International Journal of Advance Research in Science and Engineering
Volume No.06, Issue No. 11, November 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

THE RISKS AND CHALLENGES OF MODERN AGRICULTURE

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ABSTRACT

Dramatic changes are occurring in the agricultural sector – changes which will result in agricultural industries having many of the characteristics of manufacturing industries. The rapidly changing business climate is creating a new agriculture with new risks. And many of these risks require new approaches and different perspectives to adequately assess and manage them. The new risks will create both challenges and opportunities for farm and agribusinesses and those who finance them.

Keywords: *Strategic risk, real options, risk score carding, credit risk, uncertainty*

I. INTRODUCTION

In modern conditions of world development the food security became the one of the main statement problems in the face of world community. Increasing of the population in some part of the world demands the appropriate quantity and quality of food supply. It involves the agri-food production into the changes having many of the characteristics of manufacturing industries. So, together with the advantages we have to manage also different deficiencies in terms of operating cycle as well as production and capital structure. It also associates with the land use and land rent relationships. Other problem facing the economic society is the search of the new investment and financial model and determination of the important and interesting spheres. To our opinion agriculture in modern condition of the reducing financial and investment activity precisely going to be the one of the most important both for business and society. On the other hand it is just a part of the world business environment which extremely depends on nowadays changes in financial sphere. But the other side of this problem is that agriculture is the risky activity describable by the different natural and financial instability. The rapidly changing business climate is creating a new agriculture with new risks. And some of these risks require new approaches and different perspectives to adequately evaluate and manage them. The new risks create both challenges and opportunities for agri food producers and those who finance them. So, in our paper we would like to evaluate the different risks for agriculture as the "old-new" investment sphere. To achieve this aim we have to answer for a few 'ex facte' simple questions: What types of risks is more powerful for agri-food production – natural or financial? What is the difference between managing financial risks in agriculture and other businesses? And, at last, is the risk management instruments the private or government area of responsibility and how they distribute the acquiring and failures?

II. HARVESTING AND PACKAGING OF THE PRODUCTS

A field is directly seeded or planted with transplants. With transplants, seeds are put into trays and grow within a greenhouse. When the plants are large enough they are transferred to the field for planting. Large commercial facilities use transplanting as there are higher yields and more opportunity for automation. In colder climates, the plants may be started in a greenhouse prior to the temperature being suitable for growing.

A plant needs four elements to grow and each cultivar needs them in different quantities and different specific details. The four elements are: light, water, nutrition, and atmosphere. The planting techniques used by the farmer are designed to ensure plants receive these elements while ensuring that harvesting is cost-effective. The first factor considered is plant spacing, which essentially means the space separation of the plant from its neighbors. Plants are planted in a row; the space between rows provides space for equipment. Within a row, there are typically several plants across. The inter-row space is lost production space and, thus, the farmer needs to minimize that space to maximize yields. Within the row, space in four directions is considered to optimize light to all leaves of the plants, water to the roots, and accessing the plants at harvest. If plants are too close, rain water won't reach the roots uniformly, bottom leaves of the plants will not receive light, and depending on the plant itself, the plant may not form properly. If the plants are separated too greatly, the yields per square foot are reduced. Our Growing System's design optimizes the delivery of light, water, and nutrients to each plant thus providing the best possible growing environment.

Water delivery through rain or irrigation will be included in plant spacing consideration. Water is delivered through rain, enhanced with sprinklers or irrigation methods. Currently, world food production depends heavily on rain fed agriculture. Only 20% of the world's farmland is irrigated, but that farmland produces 40% of the world's food supply. (Howell, T. A. 2001. Enhancing water use efficiency in irrigated agriculture. Agron. J. 93, 281–289). The highest yields obtained from irrigation are more than double the highest yields for rain-fed agriculture. An advanced method of irrigation delivering fertilizer with water is called fertigation. The fertilizer is injected into the water being delivered to the plants. Large irrigation systems use "tapes" which are long flat flexible hoses placed in the rows of vegetables. The tape has small holes that release fixed amount of water to each plant. The holes are spaced in standard positioning and typically a plant will be located at each hole. The capital cost of this form of irrigation system is large and there are many technical problems, the most common being that water is not delivered because the holes are blocked by insects, fertilizer, and other debris. Another difficulty is that once the system is in place, tilling of the soil and removing dead plants can damage the irrigation system. The holes will plug and water will not be released. Further, plants must be positioned correctly with respect to each hole.

Nutrition is delivered in the form of fertilizer. Typically, the soil is fertilized prior to the planting. Once the plants are growing, it is difficult to deliver the fertilizer, and the fertilizer can damage the plants. Our Growing System's watering system provides water directly to the root's of the plant containing the exact amount of fertilizer (nutrients).

Harvesting methods are Continuous,One Time, or Cut-and-Come-Again.

In Continuous harvesting, the harvesting does not destroy the plant and is repeated on some cycle suitable for the plant. This method is used for strawberries, cucumbers, tomatoes and the like as the plant continuously flowers and produces vegetables or fruit for a complete cycle.

In One Time harvesting the crop is cut and the plant destroyed. Depending on the plant, the root might be harvested or handled post-harvest. Iceberg lettuce, carrots, and most other root vegetables are harvested this way.

Cut-and-Come-Again harvesting is traditionally used in backyard gardens or by small farmers. In this harvest method, the plant is cut above the crown. After some time, the plant regrows the vegetation that has been harvested. Almost all green vegetation plants (even celery) may be harvested this way. But the need for harvesting skills, long grow times, and short growing seasons make the method impractical for most commercial agriculture operations. “Cut-and-come-again” harvesting is an economically effective method of harvesting, as it enables the time and materials used to create a strong root structure to be reused multiple times by multiple harvests of the vegetable canopy. Our Growing System's design provides a growing environment that is economically viable to perform “cut-and-come-again” harvesting.

Harvesting of plants is either by hand or machine. When done by hand, its labor intensive, and by machine capital intensive. When choosing hand or machine harvesting, the selection is dependent on the cultivar, produce quality required, damage caused by harvesting, and plant spacing.

The time for harvesting is usually a short window before the winter season. In warmer locations, multiple harvests may be performed all year. Crop harvest must be performed at the optimum stage of maturity. Full red, vine-ripened tomatoes may be ideal to meet the needs of a roadside stand, but totally wrong if the fruit is destined for long distance shipment. Factors such as size, color, content of sugar, starch, acid, juice or oil, firmness, tenderness, heat unit accumulation, days from bloom, and specific gravity are used to schedule harvest. The result of harvesting at an inappropriate stage of development can be a reduction in quality and yield. Unfortunately, plants within a specific field will not be consistent due to factors like seeds, water distribution, and weather patterns, fertilizer distribution, to name a few items. While a target date can be estimated in well in advance, the actual date cannot be confirmed without regular and thorough measurements, which improve the accuracy as the date approaches. Once the harvest date is set, the weather can seriously impact the ability to actually perform the harvest. For example, a severe thunderstorm would stop a harvest due to danger to the harvesters, while a severe heat wave would damage the produce during the harvest. Our Growing Systems allow harvesting to be performed at the optimum time to maximize the qualities demanded by the consumer.

Once a harvesting date has been determined, the time of day and the weather affect the quality of the harvested produce. Plants have dew on them and release moisture at night. Vegetables are best harvested in the cool morning hours so that they stay crisp and store longer. If harvested too late in the day, they become limp and wilt quickly, having evaporated much of their moisture and absorbed the midday heat. This is especially important for leafy greens like lettuce, chard and fresh herbs such as parsley and basil. It also applies to crisp fruiting vegetables like peas, and anything in the cabbage family like broccoli and radishes.

It has been estimated that more than 40% of perishable commodities are lost after harvesting through post production since they are living, respiring tissues that start senescing immediately at harvest. Freshly harvested vegetables are mostly comprised of water, with most having 90 to 95% moisture content. Water loss after harvest is one of the most serious post-harvest conditions. Consequently, special effort is required to reduce the effects of these naturally-occurring processes if quality harvested in the field will be the same at the consumer level.

Special skills are required for proper harvesting, handling, grading and packaging of vegetables in order to ensure optimum produce quality at the marketplace. It makes little difference what the quality is at harvest if it is reduced by poor handling, packaging or storage conditions. Price received for produce is determined by quality at the marketplace, which occurs after harvesting.

Harvested vegetables remain fresh through respiration. Higher respiration rates indicate a more active metabolism and usually a faster deterioration rate and may result in more rapid loss of acids, sugars and other components that determine flavor quality and nutritive value. The increased oxygen demand due to the higher respiration rates of fresh-cut products dictates that packaging films maintain sufficient permeability to prevent fermentation and off-odors. The physical damage or wounding caused by harvesting increases respiration and ethylene production within minutes, with associated increases in rates of other biochemical reactions responsible for changes in color (including browning), flavor, texture, and nutritional quality (sugar, acid, vitamin content).

Rapid cooling as soon as possible after harvest is essential to the maintenance of optimum quality. The first consideration at harvest is removal of the produce from direct sunlight, and secondly, to pre-cool as quickly as possible. There are a number of pre-cooling methods available a) Room Cooling, b) Pressure Cooling, c) Hydro-cooling and d) Vacuum cooling.

Room Cooling is exposure of produce to cold air in an enclosed space. This is the simplest and most common cooling method. Cold air normally is discharged horizontally near the ceiling so as to enable it to return through produce stacked on the floor. Since cooling is slow, shipments may be delayed or in some cases the product may be shipped without adequate pre-cooling. Certain commodities, such as snap beans, may deteriorate before cooling is accomplished. These problems are minimized by ensuring that containers are stacked to facilitate good air circulation. Fans must be powerful enough to move the air at a velocity of 2 to 4 miles per hour among the containers, which should be vented adequately.

Pressure cooling is used for strawberries, fruit-type vegetables, tubers and cauliflower. It is accomplished through the use of fans and strategically-placed barriers so that cold air is forced to pass through the containers of produce. This method usually takes from 1/4th to 1/10th the time required to cool produce by passive room cooling, but takes two or three times longer than hydro or vacuum cooling.

Hydro-cooling is used for stems, leafy vegetables and some fruit-type vegetables. Hydro-cooling is one of the most efficient of all methods for pre-cooling. Produce is drenched with cold water, either on a moving conveyor or in a stationary setting. In some cases, commodities may be forced through a tank of cold water. Hydro-cooling is an excellent method for bulky items such as sweet corn, peaches, or cantaloupes. Good water sanitation practices must be observed and once cooled, the produce should be kept cold. The cold water must come in direct contact with the product, so it is essential the containers be designed and filled in such a way that the water does not simply channel through without making contact.

In vacuum cooling, commodities are enclosed in a sealed container from which air and water vapor are rapidly pumped out. As the air pressure is reduced, the boiling point of water is lowered so the product is cooled by surface water evaporation. Vacuum cooling works best with products that have a high surface to volume ratio, such as lettuce or leafy greens. The method is effective on produce that is already packaged providing there is a means for water vapor to escape. Moisture loss from the commodity is generally within the range of 1.5 to 5.0%. Generally, about 1% of the weight is lost for each 10o F the product is cooled. Our Growing Systems enable the temperature at the time of harvest, through packaging, to be completely controlled, thus reducing the complexity of handling and reducing the adverse effects on the product through the packaging process.

One of the major problems encountered during storage of certain vegetables is chilling injury. Another important consideration in order to maintain optimum storage conditions is relative humidity. Small fluctuations in temperature can cause wide fluctuations in relative humidity. Products stored at less than optimum relative humidity will suffer excessive water loss and begin to shrivel. Many vegetables are unacceptable for marketing if weight loss reaches 5% because of their undesirable appearance and undesirable textural changes that may accompany water loss. Leafy vegetables are among the less tolerant crops to dehydration.

Storage of different cultivars together may or may not be safe. There is a cross-transfer of odors and volatile compounds such as ethylene are emitted by some cultivars that may be harmful to others. Ethylene also stimulates ripening of many fruits and vegetables. This ripening effect is negligible at low temperatures (e.g., 32° F), but it may have an effect at higher temperatures. Traditional farmers use internal-combustion engines in and around farms and the engines release some ethylene in their exhaust. Several commercially-available materials either absorb ethylene directly or convert it to inactive compounds. Certain types of activated or brominated charcoal absorb ethylene; however, some cheaper materials utilize potassium permanganate to oxidize ethylene to simple carbon dioxide and water. Manipulation of the storage atmosphere, whether in large storerooms or in small packages, can reduce the detrimental effects of ethylene. In general, reducing oxygen and increasing carbon dioxide serves this purpose and is a commercially acceptable procedure for some products.

A key element of food safety of commercial vegetables is traceability. Traceability is the ability to verify the history, location, or application of a vegetable by means of documented recorded identification. Traceability implies that when a consumer in New York City gets sick from eating a salad purchased locally, it will be possible to trace the salad to the manufacturer, through the supply chain to arrive at a farmer in Idaho. The farmer may then check his/her records for the day when the romaine was harvested, to identify a worker, who skipped a standard procedure, and went from helping clean the pig pen to harvesting the romaine lettuce. The need for traceability is strong on a farm where volumes are high and contaminants from animals, ground water, and the environment have easy access to the vegetables.

The green revolution which is often characterized by the introduction of high yielding of seeds and fertilizers, undoubtedly increased the productivity of land considerably. But the growth in the productivity has been stagnant in recent years, resulting in a significant decline in the income of farmers.

There have aiso been negative environment effects in the form of depleting water table, emission of green house gases, and the contamination of surface and ground water. Needles to say, the agriculture sector in a state of distress, which is severely affecting peasants and marginal farmers and urgent policy intervention are required to protect their interests.

These crops are not only input intensive, but also have negative environment consequence in the form of depleting water table and the emission of green house gases. The policy response to this problem has always been to disincentives farmers from growing these crops by making merge enhancements in the MSP. However, this is not sufficient and has to be complemented with huge investment in public infrastructure.

A study conduct by the national mission for sustainable. Agriculture on micro irrigation in 64 districts of 13 states(Andhra Pradesh, Bihar, Chhattisgarh, Gujrath, Harayana Karanataka, Maharashtra, Odessa, Rajasthan, Tamilnadu, Sikkim, Uttar Pradesh and Uttarkhand), reveals that they were significant reduction in the use of water and fertilizers but the yield of crops increased up to 45% in wheat,20% in gram and 40% in soybean . However, high initial costs deter farmers to adopt this technology

Agriculture has played a key role in reducing Bangladesh poverty from 48.9%in2000 to 2016. It is high value in agriculture, including horticulture live stock poultry and fishers to foster future growth and future reduce poverty

Realigning priorities to sustain growth in to the future: Today the largest share of public expenditure for agriculture goes a to subsides .at the same time nearly half of the farmers are overusing chemical fertilizers, which create environment and health hazards .

An enabling environment for robust rural non-form growth and more efficient value changes. For non-form growth to flourish , it is essential to make it is a for enterprises to do business. Access to finance power roads technology and information along with removing discriminatory taxes and stifling regulations are needs .It is also important to ensure food safety stands build modern market infrastructure and promote agriculture related non-form enterprises such as trading and processing.

In household -level panel data on small holders farmers in Ethiopia to estimate how rural population density(RPD) affects agriculture intensification and productivity.

Over all increased input use does not lead to a corresponding increase in staple crop yields, and thus farm income declines as population .

In some situations where farmers in areas of high RPD may be stuck in place, unable to Sustainably intensify in the face of raising RPD and declining farm sizes .

III. TO OVER COME TO ALL THE PROBLEMS

The ability of the global food and agriculture system to meet the future demand for food, feed and fibre could be severally limited by a number of risks and challenges. The most important risks is the hunger and malnutrition could persist or even continue to risks in spite of food supplies that are either sufficient at aggregate levels . This is because of the soils that were found to be very deficient in nitrogen and phosphoric acids. Moreover, the paddy crops would not allow growth without phosphoric paddy and straw takes up from one acre of soil, only about 35lb of N,9lb of P_2O_5 and 42 lb of K_2O,the actual manorial does of NP_2O_5 are more. The above problem can be rectified to some extent by the usage of bio fertilizers. Azolla is a bio water fertilizers. There may be water problem in some areas which can also be decreased by the use of water fertilizers. The use of bio-fertilizers like azolla not only increases the rice productivity but also improves the long terms soil fertilizers symbiotic association with blue-green algae anabaena Azolla. Azolla is an efficient nitrogen fixing agent. The efficient biological nitrogen fixes and bio fertilizers as green crop re duction of NH_3 volatilization and increased efficency the ability of nitrogen fixation is due to the presence of the symbiotic cyano-bacterium, Anabaena that occurs in the dorsal leaf cavities of the fronds. nitrogen fixing capacity of azolla has been estimated to be 1.1kg N/ha/day and this fixed nitrogen is sufficient to meet the entire nitrogen requirement of rice crops within a few weeks. Azolla is of great agronomic value for rice crops where it is used as dual crop with rice and contributes 40-60kgN/ha per rice crop.

IV. ADVANTAGES OF AZOLLA

- Azolla easily grows in wild environment and even can be grown under controlled environment like poly house and green house
- Azolla can be grown in large quantities, if requires and used a green manure in both kharif and rabi seasons
- Azolla can fix atmosphere CO_2 and nitrogen to form carbohydrates and ammonia respectively. After decomposition it adds available to the rice in the field .
- Azollasolublities Zn, Fe and Mn and make them available to the rice in field.
- Azolla reduces water evaporation rate from irrigrate field.
- When used as supplemental feed in daily. It helped to increases the milky yield.

V. CONCLUSIONS

Global demand for food is on the rise. Demand is driven by population growth and developing world consumers adding more protein to their diets. The Food and Agriculture Organization (FAO) and others project that global agriculture production must double by 2050 to close the gap between food supply and demand.

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