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**LESSONS FROM AGRICULTURE:
AN INTEGRATIVE APPROACH**

by

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INTRODUCTION

The teaching of Christian values in the classroom is not always easy and effective when approached per se. Learning is a process of integration and is best when the lessons are meaningfully related to the experiences of the learner (Gregorio, 1990).

In the classroom, teachers are often in a quandary as to what to use for illustrations to bring about the lessons on virtues they like to impart. However, to teachers whose creative minds go beyond the four walls of their classrooms to the boundless resources of creation, “nature provides rich materials from which to draw lessons on values” (White, 1949). Through agriculture, the teacher would be able to put across effectively the lessons in values with interest to the youth and without any danger of misinterpretation and distortion. The Lord Jesus, Himself, used in His parables the plants; (the lilies of the fields and how they grow); the birds (the sparrows); the animals (the parable of the good shepherd); and agricultural practices of His time (the sower, the harvest, etc.) to illustrate the unlimited goodness of God and His coming kingdom.

The study of agriculture is full of challenges and rich opportunities for discovering God’s purposes in our lives as well as new ways of improving production and quality of plant and animal life. Ellen G. White, herself, made extensive use of object lessons from nature in her book Education to put across moral and spiritual principles.

Purpose of the Study

It is the purpose of this paper to present some agricultural practices often done in tropical regions such as the Philippines and from these practices draw spiritual implications to the teaching of Christian values to both agriculture and non-agriculture students. The objectives of this study are :

1. To integrate faith and knowledge of the truth in agricultural technology and practices and help the learners discover God's intentions for His children.
2. To draw the minds of the learners to find interest in the greatest source of knowledge-- the Word of God, and
3. To seek to improve the teaching of agriculture through the integration of value-laden lessons and activities in the curriculum.

Limitation of the Study

There are several practices utilized by farmers to ensure quality and high productivity in crops. However, this particular paper presents only three of these practices: hardening of seedlings, hot water treatment of seeds and fruits, and pruning and defoliation.

THE WHYS OF AGRICULTURE

Agriculture Defined

Agriculture is defined by Pava and Abellanosa (1995) as an art and science of raising plants and animals. It is an art because raising plants and animals requires skills and practices that produce

beauty and pleasant arrangements of plant and animal combinations to satisfy man's aspirations for perfection of his environment.

Morris (1971) defines agriculture as the science, art, and business of cultivating the soil, producing crops, and raising livestock useful to man. Likewise, Moshner (1966) defines agriculture as a special kind of production based on the growth processes of plants and animals.

Agriculture is a science because knowledge and skills are learned through systematic discovery - discovery of facts and principles, through the formulation of hypotheses, testing of hypotheses, designing of experiments, gathering of facts, analysis and interpretation of facts until a general conclusion and recommendation are arrived which ultimately become a general practice.

Agriculture spans the activities of man for he has to eat in order to survive. Even man's aesthetic activities involve agriculture. The processes of landscape gardening include the arrangement of shrubs, trees, flowers, and stones in their proper places and perspectives to effect beauty for the enjoyment of man.

AGRICULTURAL PRACTICES THAT CAN BE INTEGRATED IN THE CURRICULUM

Hardening of Seedlings.

Practices in agriculture, even those which seem harsh, have their own purposes and are at the end for the benefits of the plant. Many plants are fragile and sensitive to external forces such as drought, storm and strong winds, weeds and pests, etc. For them to survive these external threats,

young plants must be strengthened and prepared before they are exposed to these natural enemies in the open fields. Subjecting them to various rigorous treatments may enable the plant to develop stiff and tough tissues and grow into stalwart, healthy and resistant plants (Knott and Deanon, 1978).

Any treatment that makes plant tissues tough and firm is desirable prior to field setting so as to enable the young plants to better withstand the rigors of transplanting as well as adverse conditions such as higher or lower temperature, strong wind, dry soil or air, and heat (Knott and Deanon, 1978).

Hardening is usually accomplished by exposing the seedlings to less favorable conditions in order to reduce the rapid growth. The best and most practical method under tropical conditions is by exposing the plants to direct sunlight a few hours a day. The transition will prepare the plants to change from indoor life to outdoor life and lessen the shock of physical transplantation which can be quite damaging (Johnston & Brindle, 1976).

Strong, stocky plants that have been properly hardened in the seedbed have higher resistance to transplanting shock better than soft, succulent plants.

Physiological Explanation

During the hardening process, the plants undergo certain changes. With the reduction of the water content in plants, the osmotic concentration increases correspondingly. Growth processes are slowed down, thus making the plant tissues firm and tough. There is an accumulation of carbohydrates, pectins, nucleic acids, and various proteins in the tissues of the plant (Halfacre & Barden, 1979). The carbohydrates that accumulate in the plant tissues provide materials to hasten the development of the new shoots and new root system and thereby enable them to be established

more readily (Adriance and Brason, 1967). This root system serves as conduit which supplies the top of the plant with adequate moisture more efficiently than unhardened plants. Furthermore, hardened plants do not rapidly lose water by transpiration.

Spiritual Implications

In agriculture, problems of plant diseases and threats from natural calamities pose great dangers to plant survival in the open fields. Unless the plants are prepared for these enemies, they will not survive.

Actually, the hardening treatment is less favorable to the growth of the plant. It deprives the young seedling of adequate moisture and causes it to suffer direct heat of the sun that most often makes the leaves temporarily experience wilting. This agricultural practice may seem harsh but without subjecting the seedlings to the hardening process, they can remain succulent and tender and will have a slim chance to survive transplanting in the open field.

In like manner, young people today are bombarded by all kinds of contradicting values from the various media, and unless they are prepared to sift them, they will succumb to their devastating effects.

Young people who come to our Adventist colleges must be prepared to deal with problems and temptations which are brought by the fast changing technological society. Students who are weak in faith could easily succumb to youthful temptations. It is then the burden of every Christian teacher to help the students understand that these experiences, trials, and temptations in life when viewed in the perspective of God's love are for the strengthening and refining of every Christian

character. Lessons in agriculture could help develop in them faith and a deeper relationship with the Creator.

Ellen G. White said that we are God's spiritual plants (ML. p.273). The heavenly Father is the husbandman (FE, p.111). In His great love, He allows His children to undergo unpleasant experiences that they will develop strong qualities that would enable them to weather greater obstacles ahead.

Trials, if borne bravely, advance character-building (MB, p.117). They strengthen faith (4T, p. 76); renew courage (1TT, p.464); develop steadfastness of character (COL, p.61), and refine and purify (AA, p. 261). The Apostle Paul tells us not to be indifferent to trials. In fact, he encourages us to be happy about them. In 1Peter 4:12, Peter says : Beloved, think it not strange concerning the fiery trial which is to try you... But rejoice inasmuch as you are partakers of Christ's sufferings, that when His glory shall be revealed, you will also rejoice exceedingly.

At the end, like Job of old after a succession of trials, these young people could say: "But He knows the way that I take; when He has tested me I will come forth as gold" (Job 23:10). And like the Apostle Paul, life becomes perfect through suffering (Hebrews 2:10).

THE USEFULNESS OF HEAT TREATMENT

The Functions of Heat in Agriculture

In some areas where farm technology is limited by traditional practices, a more convenient way of germinating seeds and preservation of fruits could be done through the use of the simple heat treatment.

For seed types that are difficult to germinate, exposure to heat for a short time will disturb the seed coat sufficiently to permit passage of water and gases and stimulate the seeds to germinate.

A graphic example of this phenomenon is a burned field or forest after a soaking rain. It is observable that many new seedlings grow in areas that have been burned over which does not occur in unburned land. The heat from the fire has disrupted the hard coats of the seeds lying just under the soil so that the water is able to penetrate the embryo and cause germination.

In another function, heat is practically applied to check fungal infections on fruits. It is found out that heat is effective in controlling incipient or latent anthracnose infections in mangoes (Spalding, 1972). In the Philippines, farmers usually subject their lychee trees to excessive heat that simulates drought in order to stimulate the trees to flower (Agriculture, 2000, p. 13).

Where Heat Treatment Is Needed

Many seeds of trees and some plants have hard seed coats which often contain inhibitors that prevent quick germination (Copeland, 1976). A good example of seeds with tough coats are the seeds of mimosa and persimmons. Other seeds have developmental structures that inhibit germination. For example, the endosperm of date and redbud encloses the embryo completely so that germination cannot occur normally. The bonelike seeds of peach, almond, and blueberry develop from the endocarp of the ovary wall whereas beet seeds are enclosed in the coalesced pericarps and calyx bracts of the inflorescence. The seedcoat alone or in combination with the various other structures that enclosed the embryo may delay germination in any one of several different ways.

Heat Treatment Procedures

For seeds that are tough, a convenient method is to pour the seeds into a container of boiling water with the volume of water equal to three times the volume of the seeds. The heat is turned off immediately after the seeds are added. The seeds are allowed to remain in the gradually cooling water for 24 hours (Horticultural Science, 1983, pp. 81-82).

Another procedure would be to place the seeds contained in a cloth bag in boiling water and left there for 2 minutes, the actual time varying with the kind of seeds (Adriance, & et.al., 1955).

Heat treatment, as applied to fruits, uses temperature which could be lethal to the infectious organisms but does not alter the quality of the fruits. The recommended heat for carabao mango (Philippine mango) is 53 degrees centigrade for 10 minutes. For control of anthracnose, a benomyl solution heated at 50 degrees centigrade for 10 minutes at 1000 ppm. could be useful.

Hot water treatment can raise the pulp temperature of mangoes to initiate considerable ethylene production and ripening changes. The excess heat which may threaten the fruits could be removed rapidly by immersing the fruits in ice water (23 C) for 4-6 minutes (Spalding, 1972).

Spiritual Integration

Heat is allied with various meanings. It could mean comfort at a time when the temperature is cold. It could also mean a burning desire to fulfill one's purposes in life. However, in a scorching tropical region, heat is a source of discomfort, often causing sickness as well as famine in its extreme.

Using the analogy of heat, a classroom teacher could bring out moral implications that touch on the personal lives of many college students.

For example, in the Philippines where most college students are young and financially dependent on their parents, requiring them to fulfill several work hours while at the same time studying is looked upon by many as a burden and an encroachment into their personal rights (Santosidad, 1989).

However, through modeling and the use of Biblical illustrations to put across the lesson, students could be led to understand the very truism that work is more constructive than destructive (UNESCO, 1985). It is through their work that their emotional attitudes and dispositions are formed (White, 1994). As the Bible enjoins everyone to “Go to the ant you sluggard; consider his ways and be wise .” (Prov. 6:6), each student could be made to understand the real purpose of work.

Likewise, the passivity of many student learners can create problems in the classrooms especially in classes which require research and field practicum. This attitude is like a fungus that retards the growth of knowledge and destroys human capability. But the teacher could point the students to Jesus who, while still in earth, was tirelessly on His feet bringing healing and comfort to those in need.

However, just as heat can also be useful, the energy of the students could be channeled to a more profitable activity, like flower gardening, grafting, and other related work, that would divert their minds from destructive vices such as drug use. Furthermore, students should be led to understand that any discomfort or trying experience has its own benefits. As the Apostle Paul says in James 1:2-4 “Consider it pure joy... Whenever you face trials of many kinds, because you know that the testing of your faith develops perseverance...so that you will be mature and complete, not lacking anything.”

The Christian life is a daily conflict waged between good and evil. God in His providence allows His children to meet fiery trials (hot treatment) to soften their selfishness and “hardheadedness.” The three Hebrew youth, though obedient to God, literally experienced the “hot treatment” from King Nebuchadnezzar (Dan. 3) and came out with much stronger faith in God.

PRUNING/DEFOLIATING OF TREES

Definition

Pruning is the removal of certain parts of the plant to produce some definite modifications in the portion that remains (Adriance & Brison, 1955). Steiner (1952) looked at pruning as a violent but effective means to restore the vigor of neglected, old shrubs.

Rationale for Pruning

Pruning the topmost branches will allow the sunlight to reach the midsection of the tree. However, pruning is only done when the trees are dormant and not when they are flowering or already bearing fruits (Ballesteros, 1993). Also, pruning must be done when trees are dormant, that is without leaves, so that the branches could be seen easily (Childers, 1976).

Plants that are pruned develop new shoots and are more prolific and sturdier (Steiner, 1952).

A. Fruits and Nut Trees

For fruits and nut trees, the following are reasons for pruning or defoliating :

1. To develop a strong trunk and scaffold system of branches that are well distributed around the tree and which are able to support heavy loads of fruits without limb breakage.
2. To control fruit production. Proper pruning encourages the development of productive fruiting shoots and gives a thinning effect that can improve fruit size and quality.
3. To remove excess, dead, or interfering branches in order for the light to penetrate the lower portion of the tree and allow spray materials to reach the inner branches, thus, facilitating control of insects and diseases.
4. To limit the tree size to the space allocated, or limit tree height so fruits can be conveniently harvested.

B. For grape vine, pruning is done

1. To aid in the establishment and maintenance of the vines;
2. To distribute the fruiting wood to obtain the maximum production of high quality fruits;
3. To maintain vigor and production of fruiting canes;
4. To aid in the control of crop size and increase berry size by reducing the number of fruiting clusters (PCARRD, 1977)

Physiological Responses

According to Adriance & Brison (1955), all plants if not pruned tend to develop a balance between growth of the shoot and the root systems. Cutting away a part of the top, including the plant's photosynthetic apparatus and food storage tissues, together with reduction of the number of

vegetative points and flower buds while leaving the root system intact leads to the following physiological reactions:

1. The total number of growing points is reduced resulting in fewer developing shoots, fewer leaves, reduced photosynthesis, reduced amounts of carbohydrates translocated to the roots, reduced root growth, followed by a reduction in mineral and water absorption which in turn further decrease shoot growth. The effects dwarf the entire plant. The remaining growing points following pruning which utilize all the stored foods in the plant usually show a strong shoot growth. With a judicious use of fertilizers and ample supply of moisture, together with moderate pruning, an increased vigor of shoots is seen (Halfacre, 1979).

2. Moderate pruning of fruit trees can increase production. By removing those branches that are nonbearing, the photosynthates that are supposed to be utilized by them are instead used for production of fruits (PCARRD, 1991)

Similar study done on plants was done with the removal of corn leaves at a five-leaf stage. Results showed that an increase of 39% in yield is attained (Santosidad, 1983). The increase in production is attributed to the alteration in the use of energy for the development of grains instead of vegetative growth (Hicks, 1977).

Spiritual Implications of Pruning

Human character is not perfect in every stage of life. The words of the Lord Jesus Christ found in Matthew 5:20 "Except your righteousness shall exceed the righteousness of the Scribes and the Pharisees you shall in no case enter the kingdom of heaven" describe the spiritual state of man.

The Bible describes the nature of man which may bar him from inheriting eternal life. Such sinful nature as “sexual immorality, impurity and debauchery, idolatry, hatred, discord, jealousy,” etc. which the Apostle Paul described in Galatians 5:19-21 need to be pruned to fit man to live in His kingdom of glory.

Disobedience to His moral law could result in an unwanted pregnancy, a stint in jail, a broken relationship, a loss of a good name, a failing grade, and a bothered conscience.

God’s pruning scissors are sharp and the wounds left may be painful. But by allowing God to remove or cut all the unwanted “branches” of selfish ambitions, worldly desires, lust of the flesh, malice and hatred toward our fellow men, we become healthy, productive Christians bringing forth fruits in deeds of love . As Christians, we need to continuously draw spiritual nourishment from the word of God so that we may grow spiritually healthy and bear the fruits of the Spirit. (Gal.5:22)

SUMMARY AND CONCLUSION

Many people in this present world are seeking for pleasure. They are willing to pay the high cost of so-called “happiness” if only to satisfy their worldly lust. While God is not at all anti-happiness, He wants His followers to be happy but He desires His people to have a more lasting joy in contrast to the short-lived happiness that the world can offer.

The Holy Scripture say that the way ahead is not easy. Jesus tells us to “Enter through the narrow gate for wide is the gate and broad is the road that leads to destruction, and many enter through it. But narrow is the gate and narrow is the road that leads to life, and only a few find it.” (Matt. 7: 13-14)

Olympic athletes while preparing for the big event do regular and rigorous practices daily. They run, they exercise, they do strenuous activities or pass some obstacles. All these, plus proper diet, condition their bodies and make them physically fit for the best performance of their lives.

Christians, too, are running a spiritual race. It may not be as spectacular as an Olympic event but essentially more rewarding and lasting, for eternal life is the ultimate prize. But heaven is a place for people whose character has been “polished after the similitude of the palace.” That’s why Christ initiates His people with spiritual obstacles to allow them to experience numerous tests so that they will attain “perfection through suffering” (Heb. 2:10).

In the other hand, God “doth not afflict willingly nor grieve the children of men” (Lam. 3:33). “While He permits trials and afflictions, it is for our own profit, that we might be partakers of His blessings” (Heb. 12:10). If received in faith, the trial that seems so bitter and hard to bear will prove a blessing. The cruel blow that blights the earth will be the means of turning our eyes to heaven. How many there are who would never have known Jesus had not sorrow led them to seek comfort. (MB, p.10).

The hardening of seeds and seedlings, the hot-water treatment of seeds, and pruning of branches are indeed “painful” agricultural practices for plants. But the orchardman faithfully does them, not to torture or torment his crops but in the contrary for the total good of his plants for them to be healthy and finally to bear much fruit.

The words of God’s messenger Ellen White expressed beautifully the purposes of God in allowing trials to come to His followers. She said:

“The trials of life are God’s workmen, to remove the impurities and roughness from our character. Their hewing, squaring, and chiseling, their burnishing and polishing, is a painful process; it is hard to be pressed down to the grinding wheel. But the stone

is brought forth prepared to fill its place in the heavenly temple.” (Thoughts From The Mount of Blessings. p. 10)”

Such is the end purpose of God for His children and which every teachers must help the students to see and understand through the various aspects of the agricultural practices.

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