CHAPTER – I
INTRODUCTION

1.1 AN OVERVIEW

Land and water are the basic needs of agriculture and economic development in India. The demands for these resources are continuously increasing. It is possible to increase the intensity of cultivation up to 250 per cent or more provided water is available as India is having sunshine throughout the year. Further large areas of waste and fallow lands are available and hence optimum use of the available water is very critical at this juncture.

Water is a vital resource for life, human and societal development and environmental sustainability. We must treat the water economic and socially good and that water management must aim for the most worthwhile use ensuring equity, concerns, adequate, efficiency and environmental sustainability. Water planners, managers, users and generally policy makers face many challenges: The need to meet basic water requirements of present and future generations; maintain the renewable fresh water resources and develop public and private institutions capable of managing supply and demand resolving conflicts; and protecting watersheds and allocating scarce water resources.

Though water resources in India are good, but the utilizable water is about 110 Mha. (70 Mha from surface and 40 Mha from ground water). This utilizable water can irrigate about 140 Mha. This is only about 60 per cent of the gross cultivable area in the country. Further, agriculture draws about 85 per cent of the total water used at present. It is estimated that the allocation will be reduced to 71 per cent in the next 25 years, since the demand of water for industries and municipal purposes is expected to increase. Therefore, it has an it means important to find ways and means to increase the area of irrigation and production to feed the growing population.

The investment per hectare for irrigation projects has been increasing enormously from Rs. 1500 during 1951–1956 to about Rs. 1,00,000 during 9th plan and Rs. 1,50,000 during 12th plan. It has increased the production by five fold in the last 60 years i.e. from 50 million tons in 1951 to about 250 million tons at present but
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Productivity is lower as compared to many countries in the world. The main reason for this is due to inadequate irrigation management, and less area under Sprinkler and Drip irrigation on a large scale. Therefore, it is necessary to economize the use of water and at the same time increase the productivity per unit area and per unit quantity of water.

India is the 2nd largest producer of fruit and vegetables in the world, but it is not sufficient for the minimum requirement of the population. Further, there is a good potential of exporting these products to get sufficient income to the farmers and foreign exchange to the country. We get highest rainfall in the world, that is, 12,000 mm at Chirapunji – India and at the same time less than 100 mm in Rajasthan and some other parts of the country. Further the rain falls only in 3 or 4 months times during the year. Even Chirapunji is facing drinking water problem before monsoon starts. Therefore, there is a need to harvest, conserve and use the water efficiently.

Water is one of the most critical inputs for agriculture which consumes more than 80 per cent of the water resources of the country. Availability of adequate quantity and quality of water is, therefore, key factors for achieving higher productivity levels. Investments in conservation of water, improved techniques to ensure its timely supply, and improve its efficient use are some of the imperatives which the country needs to enhance. Poor irrigation efficiency of conventional irrigation system has not only reduced the anticipated outcome of investments made towards water resource development, but has also resulted in environmental problems like water logging and soil salinity thereby affecting crop yields. This, therefore, calls for massive investments in adoption of improved methods of irrigation such as drip and sprinkler, including fertigation.

Various options are available for reducing water demand in agriculture. First, the supply-side management practices include watershed development and water resource development through major, medium and minor irrigation projects. The second is through the demand management practices which include improved water management technologies and practices. The micro-irrigation (MI) technologies such as drip and sprinkler are the key interventions in water saving and improving crop productivity. Evidence shows that up to 40 per cent to 80 per cent of water can be saved and water use efficiency (WUE) can be enhanced up to 100 per cent in a
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properly designed and managed MI system compared to 30-40 per cent under conventional practice (Goyal and Singh., 2014)

1.2 SOURCES OF WATER IRRIGATION IN INDIA

Central Water Commission (CWC) has been making periodic assessment of the Country’s water resources. The water resources potential of the country, which occurs as a natural runoff in the rivers is about 1869 Billion Cubic Meters (BCM). It constitutes a little over 4 per cent of the total river flows of the world. However, due to various constraints of topography and uneven distribution over space and time, only about 1121 BCM of the total annual water potential can be put to beneficial use. This can be achieved through 690 BCM of utilizable surface water and 431 BCM through ground water. (Central Water Commission of India, 2014)

While water for drinking purpose has been accorded top most priority in water use, irrigation is the major consumer of water. Ultimate irrigation potential which can be created making use of the utilizable surface water resources through major, medium and minor projects would be about 75.9 Mha. Irrigation potential making use of ground water has now been assessed as 64 Mha. Thus the total irrigation potential from surface and ground water sources would be about 139.9 Mha. Besides this, an additional irrigation potential of about 35 Mha can be created by taking up long distance inter basin transfer of water from surplus to deficit basins. (Central Water Commission of India, 2014)

1.3 MICRO-IRRIGATION IN INDIA

Micro-irrigation is a new technology in the country compared to sprinkler irrigation but farmers are showing keen interest in introducing this water saving technology. Drip irrigation was introduced on large scale in Israel during the sixties and at present the entire area for all crops, micro-irrigation is the only irrigation method practiced. The Israeli farmers grow flowers, fruits and vegetables using drip system. But the important factor is that the Government is helping the farmers by way of extension and marketing of the products.

In India, though drip system is familiar with the farmers, the drip irrigated area is about 2.0 Mha, which is very meager compared to the total irrigated area in the country less than 100 Mha. About 60 wide spaced crops are irrigated by this method.
In the beginning, it was introduced in water scarcity areas for wide spaced crops like coconut, pomegranate, orange, grapes, etc. But now, farmers use this method even in places where sufficient water is available for irrigation and also for closely spaced row crops. Due to number of benefits in implementing the drip irrigation system. Less inputs (Labor, fertilizers, chemicals, etc.); High quality of products; and finally saving of water.

Therefore, the farmers in India are also aware of the importance of this system. But the problem of introducing this technology on cost or large scale in India is the high cost or investment. The investment cost varies from Rs. 70,000–80,000 per ha for closely spaced crops: Vegetables, cotton, sugarcane, mulberry, etc. and this cost is prohibitive to small farmers in the country, though the economics will prove that this system is economically viable.

India has 37 per cent of the total irrigated area of the world, compared to 25 to 30 per cent for the drip irrigated area. The main reason for slow progress is due to high initial cost of installation. If the cost is brought down to Rs. 10,000 per acre (maximum, Rs. 25,000 per hectare), it is possible that many farmers including small farmers will go for drip irrigation without waiting for subsidy from the Government of India. Many organizations in India are now doing research trails to bring down the cost and the farmers field in the country.

Micro-irrigation can be practiced for all row crops and in all soils. In this method, the required quantity of water is given to each plant at the root zone through the network of pipes. Hence, the losses are minimum due to water conveyance and water distribution. Since the water based on evapotranspiration (ET) is delivered daily to the plants, soil moisture will be always available more or less near the field capacity. This implies that the roots can take moisture from the soil without any crop stress. This results in the uniform and optimum of a crop. In addition, crop fertilizer requirements can be met by fertigation, thus resulting in 30 per cent savings of the nutrients without affecting the yield.

Micro-irrigation system is suited for undulated terrain, shallow soils and water scarcity areas. Saline and brackish water areas can also be used to some extent, since water is applied daily, which keeps the salt stress at minimum. These salts are pushed
to the periphery of the moisture regime, which is away from the root zone of the crop. Therefore, crop growth is not affected due to salinity. The main advantages of micro-irrigation compared to gravity irrigation system are increase water use efficiency, higher yield, less tillage requirements; improve quality products; higher fertilizer use efficiency; reduce weed growth and also save labor. All operations can be done at all times; with less labors. (Goyal and Singh., 2014)

1.4 HISTORY OF MICRO-IRRIGATION SYSTEM

Earlier attempts were made by the researchers in Germany during 1860 by simply pumping the irrigation water into the clay pipes through underground drainage system. The first works on MIS (Micro-irrigation systems) were initiated at Colorado in 1913 and it was concluded that drip system was too expensive. Later on an important breakthrough was made in Germany in 1920 when perforated pipes were used for irrigating the crops. However, in 1930, the peach growers in Australia, pumped water through 5 cm GI pipes laid along the tree rows with water emitting points made on the pipe as small triangular holes. In early 1940, Symcha Blass observed that a tree near a water leaking point exhibited vigorous growth as compared to other trees in the area. This led to the concept of MI (Micro-irrigation) where water is applied in very small amounts as drop by drop. Later on, a remarkable breakthrough was made in the material science, when polyethylene, a crack resistant and cheaper alternative was accidentally produced in a British laboratory. Later LDPE (Low density polyethylene) gave place to HDPE (High density polyethylene) and in 1977, LLDPE (Low densitypolyethylene) was introduced. Thus, micro-irrigation systems really got off the ground with the developments in plastic industry. Later on the orifice emitters were developed to improve the consistency of "holes drilled into the pipes" and gradually sophisticated water emission small diameter plastic tubes and micro tubes were developed. Turbulent flow emitters were also developed which are being used at present. (Bhaskae et al., 2005)

1.5 CONCEPT OF MICRO-IRRIGATION SYSTEM

Micro-irrigation system applies measured quantity of water slowly and directed above or below the soil surface, usually by discrete or continuous drops, tiny stream or miniature spray through emitters or applicators placed along a water
delivery line near the plant. Moreover spray-jet, foggers and micro-sprinkler with low pressure also covered under this system.

1.5.1 Types of Micro-Irrigation System

1.5.1.1 Surface drip

In a surface drip irrigation system, the emitters and lateral lines are laid on the soil surface. It is one of the most prevalent types of micro-irrigation system primarily used on the widely spaced plants, but can also be used for row crops. Generally discharge rates are less than 12 l/h for single outlet point source emitters and less than 12 l/h-m for line source emitters. Advantage of surface drip irrigation is the ease of installation, inspection, cleaning and changing if emitters, plus the possibility of checking soil surface wetting patterns and measuring individual emitter discharge rates.

1.5.1.2 Subsurface drip

In subsurface drip irrigation, water is applied slowly below the soil surface through emitters with discharge rates in the same range as that of surface drip system. This system is mostly used for close growing row crops, but can also be used on small fruit crops. The emitter outlets should be pointed upwards. The advantage of subsurface drip irrigation is to reduce the evaporation loss, very little interference with cultivation or cultural practices and possibly a longer operation life. In addition, combination of surface and subsurface drip irrigation have been tried where the lateral lines are buried and the emitters are located on or above the soil surface through the use of extension or riser tubing’s.

1.5.1.3 Bubbler

In bubbler irrigation, water is applied to the soil surface in a small stream or fountain from an opening with a point source having discharge rates greater than surface or subsurface drip irrigation, but usually less than 225 l/h. Because of emitter discharge rates usually exceeding the infiltration rate of soil; a small basin is required to control the distribution of water. Advantage of bubbler system is the reduced infiltration, low maintenance or repair need and low energy cost compared with other drip system. However, larger size lateral lines are required with bubbler system to reduce the pressure loss associated with high discharge rates.
1.5.1.4  Micro jet

It is the system of application of water in the form of discrete drops or fan type or full circle or part circle or quarter circle spray on the surface of soil from low height or low angle through air around the crop. Micro jet does not have moving parts but have greater discharge rate and greater coverage than dripper and bubblers.

1.5.1.5  Micro and mini sprinkle

In sprinkler system water is spread into the air and is allowed to fall on the ground somewhat resembling rainfall. Micro sprinkler is the application of water in the form of discrete drops or fan or full circle spray on the surface of soil from stake height less than 1 m or low angle through air around the crop. Micro and mini sprinkler incorporates moving parts and having greater discharge rates and greater coverage than drippers, bubbler and micro jet.

1.5.1.6  Misting or fogging system

It is the application of water in the form of very fine spray in order to create humidity in the air at low level or overhead. These systems are generally used in poly houses or greenhouses and in shade houses to control the humidity and temperature. Misting system has very low flow rates (10 to 30 l/h) and high pressure (3.5 to 10 kg/cm²) is required to create the mist or fog.

1.5.1.7  Pulse irrigation

Pulse irrigation system uses high discharge rate emitters and consequently has short water application time. Pulse system has application cycle of 5, 10 or 15 min in 1 hour and discharge rate for pulse emitters are 4 to 10 times higher than surface drip system. The primary advantage of this system is the reduction in clogging problem, whereas the disadvantages are need for reliable, inexpensive pulse emitters and automatic controllers.

1.5.1.8  Pop-up sprinkler

This system is similar to sprinkler system but sprinklers are installed just below the ground level with cover and get activated with pressure and come up from ground level. When the system is shut off, sprinklers automatically go back to their original position. These systems are generally used for lawns and gardens such as Golf courses. Stud farms etc.

1.5.1.9  Set move irrigation

Set move (sprinkler) systems are moved from one set (irrigation) position to another by manually or mechanically. Set move system remains stationary as water
is being applied. When the desired amount of water has been applied, the system is shut off and moved to the next set position

1.6 IMPORTANCE OF MICRO-IRRIGATION SYSTEM

According to a recent estimate, thirty four countries in the world will be facing water scarcity by 2025 AD indicating that per capita availability of fresh water supplies will be less than 100 m$^3$ person per year. A country with renewable water availability on an annual per capita basis exceeding about 1700 m$^3$ will suffer only occasional or local water problems. Below this threshold, countries begin to experience periodic or regular water stress. Rising demand for urban and industrial water supplies in the world pose a serious threat to irrigated agriculture. The allocation of water for agriculture will come down to 50 per cent from the present level of 70 per cent. However, to achieve required food and fibre production with increasing population, India has to enhance the current irrigation potential of 91 Mha to 160 Mha. However, to fulfil the additional requirement of the irrigation with improved technologies for water harvesting, excess runoff collection, storage and recycling for precision water application by economizing the available amount of irrigation water needs to be adopted.

The major problem associated with decreasing amount of fresh water for irrigation is conveyance losses, reducing the net utilization of irrigation water to 46 per cent only. The net utilization of irrigation water in drip system is 90 per cent and through sprinkler system, it is 82 per cent. In view of the same, micro-irrigation is having paramount importance with brighter future prospects. (Bhaskar et al., 2005)

The productivity of irrigated land compared to its potential is very low. Water available for irrigation is becoming scarce, cost for generating water source is ever increasing, the predominance of soils with low water retention capacities and very low hydraulic conductivities make the arid and semi-arid regions an ideal case for light and frequent irrigations through micro-irrigation. Micro-irrigation will increase the irrigation cover using the existing available water. Micro-irrigation with fertigation will enhance production per unit input in these nutrient poor, shallow and sloppy soils. Micro-irrigation is a co-ordinated and controlled water management system where water is made to flow under pressure through a network of pipes of varying diameters, the main-line, the sub-main lines and the lateral lines with
appropriately placed emitters along the length of the latter through which water is discharged to the root zone.

1.7 FUTURE PROSPECTS OF MICRO-IRRIGATION

The studies conducted and information gathered from various sources has revealed that drip irrigation is technically feasible, economically viable and socially acceptable. Drip irrigation can be implemented in most of the areas irrigated by open and tube wells, which make about 35 per cent of the total irrigated area in the country. The drip irrigation can be extended to the waste lands after planting tree crops including fruit trees; hilly areas; semiarid zones; coastal sandy belts; water scarcity areas; and command of the community wells.

At present, on an average Rs. 1,00,000 to 1,50,000 per hectare is being invested for the new irrigation projects. As water is becoming increasingly scarcer, adoption of micro-irrigation system offers potential for bringing nearly double the area under irrigation with the same quantity of water without any expenditure. It has been considered as a boon for wide spaced perennial crop namely Mango, Coconut, Oilpalm, Banana, Grapes, Pomegranate, Ber, Citrus, Tea, Coffee, and Cardamom. It is also suited for vegetables, flowers and other commercial crops cotton, banana tobacco and sugarcane.

The area under micro-irrigation at present is about 2 Mha. The potential area is estimated at 27 Mha by the Indian Task Force on Drip Irrigation. Hence, there is a great future for the rapid expansion of micro-irrigation in India in the coming years. It is expected that the projected area of 20 Mha (20 per cent of the irrigated area) will be brought under micro-irrigation in the next 15 to 20 years. (Goyal and Singh., 2014)

1.8 ADVANTAGES AND DISADVANTAGES OF MICRO-IRRIGATION

1.8.1 Advantages of Micro-Irrigation

- Saving of ample irrigation water
- Low water application rate
- Uniformity of water application around the plant
- Precision placement of water
- Efficient fertilizer and chemical application
- Better control of root zone environment
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- Significant yield enhancement
- Improve quality of the farm product
- Improve disease control
- Discourage weed growth
- Saving of power due to lesser use
- Reduces labour cost
- Being light in weight, the system can be shifted without any problem
- It can be moved on undulating topography
- It can be put to use during night also

1.8.2 Disadvantages of Micro-Irrigation

- Sensitivity to clogging.
- High initial cost
- Requires some management and maintenance
- Salt accumulation near the root zone
- Seed germination
- Moisture distribution and restricted root zone

1.9 CURRENT STATUS AND GROWTH OF MICRO-IRRIGATION IN INDIA

Micro-irrigation has seen a steady growth over the years. Since 2005, area covered under micro-irrigation systems has grown at a CAGR of 9.6 per cent geographically, states with the largest area under micro-irrigation include: Rajasthan (1.68 mh), Maharashtra (1.27 mh), Andhra Pradesh (1.16 mh), Karnataka (0.85 mh), Gujarat (0.83 mh) and Haryana (0.57 mh). (Anon., 2016)

Fig. 1.1 Growth of micro-irrigation in India
Majority of the area covered under micro-irrigation systems comes under sprinkler irrigation with 56.40 per cent, while 43.60 per cent comes under drip irrigation. Area under drip irrigation has shown stronger growth in recent years, growing at a CAGR of 9.85 per cent in the 2015 periods while sprinkler irrigation has grown at a pace of 6.60 per cent for the same time period. Overall, the area under micro-irrigation has grown at a CAGR of 7.97 per cent for the time frame. (Anon., 2016)

Fig. 1.2 Area covered under micro-irrigation system in India.

1.10 IMPEDIMENTS FOR MICRO-IRRIGATION GROWTH IN INDIA
1.10.1 Lack of Focus on Micro-Irrigation

There is a lack of focus at a central level on micro-irrigation, previously seen during the years of the National Mission on Micro-Irrigation (NMMI). Since 2014-15, there has been a dilution of focus by subsuming micro-irrigation as a component of government schemes, rather than a dedicated mission. At the state level as well, this lack of focus permeates, which has resulted in only a few states having a dedicated team for micro-irrigation. This has contributed to the deceleration of growth of micro-irrigation penetration in the country. Although some states have implemented successful models using exclusive and dedicated teams for micro-irrigation

1.10.2 Lack of IT-Backed Operations

The entire process, from application to installation and payment, cannot be tracked online in a majority of states. In most cases, only a part, if any, of the process can be tracked, this makes monitoring the transactions and ensuring efficiency in the process a nearly impossible task. There is a lack of usage of systems such as geotagging and referencing, which allow real-time monitoring of projects. Gujarat, Andhra Pradesh, Maharashtra are considered to be select examples in promoting
micro-irrigation, use such systems, which enable real-time monitoring at the state and central level.

1.10.3 Uncertainty and Sporadic Changes in Scheme Guidelines

There is lack of smoother and longer-term guidelines, which causes each scheme to only be operational for a part of the year (on average five months) and not the full twelve months. On an average, it is seen that schemes are only effective for 5 months of the year and are not available to the farmers in peak demand months. As a result of this, farmers miss the cropping season and are unable to realize the true benefits of installing a micro-irrigation system.

1.10.4 Scheme Implementation and Operating Process

There are various inefficiencies in the operating process, especially with regard to the time and length of the process. In some states, the Scheme implementation and launch process goes through the months of August and September (even October in some cases), due to which a time lag crops up. By this time the main season has already ended. Hence, farmers are unable to draw the optimal benefit of the available technology. Therefore, ensuring timely completion of the process is paramount to safeguard the interests of the farmers.

1.10.5 Delays in Subsidy Disbursement

Method of subsidy payment has been an impediment in previous schemes and continues to be one today. There is also a continued problem with unavailability of funds in certain states. This is a result of approving installation of equipment when the funds for the subsidy aren’t yet available to the states. This causes a shortage of funds, which in turn causes delays in subsidy payments and therefore, uncertainty for the suppliers of micro-irrigation systems.

1.10.6 Absence of Easy Financing Mechanisms for Farmers

Financing for farmers continues to be a major impediment. Farmers continue to have difficulty finding financing options and even once they do, the collateral is very high. Finding ways to ensure easier financing norms for farmers should be a priority. There is precedence for loans to farmers without collaterals such as crop loans. (Anon., 2016)
1.11 THE SCHEME ON MICRO-IRRIGATION IN INDIA

The use of modern irrigation methods like drip and sprinkler irrigation is the only alternative for efficient use of surface as well as ground water resources. The scheme on micro-irrigation was launched during the year 2005-06 and it has been upscaled to be implemented as the ‘National Mission on Micro-Irrigation (NMMI)’ during the XI Plan period.

1.11.1 The Main Objectives of NMMI

- To increase the area under micro-irrigation through improved technologies.
- To enhance the water use efficiency.
- To increase the productivity of the crops and farmers’ income.
- To establish convergence and synergy among ongoing Govt. Programmes.
- To promote, develop and disseminate MI technology for agriculture or horticulture development with modern scientific knowledge.
- To create employment opportunities for skilled and unskilled person especially unemployed youth.

1.12 COMPANY INTRODUCTION

Baroda Agro Chemicals Limited (BACL) was incorporated in 1996 and create small pesticides formulation unit near Baroda with the capacity of 2 KL per day EC (Emulsififiable Concentrate) formulation and packing. It have pesticides formulation and packing facility with more than 150 KL/MT capacity per day with wide range of formulations, two unit producing only insecticide, fungicides, bio-fertilizers etc. in year 2012, company has two units started under new adventure Ravi plant biotechnologies limited (RPBL) producing only herbicides. In the beginning company deal with manufacturing business only exclusively there after company started marketing of is product and covered huge number of farmer using their product. Looking to the number of consumer, RPBL started new unit “KEESEN CROP MANAGEMENT” this unit is for exclusively Micro-irrigation system manufacturer and supplier to end customer which will be farmer. It is now need of all farmers to take all technological advantage to get better yield and get wealthier with help of advanced micro-irrigation systems. Company is committed to provide world class irrigation systems, parts and services to customer at competitive price.
Companies have world class machinery for manufacturing emitting pipe (drip line). It has create in-house testing in the laboratory facility with all modern equipments which are enough capable to identify right quality is delivered to our customer.

Company is very much interested to serve industrial and corporate customers who want to take drip line from us as per their requirement. Company have its own manufacturing facility, warehouses with good supply chain.

1.12.1 Name of the Company
Keesen crop management

1.12.2 Company Products
- Drip irrigation system
- Sprinkler irrigation system
- Mini sprinkler irrigation
- Different types of dripper
- Ventury assembly
- Valves
- Pipe fittings
- Different types of filters

1.12.3 Corporate Office
KEESEN CROP MANAGEMENT
(Under taking by Ravi Plant Biotechnologies Limited)
Survey No. 2/1, Village: Vaseti, Baska – Tajpura Road, Taluka:Halol,
Dist.: Panchmahals, Gujarat, India. Pin-code : 389350
www.keesen.co.in

1.12.4 Mission of the Company
To become leader in the business of Agro input contract manufacturing.

1.12.5 Vision of the Company
Company lead by honouring business commitment through most competent services & delight our value customers.
1.13 PRACTICAL UTILITY OF THE STUDY

Project work will be helpful to understand market and future scope in term of business expansion of Keesen crop management. The present study will useful to identify the market promotional activities preferred by farmers and dealers, farmers and dealers expectations from company in marketing their product in the district. The present study will be useful to understand the economics of MIS for different farm groups. In addition this, it will useful to analyse the organizational set up and the mode of working of the company in marketing their product at particular area.

1.14 OBJECTIVES OF THE STUDY

The present study “an assessment of future expansion of MIS of Keesen crop management in Jamnagar district” was planned with the following specific objectives.

1) To identify the farmers and dealers expectation and most promotional activity preferred by farmers and dealers.
2) To evaluate market on the basis of MIS in Gujarat state.
3) To find out factors affecting the adoption of MIS.
4) To find out future scope in term of business expansion.
5) To assess the economics of MIS in different farm group.

1.15 LIMITATIONS OF THE STUDY

The present study “an assessment of future expansion of MIS of Keesen crop management in Jamnagar district” having the following inherent limitation.

- The data collected from the company project report may be risky because it may not be adequate and reliable.
- This survey is restricted to Jamnagar district.
- The sample size for the survey of farmers were limited to 180 respondents, which might not be representing the whole district.
- The results were totally derived from the respondent’s answers. There might be a difference between the actual and projected results.