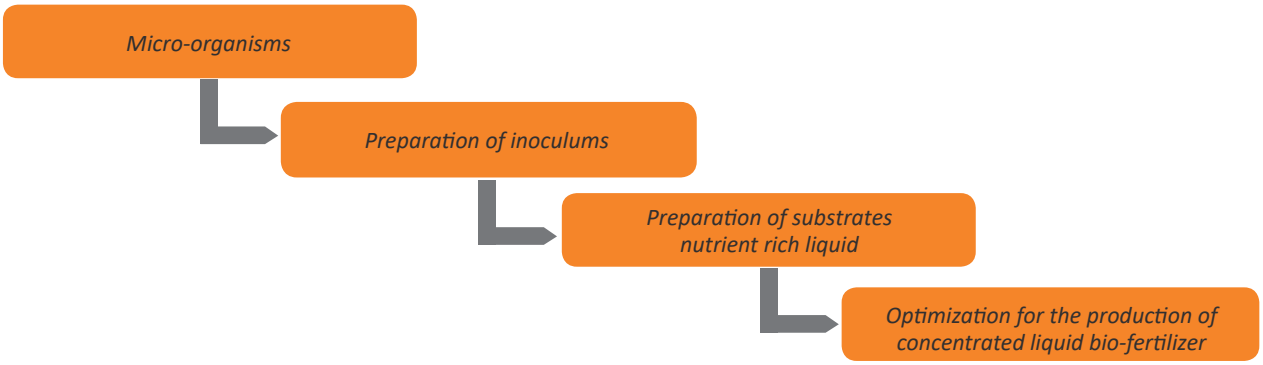
2.2 Project Features

2.2.1 Fertilizer Production Unit

There will be a complete set of equipment for the production line of biological organic fertilizer. A rapid fermentation, drying, granulation, and mixing of animal waste and various waste residue agricultural, food, kitchen, and other materials. This is complete equipment from raw material collection to finished product packaging. One of the ways to increase the number of selected micro-organisms is by using the concept of an Effective Micro-organism (EM). Nutrient availability and efficacy of most organic fertilizers are enriched with this process and desired attributes and organisms are inoculated in the process.

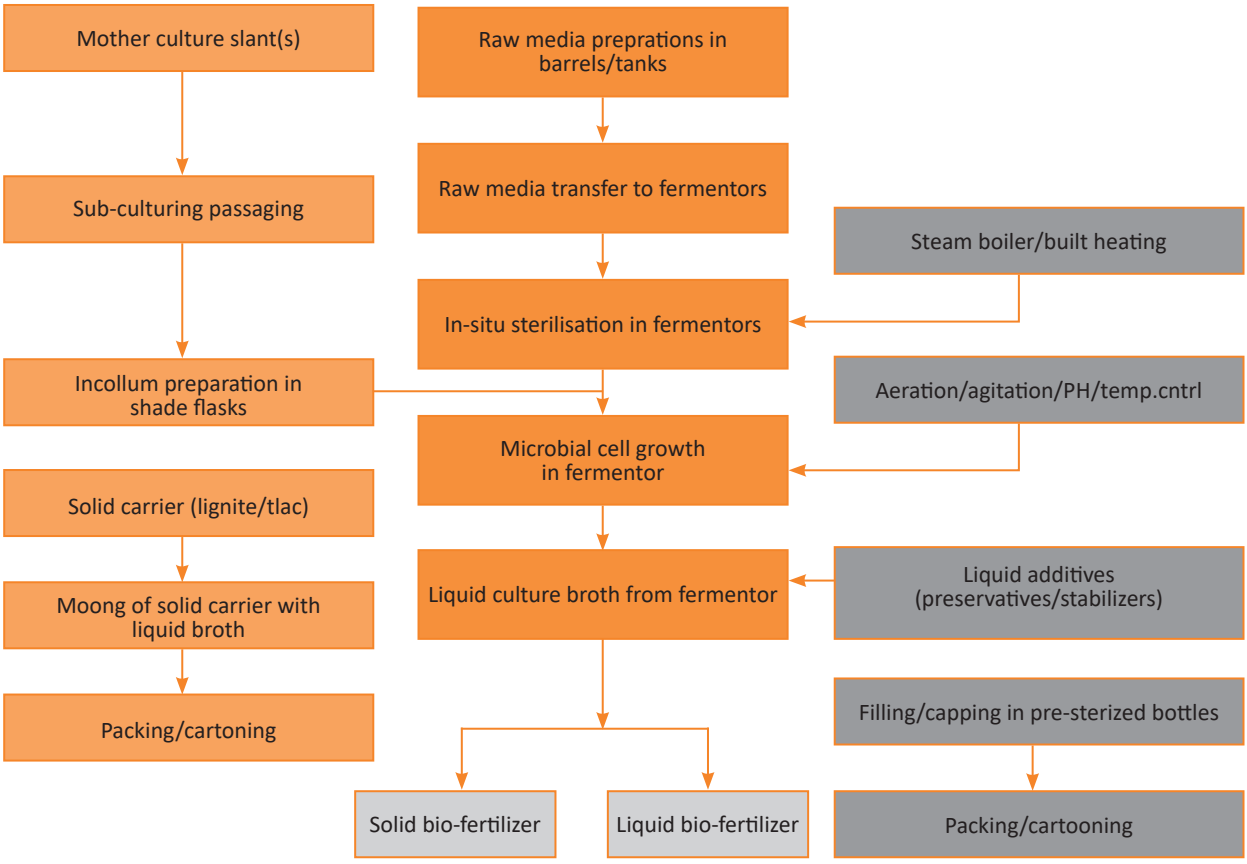
Preparation of bacterial inoculants is supported by implementation of a new process based on the application of supercritical fluid properties which has been tested to encapsulate virus formulations. The process of inoculation in bio fertilizer is shown below:

Figure 2: Process of micro-organisms inoculation in biological fertilizer



The initial stage of the production line of bio fertilizer is organic matter fermentation. Bio-fertilizers are also similar with advanced composting techniques apart from inoculating the micro-organisms. The proposed plant will basically inoculate the traditionally used bio-fertilizers such as: Rhizobium, Azotobacter, Azospirillum and Blue Green Algae (BGA). Rhizobium inoculant is used for leguminous crops such as pulses. Azotobacter can be used with crops like wheat, maize, mustard, cotton, potato and other vegetable crops. Expected production of bio-fertilizer will be around 50,000 metric ton per year. Bio Fertilizer manufacturing process is given fig 3.

Figure 3: Bio-fertilizer manufacturing process



2.2.2 Large Scale Composting Plant

The second major product of the plant will be large scale composting as organic fertilizer. Composting is a biological process in which degradable organic waste is converted into a humus-like material by micro organisms, mostly fungus and bacteria. This completed product, which resembles dirt, is high in carbon and nitrogen, making it an ideal growth substrate for plants. The composting plant estimated for the project will be of capacity of around 50,000 TPY and uses forced aeration technology. Together with the collection of basic sources for composting (forest wastes, animal manures etc.) the biological waste from major cities of Karnali Province will be collected by the project unit. For this the waste material type separating beans will be purchased and supplied to the municipality. The project unit will utilize the existing manpower for collecting and paying their labor charges and will be collected to the manufacturing unit.

The average collection of biological waste is expected to be 80 to 100 ton per day. For animal manure, agreements with commercial and local farmers will be made and collected daily or weekly or monthly depending upon the collection volume.

2.2.3 Sourcing Raw Materials

Since, the process of making bio fertilizer is using organic matter, the raw materials will be sourced from farmers, municipality wastes, natural resources within the entire areas of Karnali Province (along with possibility of expansion to other zones in the future). Slurry discharged from biogas plants, natural Amino, Humic and Seaweed extract are readily available raw materials. The major raw materials and their annual estimation is provided in table 2.

Table 2: Key raw materials and expected sourcing quantity per annum

Major Commodities to be Sourced	Quantities to be Sourced [MT] (per annum)
Animal manure (poultry, pig, cattle, and other ruminants)	70000 MT
Amino, humic, fulvic and sea weed	10000 MT
Bio inoculants (multi flora)	5000 Kg
Bio-degradable solid wastes	30000 Mt

Plant and Machinery

Apart from the large scale automatic composting unit, the required plant and machineries are given hereunder table 3.

Table 3: Plant and machineries for the bio/ organic fertilizer plant

Machinery	Units
Fertilizer Pilot Granulator Machine 3mm 10-20 Ton/Hr	1
Fertilizer Pilot Granulator Machine 2mm 5-10 Ton/Hr	1
fertilizer Shaper Machine	1
Fertilizer Ribbon Blender Mixer Machine	1
Fertilizer High-Speed Crusher Machine	1
Fertilizer Rotary Screener Machine	4
Fertilizer Conveyor Belt	1
Fertilizer Hopper 200kg	1
Fertilizer Weight Machine	1
Fertilizer Bag Closer Machine	1
Fertilizer Box Packing Machine	1
Fertilizer Dewatering Machine	1
QC and Testing Equipment	1
Power Generator Set 15KVA	1
Control Panel	1

Waste composting is a valuable fertilizer for plants. Bio-degradable yard trash (kept separate from municipal garbage) is permitted to break down or decompose in a medium. The result is a high-quality, nutrient-rich, and environmentally friendly manure that enhances soil conditions and fertility. The fertilizer processing will be carried out with aforesaid machinery, however in addition, a high capacity automatic composting unit will be installed.

2.3 Overview of the Area

The area of Terai region is 34019 Sq. k.m. which is 23% of the total area of the country which includes 20 districts. Madhesh Province includes 8 core terai districts-Parsa, Bara, Rautahat, Sarlahi, Dhanusha, Siraha, Mahottari, and Saptari of about 9661 sq km. Though being the smallest Province of Nepal, Madhesh Province in the agriculture sector is higher in terms of quantity and yield. Livestock,

Figure 4: Project area (Madhesh Province Districts)

fish, summer vegetables and grain legumes are major potential products grown in the Province.

Madhesh Province is in the south eastern region of Nepal and is the smallest province in terms of area. The province lies entirely within the plain region (Terai). The southern side has an international border with the Indian state. This province bears the great potentiality of agricultural production and as a well accessed hub for producing and supplying the agricultural inputs. Project area (8 districts) of Madhesh Province is given in the figure 4.

The province is very important from the perspectives of agriculture, industry, and tourism with the least possibility of hydro-electricity development. Major cereal crops grown are paddy, maize, wheat, millet, barley and buckwheat, cash crops are potato, sugarcane, jute, and major pulses are lentil, chick pea, pigeon pea, black gram, grass gram, horse gram, soyabean and others.

Presence of higher productive areas with existence of established farms, the access to raw materials for organic/ bio-fertilizer industry is well built up in the domain. Also, districts with similar kinds of climatic conditions provide a favorable environment for business expansion covering entire districts and accumulating natural raw materials like forest waste products.

In major cities of Nepal, managing growing volumes of solid waste has become a big concern. Solid waste may be a beneficial resource when used properly, but if it is not adequately managed, it can have major negative consequences for environment, public health, and societal sustainability. The project aims to handle the

Table 4: Glance of the general status of Madhesh Province

	Particulars	State
1	Cultivated land out of Cultivable land	90%
2	Population	20.4% of Nation's (second highest among provinces)
3	Forest covered areas	27.29%
4	Food grains production	19,86,300 Mt.
5	Population density	559/sq. km.

Source: Province Profile, 2077

bio-degradable waste management of the major cities within Madhesh Province and collect and bring them to the project unit to manufacture the compost fertilizer (organic fertilizer). Also there will be additional sources such as: Dry leaves and green leaves, vegetable wastes, animal fresh/dried manure and other possible bio-degradable substances.

In Nepal, there is no chemical fertilizer facility, and the current total demand for urea, DAP, and MoP is 785,000 tons per year, resulting in a significant demand and supply mismatch. This explains MoAD's strong desire to promote organic fertilizers (MoAD, 2015/16).

Table 5: National annual sales of chemical fertilizer

Quantity in Metric Tonnes

Type	2072/73	2073/74	2074/75	2075/76
Urea	213063	205425	235304	215733
DAP	107121	114802	105619	120893
Potash	7336	7991	7811	7377

Source: MOALD, 2077

By now, only the consumption of chemical fertilizers are documented and there is no authentic record of total use of bio fertilizers. As the chemical inputs are taken as key raw materials/source materials for agricultural production. Adoption of bio-fertilizers and organic fertilizers in commercial scale is still on demand to be followed on. The chemical fertilizer consumption in the province is given in the table -6.

As there is huge potential and several spaces to develop bio/organic fertilizers, this project has an opportunity to strengthen the organic agriculture system in Nepal in PPP model with valid and certified organic product development in the country with international standards.

2.4 Developing a Business Case

Product Mix

The industry will primarily focus on producing biofertilizer in a solid state. Secondly there will be activities like to produce liquid spray if preference surges up along with packaging and supply to the input market centers. Also, there will be compost fertilizers with high carbon, nitrogen contents and adequate organic matters.

Quality Assurance of the Products and Other Services

The project unit will be operated and managed by a unit which is planned to be developed with Public and Private Partnership.

Public

Provincial Agriculture Ministry, Municipality and (other possible)

Private

Private investor, wholesalers, commercial farmers and other members.

Table 6: Chemical fertilizers consumption by districts of Madhesh Province (2075/2076)

Unit: Metric Tonnes

Districts	Urea	DAP	Potash	Total
Siraha	8,433.85	5,496.55	194.00	14,1 2 4.40
Saptari	8,110.40	5,364.10	391.85	13,8 6 6.35
Dhanusha	6,939.10	5,615.33	137.85	12,6 9 2.28
Mahottari	6,123.65	4,816.13	153.55	11,09 3.33
Sarlahi	6,216.30	4,884.45	373.50	11,47 4.25
Rautahat	8,449.55	5,410.80	253.10	14,11 3.45
Bara	8,240.95	6,400.90	240.30	14,882.15
Parsa	15,004.75	7,278.83	188.05	22,471.63
Total	**67,518.55**	**45,267.08**	**1,932.20**	**114,717.83**

Source: MOALD, 2077

In order to maintain the product quality and sustainability of project operation, government units will be regularly monitoring the product quality and handling and processing standards. Subsidies for production increment, linkage establishment and international market assurance are expected to be facilitated by government bodies. The role of private sectors will be to make an attempt for regularization of operation in full capacity with extended linkage networks.

2.5 Market Assessment

Increased usage of organic fertilizers has become the sole option for farmers to meet plant nutrient demands and maintain soil fertility due to the inability to get appropriate amounts of chemical fertilizers in a timely manner and the resultant increase in the price of chemical fertilizers. Domestic production and marketing of organic fertilizers minimizes reliance on foreign fertilizers while also lowering chemical fertilizer costs.

In order to make in and outflow of the plant regular, projects will have their own supply units in different accessible areas. These might be completely a new structure or refinement/restructuring of the existing agriculture market/collection center (based on the need and consent of the Local Authority/Province Government.

Existing market networks and trade flow status of the various products indicate that the future potential market of organic products is incredible within this province and already there is huge prospect to supply to major national market hubs being located at the central point with accessible road networks to those areas. Proposed project's operation strategy will be to make strong connections with the major market hubs (commercial and local farms) of the country. For the transportation, own vehicles can be utilized with available GoN's subsidies in fuel and vehicle related taxes.

2.6 SWOT Analysis

SWOT analysis allows for the discovery of elements that characterize a company or organization in the context of a certain goal, as well as the classification of those characteristics into four areas. As seen in the table, two of them are positive, while the other two are negative:

SWOT Analysis for Bio-fertilizer and Organic Fertilizer Industry in Madhesh Province

Strength	Weakness	Opportunities	Threats
• Increasing awareness for quality and safe inputs in farm production • Well accessed domain connected with potential markets (e.g. Kathmandu) and other urban/peri-urban areas • Increased awareness of people on quality food consumption • Effective monitoring and quality control system (PPP) • Integrated large scale farming might have lower chance of failure in business	• Slow effect/impact of organic fertilizers in crop production as compared to chemical inputs • Difficulties in getting raw materials, biological flora • Challenge of adoption of organic farming • Time management challenges	• Interest of respective stakeholders • Increased Involvement in commercial organic farming, development of distant marketing and information system • Surrounding infrastructures being improved • Potential of expansion of project covering various products with international market demand • Increased interest of farmers and commercial producers in Organic Agriculture Sector	• High cost of production leading to higher price than imported commodities • Low economic status of Nepalese farmers for quality agriculture inputs • Quality vs Consumers' awareness

3

FINANCIAL ANALYSIS

3.1 Pre-Feasibility Approaches & Assumptions

Project Cost

Total cost of the project amounted to NPR 6,11,88,000 excluding interest during construction. The total cost including interest amounted to NPR 6,37,58,000. Costs are assumed to occur evenly in the construction period.

Estimation of Project Cost

Component	Percentage	Amount in NPR '000
Plant and Machinery	49%	31,188
Building and Civil Work	47%	30,000
Capitalized Interest	4%	2,570
Total Project Cost(NPR)	**100%**	**63,758**

The portion of the interest during construction is capitalized in the individual assets on a proportionate basis.

Capital Structure

The project is proposed to be financed in a 70:30 debt equity ratio on the total cost of the project including Interest During Construction (IDC). The requirement of working capital would be financed by internal resources itself. Based on the structure, the total investment pattern has been tabulated below:

Component	Percentage	Amount in NPR
Equity	30.00%	19,127.37
Debt	70.00%	44,630.53
	Total	**63,758.00**

Cost and Collection Efficiency

Based on the various studies conducted by international agencies and prevailing market tendency, collection of the solid waste has been assumed as follows-

From	To	Overhead and Salary Charging	Direct Sales
0 year	0 year		
1 year	9 years	60%	40%
10 years	14 years	70%	50%
15 years	24 years	80%	60%
25 years	30 years	90%	70%

Project Construction and Operation Period

The project is assumed to be built in the period of 3 months. And the total operation period after the construction period would be 30 Years. The project would be handed over to the government after the completion of the operation period.

Tax, Staff Bonus, and Depreciation Assumptions

The tax rate for the project is assumed at 20% on profit earned during the year. Further the loss carryforward has been taken for 12 years in due consonance with the provision of Income Tax Act 2058. Further, the staff bonus is assumed at 10% on taxable income earned during any year of the operation as required by the Bonus Act.

Also, the rate depreciation and basis of depreciation is in due adherence to the provisions of the Income Tax Act as follows:

Particulars	Depreciation Method	Rate of Depreciation
Land	-	-
Civil Structure	WDV	5%
Vehicle	WDV	15%
Other	SLM	20%

However, 1/3 of the additional depreciation has not been taken into consideration as facilitated by Income Tax Act.

Basis of Revenue and Inflation

Project generates its revenue from the sale of output from the digestion plant installed and sale of the reusable products. The sales inflation rate is assumed to increase at the rate of 2% per annum and which would be capped at 150%

Other Cost of Operations

Inclusive of all staff salary, vehicle maintenance but don't include Interest cost and depreciation cost component. It is further Assumed that the total operating expense is likely to increase at the rate of 3% With the cap of 200%. As discussed in earlier Paragraph, the project would be financed by 70% Debt. The Interest rate that has been taken into the calculation is 12% which would be repaid in four equal installments in the period of 12 years.

Working Capital and Other Assumptions Used

It has been assumed that the overall working capital requirement would be financed by the equity holders. The working capital has been assumed on the following basis.

Receivable & Advance	45	Days
Payable and Liabilities	30	Days

3.2 Financial Analysis

3.2.1 Financial Results

The project's overall cost is NPR 6,37,58,000 including interest. The overall project, excluding working capital, was financed by loan for 70% and equity for the remaining 30%.

The project's Internal Rate of Return (IRR) is assessed to be 17.32 %, while the project's equity IRR is calculated to be 26.73%. The project's IRR and equity IRR prove the project's viability.

After the date of operation, the project has a simple payback term of 4.94 years. The pay-back term appears to be enough, given the nature of the firm and the broader industry.

At 1.59 times of the project, the average debt service coverage ratio is determined. Furthermore, the project's cost-benefit ratio is multiplied by 1.21.

Indicators	Results
Firm IRR	17.32%
Equity IRR	26.73%
NPV Equity	12,278.96
Debt Equity Service Coverage Ratio(Average)	1.59 Times
Project BCR	1.21
Equity BCR	1.64
Simple Payback Period	4.94 years
Discounted Payback Period	9.14 years

3.2.2 Sensitivity Analysis

Sensitivity Analysis has been carried out on three different components: Interest Rate, O & M Cost and Project Cost.

Interest Rate

Percentage of Change Project Cost	Impact on Project IRR	% of Change
0.00%	26.73%	-
5.00%	25.89%	-3.13%
-5.00%	27.55%	13.06%

O & M Cost

O & M Cost	Impact on Project IRR	% of Change
0.00%	26.73%	-
5.00%	26.73%	-0.00%
-5.00%	26.73%	-0.00%

Project Cost

Project Cost	Impact on Project IRR	% of Change
0.00%	26.73%	-
5.00%	26.73%	-0.00%
-5.00%	26.73%	-0.00%

4

STATUTORY AND LEGAL FRAMEWORK

4.1 Statutory and Legal Framework

Multiple requirements have been included in the Organic Model Agriculture Programme Implementation Procedure, 2076, to promote and enhance organic agriculture in the province. Different local levels of the province have implemented an organic model farm development initiative. Compost, vermicompost, green manure, and other organic agricultural inputs are available. Organic farmers may benefit from skill development programs. These are some notable programs that have been suggested. To select the best areas for promoting organic agriculture and to guarantee that the program is implemented effectively, a committee is created at each local level and ward.

There are a lot of laws that govern solid waste management and all of the activities that go along with it. The most important ones are listed below:

1. Solid Waste Management National Policy, 1996

To address the rising solid waste management difficulties caused by urbanization, the first Solid Waste Management National Policy was created in 2053 BS (1996 AD). Waste management in municipal and urban regions was stressed in the policy. This policy remains in effect.

2. Solid Waste Management Act, 2011

The Nepalese government passed the Solid Waste Management Act of 2011, which took effect on June 15, 2011. The act's goals include keeping the environment clean and healthy by reducing the negative impacts of solid waste on public health and the ecosystem. Municipalities, for example, have been given responsibility for the building, operation, and administration of MSW collection, treatment, and final disposal infrastructure.

Local Governments are required to make the appropriate efforts to encourage Reduce, Reuse, and Recycle (3R), including MSW segregation at the source, under the legislation. Through competitive bidding, it also allows the private sector, community-based organizations (CBOs), and Non-Governmental Organizations (NGOs) to participate in SWM. Bidding procedures, the selection of the winning bidder, and the bidder's power to collect tipping fees (tariffs) against SWM services are all outlined. The legislation also enables the imposition and collection of service fees against SWM services, as well as the grounds for determining such costs and the processes for collecting and using them. It also allows Local Governments, with the agreement of the municipal board, to create regulations, bylaws, and guidelines.

3. The Local Government Operations (LGO) Act, 2018

The Local Government Operations Act of 2017 has established and delimited distinct duties and procedures for SWM throughout Local Governments, in keeping with Nepal's 2015 constitution's power segregation. Local Governments are required under the legislation to work with the private sector to carry out solid waste management-related duties. Local Governments have been given regulatory and monitoring powers, as well as the ability to facilitate garbage disposal from families, slaughterhouses, and even healthcare facilities. In order to reduce carbon emissions, the LGO Act 2017 promotes Local Governments to use environmentally friendly technology. Local Governments are also responsible for the building and operation of sanitary landfills according to established standards, as well as the competitive contracting and licensing of private sector actors and Non-Governmental Organizations (NGOs) for SWM services. Similarly, Local Governments can charge a fee for waste management services provided via it.

4. Solid Waste Management Regulation, 2013

Under the rights of the Solid Waste Management Act, 2068, the Nepalese government produced the Solid Waste Management Regulation in 2013. This rule emphasizes the separation of hazardous waste at the source and states that the producers are responsible for the correct disposal and management of separated hazardous waste. The legislation also prioritizes waste separation and reduction at the point of generation. As a result, the need of Local Governments in raising public awareness about proper garbage management has been highlighted.

5. Environmental Protection Act, 2019

The Environmental Protection Act of 2076, which amends and consolidates existing environmental legislation, went into effect recently. The Act aims to:

- Protect each citizen's fundamental right to live in a clean and healthy environment
- Compensate victims for damages caused by pollution or degradation of the environment
- Maintain a proper balance between environment and development
- Mitigate negative environmental impacts on the environment and biodiversity
- Face the challenges posed by climate change.

6. Sustainable Development Goals (SDGs), 2016-2030

The SDG-11 objective 6 calls for cities to decrease their negative per capita environmental effect by focusing on air quality and municipal and other waste management. Nepal has established two objectives and indicators in municipal waste management in compliance with SDG-11, target 6. The number of municipalities with sewage systems reaching 100% by 2020, and the percentage of private hospitals separating waste reaching 100% by 2017.

7. Investment Board Act, 2068 (2011)

OIBN has been supporting investment in solid waste management projects in urban areas under section 9 (1) (C) of the Investment Board Act, 2011 (2068 BS).

"Regardless of any condition made in existing laws, the investment necessary for the implementation of any project for Solid Waste Management and Treatment in urban areas should be mobilized based on this Act," the law adds. As a result, every project of this sort should be approved by the Investment Board before it is implemented.

Solid waste management has been given a low priority in many Nepalese municipalities, owing to the larger demand for other public services. Due to a shortage of SWM baseline information and data relevant to the functional parts of SWM, Local Governments are having difficulty formulating management plans. When creating and executing comprehensive waste management strategies that incorporate resource recovery through suitable means, it is critical to determine the quantity and composition of Municipal Solid Waste (MSW).

5

PRELIMINARY ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

5.1 Socio economic aspects

This project can be reflected in terms of multi dimensional positive changes to producers, traders, consumers and other people who are directly or indirectly related to agro based industries. Producers, traders, consumers, and anyone who are directly or indirectly involved in the sector will see multi dimensional positive improvements as a result of the initiative.

The project will have an impact on social and gender development by

(i) increasing opportunities for poor and disadvantaged groups, as well as women, to participate in safe agricultural activities
(ii) reducing the vulnerability of disadvantaged groups
(iii) improving the capabilities of poor, disadvantaged groups, and women to participate directly in or benefit indirectly from employment generation at industry site.

5.2 Environmental Impact Assessment

Biological nitrogen fixation is considered a key process in sustainable agriculture. Also, the use of bio-fertilizers can improve productivity per area in a relatively short time, consume smaller amounts of energy, mitigate contamination of soil and water, increase soil fertility, and promote antagonism and biological control of phytopathogenic organisms. According to the planned project's environmental study, minor negative consequences may be caused during processing such as gas emissions. However, as the project is aiming at producing sole organic inputs the products will have positive impact in the environment and contribute to mitigate negative consequences being received with use of chemical inputs in the agricultural system of Nepal.

6

PRELIMINARY RISK ANALYSIS

The key challenges to the functional unit will be to encourage high technology based production, processing, storage and market linkage network development of associated products.

Possible risk factors and mitigation measures

S.No.	Possible Risk/Issues	Mitigating Strategies
1	Produced/stored/supplied below than the capacity and price of products	Strategies to produce early and late (by a few months) than the peak production season from every possible production sites and crop rotation
2	Electricity (power cut), transportation facilities and fuel crisis	Power backup (15 KVA generator), fuel efficient transportation vehicles, timely maintenance and subsidy arrangement.
3	Biofertilizer storage and supply volume	Storage in full capacity even by importing commodities, fine processing and demand oriented mass scale processing and packing.
4	Sudden loss in crop productivity, pest/disease abundance etc.	Interlinkage with price determination unit.
5	Farmers continue to follow traditional farming practices	Awareness, field based observation and guiding, TOT, Monitoring and result demonstration
6	Risks associated with bio-degradable waste collection	Additional arrangement for monitoring and operation system in PPP model facilitated

7

PROJECT STRUCTURE AND IMPLEMENTATION MODEL

Public Private Partnerships (PPP)

A Public Private Partnership (PPP) is an agreement between public and private entities for a certain length of time in which private businesses agree to take on the risk of all or part of the funding, construction, operation, repair, and maintenance of projects under the PPP model. Such an entity may generate a fair profit by providing public services directly or indirectly through the building, operation, repair, and maintenance of public or private assets. Through legislative, legal, institutional, and economic arrangements, public institutions must establish an environment that encourages private sector investment [4].

It will be suitable to develop a project using the PPP model, which involves both public and private entities. When national treasury resources are insufficient, assets of public utility and less expensive operation of public services, as well as resources, skills, and technology accessible in the private sector, must be drawn to nation-building projects based on the PPP idea.

The PPP model is appropriate in the current context of the Bio fertilizer and organic fertilizer industry in Madhesh Province. According to the preliminary research done in these towns, Local Governments would give land for the construction of an Bio-Fertilizer and Organic Fertilizer Industry in Madhesh Province.

4 World Bank, 2072, Public-Private Partnership Policy

8

FINDINGS AND RECOMMENDATIONS

8.1 Findings

The following are some of the study's significant findings:

1. The Bio-Fertilizer and Organic Fertilizer industry in Madhesh Province will provide locals with the opportunity for income.
2. According to the study, Madhesh Province is the best place for developing the Bio-Fertilizer and Organic Fertilizer Industry in Madhesh Province because of its climate, proximity to large settlements, accessibility, and other factors.
3. The project's business model was determined to be a Public Private Partnership.
4. With a total cost of NPR 6,37,58,000.00 (including interest component throughout the construction period). The project's Internal Rate of Return (IRR) is assessed to be 17.32 %, while the project's equity IRR is calculated to be 26.73%. The project's IRR and equity IRR prove the project's viability.
5. Payback period has been determined as 4.94 years.

8.2 Recommendations

The project appears to be technically and financially viable for a developer to invest, based on the findings. In the following step, however, environmental and social aspects, as well as a thorough examination of all other components, must be addressed.

Disclaimer

This project profile is based on preliminary study to facilitate prospective developers to assess possible scope. It is, however, advisable to get a detailed feasibility study prepared before taking a final investment decision.

9

ANNEX

Financial Report

Projected Profit and Loss Statement for I nitial 10 years

Amount in NPR '000

Particulars	1 years	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
Direct Sales	88,000	89,760	91,555	93,386	95,254	97,159	99,102	101,804	103,106	131,460
Total Direct Income	88,000	89,760	91,555	93,386	95,254	97,159	99,102	101,804	103,106	131,460
Less: Direct Expenses	-	-	-	-	-	-	-	-	-	-
Cost of sales	57,600	59,328	61,108	62,941	64,829	66,774	68,777	70,841	72,966	93,944
Total Direct Expenses	57,600	59,328	61,108	62,941	64,829	66,774	68,777	70,841	72,966	93,944
GP % on sales	35%	34%	33%	33%	32%	31%	31%	30%	29%	29%
Gross Profit	**30,400**	**30,432**	**30,447**	**30,445**	**30,425**	**30,385**	**30,325**	**30,244**	**30,140**	**37,517**
Add: Other Income	880	898	916	934	953	972	991	1,011	1,031	1,315
Profit before overhead & interest	31,280	31,330	31,363	31,379	31,377	31,357	31,316	31,254	31,171	38,831
Operating Expenses	-	-	-	-	-	-	-	-	-	-
Depreciation	6,438	6,360	6,285	6,215	6,148	6,084	4,399	1,092	1,037	985
Salary Expenses	2,592	2,670	2,750	2,832	2,917	3,005	3,095	3,188	3,283	3,946
Overhead Expenses	7,236	7,453	7,677	7,907	8,144	8,389	8,640	8,899	9,166	11,015
O & M Expenses	6,567	6,764	6,967	7,176	7,391	7,613	7,841	8,077	8,319	8,569
Operating Profit	8,447	8,083	7,684	7,249	6,777	6,266	7,341	9,999	9,365	14,317
Interest Expenses	5,277	5,053	4,800	4,516	4,196	3,836	3,430	2,974	2,460	1,882
Profit	**3,170**	**3,030**	**2,884**	**2,733**	**2,581**	**2,430**	**3,910**	**7,025**	**6,905**	**12,435**
Provision for Staff Bonus	288	275	262	248	235	221	355	639	628	1,130
Income Tax	576	551	524	497	469	442	711	1,277	1,255	2,261
Net profit	**2,306**	**2,204**	**2,097**	**1,988**	**1,877**	**1,768**	**2,844**	**5,109**	**5,022**	**9,043**

Projected Balance Sheet for Initial 10 years

Amount in NPR '000

Particulars	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
Shareholders Fund										
Share Capital	19,127	19,127	19,127	19,127	19,127	19,127	19,127	19,127	19,127	19,127
Reserve and Surplus	2,306	4,509	6,607	8,595	10,472	12,239	15,083	20,193	25,214	34,258
Loan Fund	-	-	-	-	-	-	-	-	-	-
Term Loan	42,842	40,829	38,564	36,014	33,144	29,915	26,279	22,188	17,583	12,399
Short Term Loan	-	-	-	-	-	-	-	-	-	-
Total	**64,275**	**64,466**	**64,298**	**63,736**	**62,744**	**61,281**	**60,490**	**61,508**	**61,924**	**65,785**
Particulars										
Fixed Assets (Net)	57,320	50,961	44,675	38,461	32,313	26,229	21,830	20,739	19,702	18,717
Investment	-	-	-	-	-	-	-	-	-	-
Current Assets	7,502	14,069	20,203	25,875	31,047	35,687	39,313	41,442	42,916	47,782
Sundry Debtors	3,910	3,916	3,920	3,922	3,922	3,920	3,914	3,907	3,896	4,854
Inventory	-	-	-	-	-	-	-	-	-	-
Cash & Bank Balance	3,592	10,153	16,283	21,951	27,125	31,767	35,399	37,535	39,020	42,928
Less: Current Liabilities	547	564	581	598	616	634	653	673	693	714
Net Current Assets	6,955	13,506	19,623	25,276	30,431	35,053	38,660	40,769	42,223	47,068
Total	**64,275**	**64,466**	**64,298**	**63,736**	**62,744**	**61,281**	**60,490**	**61,508**	**61,924**	**65,785**

Projected Cash Flow Statement

Amount in NPR '000

Particulars	4 years	5 year	6 years	7 years	8 years	9 years	10 years	11 years	12 years	s13 years
Cash flow from operating activity	-	-	-	-	-	-	-	-	-	-
Net profit before interest and tax	2,882	2,755	2,622	2,485	2,346	2,210	3,555	6,387	6,277	11,304
Add: Depreciation	6,438	6,360	6,285	6,215	6,148	6,084	4,399	1,092	1,037	985
Add: interest	5,277	5,053	4,800	4,516	4,196	3,836	3,430	2,974	2,460	1,882
Operating cash flow before working capital change	14,597	14,167	13,707	13,215	12,690	12,129	11,384	10,452	9,775	14,172
Increase/Decrease in Current Assets	(3,910)	(6)	(4)	(2)	0	3	5	8	10	(957)
Increase/Decrease in Current Liabilities	259	29	30	31	32	32	(116)	(264)	31	(482)
Payment of Tax	(288)	(564)	(538)	(511)	(483)	(456)	(576)	(994)	(1,266)	(1,758)
Net Cash flow from operating activity	**10,658**	**13,626**	**13,196**	**12,734**	**12,239**	**11,708**	**10,697**	**9,202**	**8,550**	**10,974**
Cash flow from Investing Activity	-	-	-	-	-	-	-	-	-	-
Purchase of Fixed Assets	(63,758)	-	-	-	-	-	-	0	-	-
Increase/Decrease in Investment	-	-	-	-	-	-	-	-	-	-
Less: Payment of Dividend	-	-	-	-	-	-	-	-	-	-
Net Cash flow from Investing Activity	**(63,758)**	-	-	-	-	-	-	**0**	-	-
Cash flow from Financing Activity	-	-	-	-	-	-	-	-	-	-
Increase in Share Capital	19,127	-	-	-	-	-	-	-	-	-
Increase in Borrowing Fund (Long Term Loan)	44,631	-	-	-	-	-	-	-	-	-
Increase in short Term Loan	-	-	-	-	-	-	-	-	-	-
Less: Repayment of Long Term Loan	(1,788)	(2,013)	(2,265)	(2,550)	(2,870)	(3,230)	(3,635)	(4,092)	(4,605)	(5,183)
Less: Payment of interest on Short Term Loan	-	-	-	-	-	-	-	-	-	-

Amount in NPR '000

Particulars	4 years	5 years	6 years	7 years	8 years	9 years	10 years	11 years	12 years	13 years
Less: Payment of Interest on Long Term Loan	(5,277)	(5,053)	(4,800)	(4,516)	(4,196)	(3,836)	(3,430)	(2,974)	(2,460)	(1,882)
Net Cash flow from Financing Activity	56,692	(7,066)	(7,066)	(7,066)	(7,066)	(7,066)	(7,066)	(7,066)	(7,066)	(7,066)
Increase/Decrease in Cash and Cash Equivalent	3,592	6,561	6,130	5,668	5,173	4,643	3,631	2,136	1,484	3,909
Cash & Bank Balance at the beginning of the period	-	3,592	10,153	16,283	21,951	27,125	31,767	35,399	37,535	39,020
Balance at the end of period	**3,592**	**10,153**	**16,283**	**21,951**	**27,125**	**31,767**	**35,399**	**37,535**	**39,020**	**42,928**

The Equity shareholders need to inject additional cash for serving Working capital in initial years as assumed in the report Earlier