Chapter 5
Demand for a Better Quality Input: Solutions

Productivity related issues of the agricultural sector in the survey area were discussed in the previous chapter. It was proved that the major sources of productivity deceleration were soil erosion and unwanted application of inorganic fertilisers. Though the farmers have sincere desire to step up the potential of their farmlands they are in a dilemma; they are not capable of making any fruitful efforts, as they do not possess the required knowledge and finance for the improvement programme. The farmers gradually come to know that the agricultural practices they have been following were not sustainable and realised that they can do nothing. These twin hurdles are equally important and complementary. Declining productivity has been acting as a vicious circle on the demand side. Low productivity means low incomes at the subsistence level and low incomes left nothing for further investment to launch any productivity enhancing programmes. The consequence will be a much lower productivity in the coming years due to the present unsustainable practices. At the same time farmers are unaware of what they must do to break this vicious circle. The dead lock is complete. This chapter focuses on the following.
1. Valuing the deterioration of environmental quality in the form of soil degradation.

2. The features of environmental quality as a production input.

3. The concepts of Willingness to Compensate Deterioration and Willingness to Accept deterioration in respect of land fertility.

4. Solutions to the environmental problems leading to deceleration of land productivity.

5.1 Distinction between Value and Price

Neo classical economists especially Marshall believed that value is nothing but the price of the commodity or object in question. The neo classical valuation requires a well defined market in which the demand and supply forces together determine value. In their view there are goods which do not enter into the market; those goods do not fetch any economic value rather than to have a use value. These goods have only use value as they are ‘free gifts of nature’. It is quite obvious from the basic principles of economics that the underlying assumption in determining value is that values can be measured by the preferences of individuals. In essence the neo classical theory of valuation is a scarcity and preference based one which brought a good deal of harm to the environment and put the existence of the humanity on a verge of peril.
The outcome of human induced development was that, what men considered as ‘free gift of nature’ and the concept of ‘abundance’ became no more valid. Now most of the environmental goods and services are in short supply, which, unfortunately, are non-responsive to prices as no market exists for these goods. The supplier of such goods and services is nature or our environment that functions based on ‘natural law’ free from the perceptions of greedy men.

Now, one of the major problems that an economist faces along with his analysis is to find the true value of something. He might know the price of every thing but may not know the value of them. This view is a departure from the ‘scarcity’ and ‘preference’ based valuation. “The interaction of preferences with the various services provided by a commodity generates a variety of values; however, a useful starting point is the concept of Aggregate or Total Economic Value” (Bateman et al. 1-3). Now the basic principles of economic valuation undergo drastic conceptual changes. The economic value based on ‘scarcity’ and ‘preference’ is supposed to supplement the environmental value of goods and services. In the words of Turner “all the elements of Total Economic Value (TEV) can be seen as secondary to a primary environmental quality value, which is a necessary prerequisite for the generation of all subsequent values” (Bateman
et al. 1-3). The Total Economic Value as conceived on the theoretical and philosophical ground involves the practical problems of valuation. A practical problem with these Non-Total Economic Values is that they are essentially beyond the scope of conventional anthropocentric, preference based economic valuation. However, none can deny the fact that all economic values which all ‘rational’ men have been generating through ages were from the true environmental quality. Put differently, all the economic values have their significance and origin from the environmental quality. Then the usual question is what constitutes the true value for men and his living standard? No doubt; it is the environment.

The foundation of standard economics is that of an isolated circular flow of exchange value between firms and households. It is a closed system; nothing enters into it from the environment and nothing exits from it. The physical environment is completely abstracted from it. However the environmental economics or ecological economics views the economy, in its physical dimensions, as an open subsystem of a finite, non-growing and materially closed ecosystem (Daley 481-486).

However, the ‘preference’ and ‘scarcity’ based valuation is still valid but the objective of ‘rationality’ shall neither be the profit maximization of individual produces at any rate nor the utility maximization of individual
consumers. Instead, the rationality should focus on the maximization of the environmental value at the micro as well as at the macro level.

5.2 Contingent Valuation Technique

In the theory of consumer behaviour contingent valuation is widely used to elicit the consumer preferences towards a non-marketed good or service, say the quality of breathing air. The implementation of a CV involves a number of distinct stages. In the preparatory, stage a ‘hypothetical’ or contingent market is set up in which individuals are asked how much they are Willing to Pay (WTP) in respect of the proposed change or improvement. In these conditions generally, scientists try to elicit the value of willingness to pay or the willingness to accept. The latter is applied when people are willing to accept the damage that has occurred.

In the production theory, environmental quality enters as a production input in addition to other inputs. These other inputs are priced inputs and they are valued in their respective markets. The use of these inputs can be managed by the farmers. However, land fertility, though, is a marketable input to some extent so long as it is fertile; its deterioration within the present theoretical framework of economics is beyond the control of the farmer. The fertility deterioration of land occurs due to such causes as soil erosion and application of chemicals which are beyond the present
understanding and knowledge levels of the farmers. Once the fertility of land deteriorates, the market for land for agricultural purposes starts to collapse. When the fertility deterioration reaches a low level as indicated in fig. 5.1, all farmers turn to be the sellers of land whereas the demand for agricultural land for agricultural purposes becomes almost zero.

**Fig. 5.1**

*Market Failure: Land for Agricultural Use*

It is assumed that the demand for land for agricultural purposes is a positive function of land fertility whereas the supply of agricultural land (offered for sale by the occupied farmers) is a negative function of land fertility. The equilibrium position ‘E’ is quite unstable; a fall in fertility has a
cumulative effect of decrease on land price. At a low level of land fertility such as ‘F’ all existing farmers turn to be sellers (perfectly elastic supply) of their farm-lands but none is ready to buy it (zero demand).

In consumption theory ‘public goods’ are supplied by a public agency due to their ‘non-rivalry’ and ‘non-excludable’ characteristics. Being land fertility as a production input, its deterioration on a massive scale across a region through the spillover effects adversely affects the society as a whole. Any improvement of land fertility through public action or otherwise is non-rivalry and non-excludable for all the members of the society (Positive spillovers). For example, low price of food grains as a result of an increased production due to improvement in land productivity and pesticide free food items resulting from organic farming benefit the society at large.

In essence one should view land fertility as a public good (Vincent 1) as its quality deteriorates below a certain level. As we have noticed in the first chapter, the major form of capital assets of farmers in the Idukki district is the land they possess. The quality deterioration of land adversely affects the productivity per acre which is the sole source of income to the farmer community. Thus, one should view, land fertility as a production input which has direct relationships with productivity in the long run. The value of land deterioration can be measured by setting up a hypothetical or contingent
market for land fertility. At this juncture, one has to redefine the terms Willingness to Pay and Willing to Accept in line with the production theory.

### 5.3 Willingness to Compensate Deterioration (WTCD)

The procedure of valuing land fertility as a non-marketed production input and the farmer as a producer of farm products includes setting up of a contingent market and eliciting the amount of money that farmers are either ‘Willing To Compensate Deterioration’ (WTCD) or have a ‘Willingness To Accept Deterioration’ (WTAD). The first option provides opportunity for the optimistic farmers to reveal their valuation for improved fertility or quality improved land input. The second option is more suitable for those farmers who are pessimistic about the future of agriculture. They now wish to quit farming as an earning employment in search of other profitable occupations or believe that remaining in agriculture will be more troublesome.

Land degradation, of course, is the result of a long run process of intensive cultivation. In the same vein, the process of restoring land fertility will also take years. The question ‘how much you are willing to accept’ to continue the ‘state of degradation’ is not sound either on humanitarian or on economic grounds. That some people pay a certain amount of money to other people to accept the degradation or damage is the explicit evidence of
perpetuating inequality and in case of environmental goods and services it is brutal. The compensation principle of welfare which was mainly introduced by Hicks and Kaldor does not contain the element of environmental justice. The poor people are likely to accept the degradation or damage as they live in the margin. In this way one can infer that the compensation principle itself is a basis for perpetuating environmental inequality with the aid of financial resources. This is quite unnatural and unethical, if the criteria were to elicit Willingness to Accept Deterioration, the compensating person, authority or agency will have to compensate for infinite years, if the state of degradation continues. On the other hand, Willingness to Compensate Deterioration can be taken as a desire for investment, a desire for improvement. Not only that the elicited value of willingness to Compensate Deterioration may not be the same as that of the Willingness to Accept measure. Therefore the right choice is to elicit the WTCD for land improvement, especially for policy purposes. In formulating contingent markets for evaluating the value of such environmental quality what does matter is how much output will increase if the input quality increases.

5.4 WTCD in the Idukki District

A total of 360 farmers were asked to elicit their Willingness to Compensate Deterioration of their land fertility, if the fertility were stepped
up to a level during a previous year in which they got a good harvest. Most of them demanded further explanation regarding the question. However, only 347 (96%) farmers revealed their willingness. The remaining 13 (4%) farmers were not ready to answer a hypothetical question, even though the hypothetical situation was elaborated many times. Their arguments were surprising that they never could imagine such a market and expressed their desperation “nothing will happen here”. These farmers were non-responsive.
due to the prime reason that they lost their faith in agriculture which was once the prime motivating factor that encouraged them to cultivate again and again. The non- response of farmers is shown in Chart. 5.2

5.5 Average Willingness to Compensate Deterioration

Average Willingness to Compensate Deterioration is the sum of the amount of money that farmers are willing to pay for better quality or fertile farm-land per acre divided by the number of farmers who have elicited their willingness for payments.

\[ AWTCD = \frac{\sum_{i=1}^{n} WTCD}{nF} \] .................................(5.1)

\[ \sum_{i=1}^{n} WTCD = WTCD_1 + WTCD_2 + ... + WTCD_n \]

\[ nF = \text{The number of farmers} \]

1, 2,…, n are farmers

\[ AWTCD = \frac{9283000}{347} = 26752.16 \] .................................(5.2)

Source: Data collected from the Idukki district

The Average Willingness to Compensate Deterioration is estimated to be Rs.26752.16 per acre. It means that with the present state of affairs, farmers in the Idukki district on an average are willing to spend Rs.26752.16 for getting one acre of land improved to the level of a pre-determined quality.
5.6 Factors Affecting WTCD in the Idukki District

The factors affecting Willingness to Compensate Deterioration were examined in the background of the survey area in the Idukki district. The following variables were identified.

1. Range of Productivity Decline (RPD)
2. The Educational Attainment Scale (EAS)

Willingness to Compensate Deterioration of a production input is primarily influenced by the expected excess crop they can harvest if the input were as much productive as it were during an acceptable period. An acceptable period is one during which the farmer had a good harvest. Farmers evaluate all the future output with current prices. Then what does matter is the increase in output per acre. Those who have revealed their valuation imagines that the output level per acre will rise to that particular year or years in which they got a good harvest. Range of Productivity Decline RPD measures decrease in productivity from the view point of farmers and at the same time it gives the idea about the quantity of output they expect if the fertility were increased.

\[ EIP = RPD \]

Where, EIP = Expected Increase in Productivity.

RPD = Range of Productivity Decline
Secondly, Willingness to Compensate Deterioration is influenced by the level of Educational Attainment. Farmer’s educational attainment has been classified into seven groups and based on the level of attainment these groups have been converted to an Educational Scale ranging from ‘0’ to ‘6’.

The values elicited by 347 farmers as their Willingness to Compensate Deterioration has been regressed against the explanatory variables explained above and obtained the following regression.

\[ WTCD = 4878.814M_1 + 11.668M_2 \]……………………………………(5.3)

Where, \( M_1 \) = Range of Productivity Decline (RPD)

\( M_2 \) = Educational Attainment Scale (EAS)

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<tr>
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<td>M2</td>
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ANOVA

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<th>Mean square Sum</th>
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<td>Total</td>
<td>347</td>
<td>301095000000</td>
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Source: Primary data collected from the Idukki District

The regression obtained is passing through the origin, without any intercept. This is quite logical and natural that farmers wish to spend nothing, if they were not experiencing a productivity decline. An illiterate person also may offer nothing in view of productivity improvement if he does not feel productivity decline. However, fortunately all the farmers surveyed were all literate. Yet, mere literacy is not a sufficient condition for making right decisions in time for better management of farms.

5.7 Impact of Educational Attainment on WTCD

In order to estimate the impact of Educational Attainment (M1) on WTCD, one should assume that the value of M2 is constant or zero. Then allow the variable M1 to vary so that the sole source of variation is M1. How much it contributes when M1 changes by one unit is given by $\alpha_1 = 4878.81$. If the educational attainment steps up from one level to another level, the desire for improvement in monetary terms increases to about Rs.4878.81.
This is a strong case for educating the farmers. The Impact of M1 on WTCD is depicted in fig. 5.3.

Another problem in respect of the estimated coefficient of M1 is to prove whether it is statistically significant or not; that is different from zero. One should test the null hypothesis for it to be either rejected or accepted.

\[ H_0 : \alpha_1 = 0 \]

\[ H_1 : \alpha_1 \neq 0 \]

\[ \hat{\alpha}_1 = 4878.81 \]

One may make use of the confidence interval constructed for testing purposes. Such confidence interval is defined as

\[ \hat{\alpha}_1 - t_{\alpha/2}se(\hat{\alpha}_1) \leq \alpha_1 \leq \hat{\alpha}_1 + t_{\alpha/2}se(\hat{\alpha}_1) \]

\[ \alpha = 5\% \]

In this case, the confidence interval is

\[ 4878.81 - 1.96(627.103) \leq \alpha_1 \leq 4878.81 + 1.96(627.103) \]

\[ 4878.81 - 1229.122 \leq \alpha_1 \leq 4878 + 1229.122 \quad 3649.692 \leq \alpha_1 \leq 6107.936 \]
The hypothesized value of $\alpha_i$ is not included in this interval. Therefore with 95% confidence one can reject the null hypothesis. Change in M1 has significant impact on WTCD and the coefficient $\alpha_i \neq 0$, or it is different from zero. Hence the estimate is statistically significant. The true hypothesis is;

$$H_1 : \alpha_i \neq 0$$

$$\alpha_i = 4878.81$$

Fig. 5.3
Impact of Educational Level on WTCD

$${\tan}\alpha = 89.98$$

Source: Survey conducted in the Idukki District
5.8 Impact of Productivity Decline on WTCD

The impact of Productivity Decline on the Willingness to Compensate Deterioration can also be measured by the same procedure as adopted now. The other variable (Educational Scale) that affects the WTCD need to be assumed constant or zero and allow the Productivity decline variable (M2) to change. The impact of productivity decline variable (M2) on WTCD is measured as $\alpha_2 = 11.668$. Generally speaking, farmers are ready to Compensate Deterioration, on an average, Rs. 11.668, if productivity in the long run declines by one unit say one Kg. Farmers in the survey area are fragile that the proportions of productivity decline is very large. The impact of productivity decline on WTCD is depicted in fig. 5.4

The statistical significance of the coefficient $\alpha_2$ may be tested with the null hypothesis as follows.

$$H_0 : \alpha_2 = 0$$

$$H_1 : \alpha_2 \neq 0$$

$\hat{\alpha}_2 = 11.668$

One may make use of the confidence interval constructed for testing purposes.

Such confidence interval is defined as
\[ \hat{\alpha} \pm t_{\alpha/2, se} \leq \alpha_2 \leq \hat{\alpha} + t_{\alpha/2, se} \]

\( \alpha = 5\% \)

In this case, the confidence interval is

\[ 11.688 - 1.96(2.172) \leq \alpha_2 \leq 11.688 + 1.96(2.172) \]

\[ 11.688 - 4.257 \leq \alpha_2 \leq 11.688 + 4.257 \]

\[ 7.411 \leq \alpha_2 \leq 15.925 \]

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**Fig. 5.4**

Impact of Productivity Decline in the Long Run on WTCD

\[ \tan\alpha = 85.1 \]

Source: Survey conducted in the Idukki District
The confidence interval constructed above does not contain the value of $\alpha_2 = 0$. Therefore, with 95% confidence one can reject the null hypothesis. Moreover, the very low ‘p’ value of the ‘$t$’ statistic as shown in the regression coefficient table indicates that one can reject the null hypothesis with approximately 100% confidence (approximately 0% of significance). Changes in M2 affect WTCD significantly so that the co-efficient $\alpha_2 \neq 0$, or it is different from zero. Hence the true hypothesis is:

$$H_1: \alpha_2 \neq 0$$

$$\alpha_2 = 11.688$$

**5.9 Simultaneous Impact of M1 and M2 on WTCD**

Simultaneous impact of M1 and M2 on WTCD can be analyzed with the help of fig. 5.5.

The Range of Productivity Decline is measured along the horizontal axis and the Willingness to Compensate Deterioration and the Educational attainment Scale are measured along the vertical axis. As it was made clear that the variable Educational Scale (M1) takes only seven values from ‘0’ to ‘6’, it is easy to construct a regression line for each of the Educational level attained. It is obvious that as the Educational Scale increases from one level to the next, Willingness to Compensate Deterioration increases to about
Rs.4878.8. The slope coefficient of each regression line is the same and it is equal to 11.7 per unit change in the independent variable. \((\tan \alpha = 85.1)\).

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**Fig. 5.5**

Simultaneous Impact of M1 and M2 on WTCD

Source: Survey conducted in the Idukki District

*The diagram is only a representative tool. The angle need not represent the exact value of \(\tan \alpha\)

The overall significance of the model can be evaluated based on the value of ‘F’ statistic in respect of the Regression Sum of Squares and Residual Sum of Squares as shown in the ANOVA table. The critical ‘F’ Value in respect of a regression with 2 numerator df and 345 denominator df at 1% level of
significance is 4.61 which is much below the estimated F value of 234.33. Put differently, the estimated ‘F’ value far exceeds the critical ‘F’ value. Hence, the coefficients estimated such as $\alpha_1$ and $\alpha_2$ are simultaneously highly significant.

### 5.10 Solutions to the Crisis

Revolutions are rather difficult to organise. Part breaking changes in the attitude of people which they have been bearing in the mind as true and such practices worthy to be followed are very difficult to be organised and changed by science and technology. People may not respond to such drastic changes, even when a way out is present through some sort of innovations, unless they face a crisis. Much of the revolutions that took place in different parts of the world had its roots in crises or sufferings. There are many fundamental problems in the way that science and development assistance are organised to make such innovations successful. Thomas Khun discusses these obstacles in his classical work on the difficulties of achieving revolutions in science. Khun’s contention is that such revolutions can occur only when a state of crisis is reached. The environmental and poverty crises that are now confronting the world may provide the trigger that is needed for change. Khun claims that:
Scientific revolutions are inaugurated by a growing sense…….often restricted to a narrow subdivision of the scientific community, that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way….the sense of malfunction that can lead to crisis is pre-requisite to revolution. (Sayer et al. 27)

Now farmers in the hill district of the State of Kerala face a crisis like situation. Plant protection practices have a negative impact on the output level of the major crop. In the limiting case new pepper plantations in some areas especially in the Erattayar Panchayath do give yield only during one or two years after the beginning of harvest. Afterwards the pepper plants show stunted growth and the lateral shoots begin to vanish. Any effort to revive this situation with the technology available at present has pushed farmers into mere desperation. The foremost result of this decline in production is drastic depletion of income, the only source of livelihood. Income depletion was further intensified by the disproportional growth of pepper price and prices of other commodities and services. Now pepper farmers could fetch only a price of Rs.75 or Rs.80 which is very close to the price twenty years back; there is approximately zero percent of growth. Roughly 20 years back the average price of pepper was Rs.70 per Kg. During this 20 year period,
prices of essential commodities have risen about 300% or 400%. One can simply conclude that farmers were trampled down, after 40 or 45 years of cultivation, to a level which they had experienced in the initial year when they had come to the high-range with empty hands. Then they had good aspirations and dreams but now they have not. Whatever business they do other than agriculture might not fall into this crisis ridden situation.

However, one expects that this crisis would saw the seeds that generate path breaking changes in the agricultural practices. Farmers understood that the cultivation practices they have been following were not in the right relationship with the environment they must have for the sustainability of farmland. This can be considered as an important turning point.

5.11 Survey Results

The results obtained from the survey and analysis can be used for preparing a theoretical framework for remedial programme. Major results obtained from the productivity and demand analysis are the following.

1. Soil erosion is the major productivity deteriorating factor in pepper cultivation and the efforts of those who had undertaken preventive measures were not sufficient (regression equation in chapter 4 and fig.4.5; table 4.2 and chart 4.2).
2. Use of chemical fertilisers is detrimental to the productivity of pepper in the long run (regression equation in chapter 4, and fig. 4.6).

3. Organic fertilisers or manures have greater positive impact on productivity of pepper in the long run (regression equation in chapter 4, and fig. 4.7).

4. The educated farmers have a great desire for land improvement (regression equation in this chapter, eq.5.3; fig. 5.3 and fig.5.5).

5.12 Land Management

The first and foremost task is to cope with soil erosion either through changing cultivation practices or through adopting preventive measures. Soil tilling and weed clearing using spades locally called ‘Kalachethu’ are the practices that encourage natural soil erosion. Farmers aim to keep moisture within the soil, getting the soil sufficiently loose to facilitate the growth of root system and to make harvesting easy through these farm practices. Even without these practices farmers could achieve most of their advantages. For example proper mulching would keep moisture within the soil during summer season. But the question is that what materials are to be used by the farmer for mulching. Tree crops such as jack and ‘Killinjil’ should be planted at moderate levels. It is quite natural that even without any tillage soil in a forest is sufficiently loose. In the same way soil in these
farmlands could be kept sufficiently loose if moderate and manageable tree shade is arranged, for which also jack-fruit tree is good. The shade so created should be properly managed during different periods in a year by cutting the branches.

Another advantage of ‘kalachethu’ is that it keeps the plantation clean so that it is easy to collect the spikes and berries falling down while hand picking the spikes from the plants. In order to collect the berries and spikes that fall down, an alternative technology other than ‘kalachethu’ is essential. One can try a flexible rounded cloth or other suitable materials fixing around the pepper standards on the soil. After completing the picking of spikes from a plant, farmers can easily collect the fallen berries and spikes within a few seconds by folding the material used. This sort of alternative technology is suggested on the ground that it is illogical and unsound to allow the top soil to be subjected to erosion only for this harvesting advantage.

Alternatively one could control soil erosion by adopting land terracing. The slope of farmlands can be reduced to zero by raising the lower part of the slope and constructing walls using granites or mud to prevent erosion. The second option of using mud is only a temporary arrangement that requires repair to have repaired during alternative years. The repairing period could be extended if grass like plants were planted over these mud
terracing. Using granites for constructing walls as part of land terracing is more or less a permanent system. If such terracing is sufficient in number to completely eliminate the slope, soil erosion could be fully arrested. However, from the practical point of view, it is not quite easy.

1. Lack of financial resources; terracing involves huge capital investment costs such as charges for technical labour and as purchase costs of granites.

2. Farmers are lacking the required technical know-how to arrange terracing in a complex sloping farm-land.

3. Property rights some time pose as a hurdle to transport the materials (granites) required for terracing. It is not surprising in a district like Idukki where the road system and transportation facilities are underdeveloped.

Permanent land terracing with sufficient mulching keeps the soil loose and the moisture within it during the summer season and facilitates proper drainage during the monsoon season. However, it could be adopted only with huge capital investment with a long time perspective and with a long gestation to realise its costs fully. However, it would keep the soil in a farmland within that farmland and keep the fertility of land for a long time.
5.13 Organic Farming

Organic farming is the only alternative for unsustainable inorganic farming which is a threat to productivity in the long run. Organic farming is a system of farming in which naturally originated inputs only are applied in cultivation and the different components of the farming system are assumed to be interdependent in their activities and functions and each component is expected to interact with others as all components as a single unit. Organic farming can be seen as an approach to agriculture where the aim is to create integrated, humane, environmentally and economically sustainable agricultural production systems. The term ‘organic farming’ does not simply mean using organic inputs in cultivation. It is best to describe the concept of farm as an organism, in which all the component parts – the soil, minerals, organic matter, micro organisms, insects, plants, animals and humans – interact to create a coherent whole. For example in our system, trees planted for shade provide sufficient mulching materials which again add to the biomass content of the soil and preserve moisture. It further promotes the growth of the major crops and other tree crops. The grass planted to preserve land terracing using mud may be used as cattle feed. Cattle rearing provide a supplementary income source on the one hand and cow-dung and other excreta are used as manures for crops on the other. Thus the farmland
is an organism in which the pivotal role of the farm manager is performed by the farmer. Therefore, “Organic farming is essentially an agriculture employing a knowledge/understanding of naturally occurring processes” (National Project on Organic Farming, Annual Report ii -2007-08).

Organic farming uses the biological, cultural, natural and organic inputs curtailing the use of chemical fertilisers, chemical pesticides and other chemicals to create ecological balance and micro-environment suitable for desired health and growth of soil micro flora, plants, human being and food, water and clean environment. Organic farming systems (OFS) rely on large-scale application of organic Farm Yard Manure (FYM), compost, leguminous crops, crop residues, weeds, green manuring, off farm organic wastes, vermin-culture or earthworms, bio fertilisers, bio pesticides and biological pest control methods to maintain and enhance the soil productivity and sustainability of agriculture.

Under Organic Farming, nothing is wasted in agriculture. The residues after every act of agricultural production such as broken twigs, left over straws, weeds and vegetable kitchen wastes may be used for addition to the soil to increase organic matter and soil fertility either as such or via compost or farm yard manure. It would increase the long-term sustainability of agriculture.
The concept of organic farming is based on four internationally accepted principles.

1. Health
2. Environment
3. Fairness
4. Care

The first principle ensures that agriculture produce never results in health damage to any living organisms on this planet including man by using them or otherwise. Under the inorganic farming system, the pesticide and chemical content which cause health damage and diseases like cancer in the farm produce vary directly with the quantity of these items applied. “According to World Health Organization estimates, pesticides cause 30,00,000 cases of poisoning and 2,20,000 deaths annually across the globe, the majority of which are reported from developing countries” (Indiradevi 1). Moreover, pesticides “tend to accumulate in animal tissues through chain of events in various systems, posing threat to human health” (Roy 5).

The second principle concentrates on keeping and maintaining the environment conducive to production and consumption sustainability. The farm practices must ensure long term soil fertility on the one hand and must avoid adverse climate change that reduces productivity on the other. For
example, the fertiliser urea contains 46% of nitric oxide and 54% of other fillers. Nitric Oxide is a green house gas, excessive emission of which depletes the ozone layer and results in drastic climate change which adversely affects productivity. The ‘other fillers’ do not dissolve in the soil and they remain around the plants where urea is applied. Continuous application of this fertiliser forms a sediment layer which makes the soil a hard substance around the plants. It prevents the natural growth of plants like pepper.

The third principle stands for fair trade. The farmers of organic products must get a premium price. But at the same time, consumers must get these products at reasonable rates. In essence, this principle aims to reduce the number of middlemen between farmers and consumers of these products. Very often the organic products fetch a price at a premium of 20 to 30 percent of the price that their corresponding inorganic products fetch.

The fourth principle is to introduce interdependence among various components of the whole agricultural system as a coherent whole. The agricultural practices must take care of the existence of all organisms in the system for which it is essential to maintain the non-living materials intact.

The major factor which distinguishes organic farming from other approaches to sustainable agriculture is the use of the market to support the
environmental, social and animal welfare objectives. This has led to the development of detailed production standards and certification procedures to draw a clear dividing line between organic and other farming systems.

5.14 Organic Certification

Organic certification is an essential part of the organic farming. Organic farming is essentially an agriculture employing a knowledge/understanding of naturally occurring processes while the certified organic farming is essentially the same but there is an addition of checks and balances to maintain soil fertility and control insect-pests and diseases. It is done by involving third party inspection, record keeping on various aspects and their verification. (National Project on Organic Farming, Annual Report ii -2007-08).

Once a farmer adopts organic farming in his farmland, usually a certain period is treated as the conversion period during which he converts an inorganic farm-land into an organic farm-land. It is to be observed and checked whether the farmer follows organic farming practices during the conversion period and afterwards. Therefore organic certification involves checks and balances to maintain soil fertility and control insects, pests and diseases.
It is necessary in order to maintain the high ethical standards of the
organic movement, to retain consumer confidence in produce, to encourage
and support genuine organic farmers, and lastly to provide a basis for traffic
in organic produce across frontiers. The Symbol schemes that farmers,
wholesalers and processors join are a central feature of organic regulation.
Once certified by the association running the scheme, they are entitled to use
the symbol.

Certifying Agencies set organic standards which contain a minimum
universal code of rules that transcend national boundaries. What marks one
group different from another is the degree to which they go beyond the bare
essentials of organic regulation. Some of the major organic consuming and
producing countries have set up national standards for organic certification.
France a leading organic producer was the first European country to
introduce an official label (AB) for organic cereals, fruits and vegetables.
AB stands for *agriculture biologique*. The United Kingdom Register of
Organic Food Standards (UKROFS) was set up by the Food from Britain
Organisation in 1987, and is founded by the Ministry of Agriculture. Taking
advice from producers and processors, UKROFS has compiled an official set
of organic standards (UKROFS, 1993), covering both arable and livestock
production, as well as the horticulture and the processing of organic
products. As part of the overall policing of the scheme, UKROFS inspectors check a random sample of 10% of the approved producers in the schemes at least once a year.

5.15 Land Productivity: A Capital Asset

In modern times as we have seen in the first chapter, land productivity is considered as an input of production, a capital input. The modern vision of the economy is that the physical economy is a subsystem of a finite, non-growing and materially closed ecosystem. This is a departure from the earlier vision that the foundation of the economy is an isolated closed circular flow between households and firms; nothing enters into nor exits from it. The new vision is instrumental in classifying the capital into natural capital and man-made capital. Natural capital contains our soils, sunlight, climate, animals, quality of water and other natural resources whereas man-made capital contains buildings, roads, equipments and tools constructed by man for the aid of production. In other words, the natural resource base of the rural community is the natural capital available to the poor farmers. Natural capital can be renewable and non-renewable. The farm equipments that farmers own constitute the man-made capital in the farm sector. This classification of capital makes it necessary that the old definition of capital, “produced means of production” which implies only man-made capital
needs to be revised as “a stock that yields a flow of useful goods or service in to the future” (Daly 486) to include the natural capital in the purview of the definition of capital. This is because natural capital is not man-made. Therefore, land productivity is a function of the stock of natural as well as man-made capital.

The phrase “as well off as before” included in the sustainability definition indirectly implies that the total capital stock is to be maintained intact over time. Quantity and quality of consumption as a measure of well being, means that future generations must have the same quantity and quality of consumption goods to be produced over time. To put differently, the productive capacity should be kept intact for which the total stock of capital needs to be maintained.

One can maintain the total stock of capital either on weak sustainability basis or on a strong sustainability basis. Any analysis of capital must specify the relationship between natural capital and man-made capital. The question is whether, natural capital and man-made capital are substitutes or complementary. If they are substitutes, man-made capital can be substituted for depletion of natural resources or capital, and this is a case of weak sustainability. The strong sustainability concept is built on the premise that these two types of capital are complementary and this is a
vision in the long run. It means that the natural capital and man-made capital need to be maintained intact separately.

“Man-made and natural capitals are fundamentally complements and only marginally substitutes” (Daly 481-846). In hill agriculture also this is true; man-made capital and natural capital are complements. They are complements in the sense that man-made equipments and tools are necessary together with land resources for cultivation. However, one specific problem that we must address is the pattern of scarcity. During the ancient period, man-made capital, the limiting factor, was scarce. Hence, attempts were made to increase the supply of man-made capital. Now the pattern of scarcity has changed; the natural capital becomes the limiting factor. Hence what is required is to raise the value of natural capital by making investment in natural capital.

One usual question that arises from this analysis is how investment is made in natural capital? Any investment that is undertaken by man is to be termed as man-made investment. The term investment is applied in its right sense that it involves the notion of ‘waiting’ for return and ‘abstinence’ for making investment. Here we may define a new category of investment called ‘Intermediate Investment’ to include all those man-made capital created for the Improvement of natural capital. For example, expenditure necessary for
permanent terracing of land falls in this category. Intermediate investment, like social investment contributes indirectly to production and productivity.

5.16 Agricultural Capital Assets in the Idukki District

The malady associated with the productivity issue in the Idukki district is that the total stock of capital especially the natural capital component is fast diminishing. When the farmers had good crop and good price, they compete to draw maximum production without making much investment in both natural as well as man-made capital. No significant effort has been made to prevent the quality deterioration of the fertility of farmlands by making any sort of investment to prevent soil erosion and to improve soil conservation measures. Now the farmers are caught in a vicious circle that makes them unable to undertake any investment projects; quantity of production as well as prices of products fell to a very low level. The result is that agriculture in the district became a ‘below subsistence occupation’. Farmers are negatively saving and investing for the future.

Investment in soil conservation measures and soil fertility improvement techniques by means of money expenditure and labour employment must be adopted. However, soils are slowly improving, to the point where future labour inputs will be reduced. This situation is most welcome, as it will ease the burden of farming for farmers’ children, who
will take over the farm one day. As pointed out here, the pace of fertility improvement will be slow and gradual even if such measures were taken fully. The poor farmers are unable to undertake such a kind of investment with long periods of realization cost but it is strongly recommended for the sake of the future generations.

5.17 Education and Extension

Demand for environmental quality improvement analysis explicitly states that the educational attainment level has a significant impact on the Willingness to Compensate Deterioration (WTCD). The desire for a better quality environment is the result of knowledge and wisdom that the farmers have. This is the time to raise the slogan ‘Educate farmers and save agriculture’. Most of our agriculture is managed by illiterate peasantry. According to the 2001 census, about 92.33 percent of males and 85.02 percent of females are literate in the Idukki district (Panchayath Level Statistics 12). However, mere literacy is not enough but agricultural literacy and environmental and ecological literacy are also needed.

Mahatma Gandhi warned us … that unless there was a marriage between intellect and labour in rural India, there would be neither agrarian advance nor rural prosperity. Our agriculture future will hence depend to a great extent on how successful we are involving
youth and the illiterate, both men and women, in rural transformation.

(Swaminathan 26-27).

Education, which considers nature, here agriculture farm or land area as the medium of education, needs to be introduced. It is true that nothing could be learned than the literature on every subject without any experience from within the four wall limits of the schools or colleges. In a place like Idukki where agriculture is the major occupation of masses for their livelihood, the system of education must contain agricultural studies, field visits, and project activities. Farm practices should be a leading subject in our schools and it must be a course in our colleges. Our education system now focuses to generate intellectuals only for business and service sectors. Agriculture is altogether ignored. Now in the survey area, no significant education programme on agriculture is going on. An objective education programme for farmers must contain the following.

1. Environment and Ecological Awareness Programme

Farmers always think in line with the neo-classical economic theory of maximising some thing say production or profit. They are unaware of the fact that the economy is only a sub system of the major ecosystem and how their activities affect the environment and ecology. First of all, the requirement is to impart a correct awareness of the relationship between the
agricultural production system and the ecosystem. How much the economic system can grow in relation to the ecosystem?

The guiding principle of such a programme must be the synergy in agriculture, one of the most fascinating scientific developments in recent years. Synergy is a mechanism, which “results in the product being something much more than the sum of the parts has been the most potent tool involved, in natural evolution. Symbiosis, or mutually beneficial relationships and coordinated functioning are essential ingredients of synergy” (Swaminathan 42).

It means that the ‘monistic’ approach as suggested by the neoclassical economists is not compatible for sustainability which requires a certain degree of ‘pluralism’ in agriculture science. Nirmal Chandra argues that the ‘paradigm shift’ in science as suggested by Khun is irrelevant; what is relevant is the ‘co-existence’, a holistic and integrated approach in the agricultural science.

2. Technical and Theoretical Education on Farming

Secondly farmers must get technical and theoretical knowledge about farm practices such as fertilisation, using pesticides and herbicides, plant protection, weed clearing and soil tillage. The farmers must know the soil chemistry, nutrient application and plant biology.
Work experiences in the primary classes must partly or fully cover these agricultural practices. The secondary school education and university education in this area must contain agriculture as core subjects. The historical knowledge of teachers need not be sufficient to motivate the farmers; instead, the experience of ‘progressive’ farmers is useful.

3. Extension Programmes and Field Work

With the boom of Information technology, the newly developing technology in agriculture and other areas is readily available but the mechanism for transferring it to the illiterate and small farmers in an effective manner does not exist in this state. The Information Technology makes the latest findings of science available almost immediately to research workers in any corner of the world; but what is urgently needed is such a communication net work at the service of the poor farmers in our country. It is not only knowledge that is needed, but an approach which will be able to supply the right knowledge and tools to the right people at the right time and place.

5.18 Agricultural Education in the Idukki District

The survey conducted in the Idukki district reveals that farmers do not get any reliable scientific knowledge about agricultural practices either from the universities or government agencies. About 90 percent of farmers had
only knowledge which was transmitted from their ancestors and peer groups. A meagre 10% farmers, in addition to the above, collects information from news papers and advertisements. Many farmers decide the doses of pesticides and fertilisers to be applied based on the suggestions of the shopkeeper who always tries to enhance his sales.

**Fig. 5.6 Sources of Farmers’ Information**

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Farmers have only traditional Knowledge</td>
<td>90%</td>
</tr>
<tr>
<td>2. Farmers depend on advertisements and traditional knowledge.</td>
<td>10%</td>
</tr>
</tbody>
</table>

Legend:
1. Farmers have only traditional Knowledge
2. Farmers depend on advertisements and traditional knowledge.
Source: Data collected fro Idukki district

However, these farmers fell into trouble as these advertisements never revealed the consequences on agricultural production and health of people resulting from the continuous application of such chemicals in the long run. Shopkeepers concentrate on their gain in the short run and as such they speak of the possible productivity gain in the short-run. What is required is
to have a comprehensive and integrated information delivery system on cultivation which provides farmers the right knowledge and information at the right time with authenticity and precision.

Indeed, this is a matter of government policy whether to promote organic farming or to continue the existing unsustainable agricultural practices. During 1960s the policy was to enhance agricultural production. Though it was not experimentally proved, the increased production has been at the cost of environmental degradation. Now, this is the time to switch over to a new set of policies which makes the agriculture sustainable over time.
Works Cited


