Chapter 7
Conclusion: Findings, Inferences and Suggestions

This study is an attempt to estimate the impact of conventional human engineered agricultural practices on land productivity in the long-run and to categorize these practices into two broad groups namely anti-environmental and environmentally friendly groups. As far as poor people in the Idukki district are concerned, the major form of capital that generate income for their livelihood and maintenance of the existing capital stock is the land potential which is described as fertility of land. Though land is a form of natural capital, deterioration of land could be reversed or the quality of such input could be improved through investments. Therefore, land fertility has a direct bearing on the welfare of these people and as such capital investments in natural capital indirectly influences the well-being of the farming community. Any improvement of land fertility promotes the welfare of poor agricultural folk and vice-versa.

In this study, certain practices such as soil tillage, weed clearing, application of organic and inorganic fertilisers and the percentage of crop mixing are identified and found to be affecting the productivity in the long
run. The impact of these explanatory variables on the productivity in the long run as estimated by the Phased Aggregates of Average Productivity is also estimated. It is found that these practices do not affect productivity change in the same direction and uniformly.

The attitude of farmers towards undertaking investment in the natural capital such as land is elicited under the contingent valuation technique. Farmers are asked to elicit their Willingness to Compensate Deterioration (WTCD) of the agricultural production input, land fertility. The major factors that affect the Willingness to Compensate Deterioration are also identified and the response of WTCD to changes in these variables is also estimated. The Range of Productivity Decline during the entire cultivation period and the educational status is found to be the major factors that affect the WTCD.

7.1 Findings

The preceding analysis of primary and secondary data collected leads us to the following findings.

Productivity

Two concepts of productivity-the Range of Productivity Decline (RPD) and the Phased Aggregates of Average Productivity (PAAP) - are defined and estimated ((Equation 4.1 and 2.1). The former is defined as the
difference between the Peak Production during the entire period of cultivation and the Current Average Production (CAP) and is used to estimate the productivity loss in the perspective of a single farmer. For all respondent farmers the Mean Range of Productivity Decline is estimated. The ratio of Mean Productivity Decline to The Mean of Peak Production expressed as a percentage is a measure of productivity loss. The estimated value of productivity loss is 70% during the last 45 years.

The second concept of productivity - PAAP- is the weighted average of production during the entire period of cultivation (the variable PAAP in Appendix B1). As this is an average, the disturbances in the short-run will have the minimum effect on the measure of productivity which is assumed to represent productivity in the long run. Also Productivity Decline is a broader measure and if there is any decline, it has been due to many factors such as climate change (table 4.3), rain fall disorder (table 4.4) and infection of diseases in addition to those assumed to affect the Phased Aggregates of Average Productivity.

**Soil Erosion**

Soil erosion is found to be the major productivity deteriorating factor in the Idukki district. The natural process of soil erosion has been encouraged by the agricultural practices such as soil tillage as part of plant
protection and weed clearing using spades in slopy farmlands without sufficient permanent terracing. It was found that only 11 per cent of the farmers surveyed, who possess slopy farmlands, had sufficient terracing capable of controlling soil erosion. Though 42 per cent of such farmers adopted terracing activities but quite insufficient to control erosion. The regression result shows that mean productivity of soil erosion prone farmlands as a group is much lower as 235 Kg. per acre compared to the productivity of farmlands which are not prone to soil erosion as a group as 339 Kg. per acre. The productivity differential between these groups of farmlands is significant as 104 Kg. per acre (Equation 4.3).

Farmers were not ready to switch over from such practices as these practices provide them with some significant advantages in cultivation such as keeping moisture within the soil during the winter season, cleaning the site for harvesting and keeping the soil sufficiently loose promoting the growth of root system.

**Total Quantity of Fertilisation**

Another factor that affects productivity in the long run (PAAP) is the Total Quantity of Fertilisers including both organic and inorganic fertilisers applied. The Total Quantity of Fertilisers applied has a significant positive impact on the PAAP as the Total Quantity of Fertilisers increases by one
Kg., PAAP increases by 19.32 Kg per acre (Equation 4.3). This result can be evaluated with the present state of Intensity of Inorganic Fertilisation. It is found that 87.2 per cent of farmers apply fertilisers with Intensity of Inorganic Fertilisation with less than or equal to 10 per cent (the variable $X_1$ in Appendix B$_1$).

**Chemical Fertilisation**

Applying chemical fertilisers as a practice had begun in the district by the end of 1970s. It was the result after a massive propaganda released by the Central government in favour of the so-called ‘Green Revolution’ to double the production and huge advertisement campaign undertaken by the fertiliser companies through all types of media. Production had stepped up but only for a short period of applying such fertilisers and for maintaining a sustained trend of production, farmers had to marginally increase the doses of applying such chemical fertilisers year by year. Increased application of fertilisers destroys the eco-system balance and adversely affects productivity in the long run.

In the Idukki district farmers can be classified into three categories based on the nature of applying the fertilisers and manures (Table 6.4).
1. Those who apply both chemical fertilisers and organic manures in different proportions.

2. Those who apply only chemical fertilisers.

3. Those who apply only organic manures.

Fertiliser application of these categories of farmers was successfully incorporated in the variable ‘Intensity of Inorganic Fertilisation’ in which the percentage of chemical fertilisers applied to the total quantity of fertilisers was estimated. This estimated percentage was regressed among other explanatory variables with the Phased Aggregates of Average Productivity (PAAP). It was found that as ‘Intensity of Inorganic Fertilisation increases by one per cent, The Phased Aggregates of Average Productivity (PAAP) decreases by 3.76 Kg. per acre (Equation 4.3).

**Crop Mixing Percentage**

The crop mixing percentage as estimated in this study represents the percentage of the number of plants of the major crop to the number of plants of all crops including the major crop. It is found that as the per cent of the major crop increases by one per cent the productivity increases by 2.14 Kg per acre (Equation 4.3).
Farmers’ Behaviour towards Organic Fertilisers

Primary information collected from the Idukki district shows that farmers are not at all reluctant to apply organic manures if they were sufficiently available. About 92 per cent of the farmers surveyed use organic inputs in varying proportions (Table 6.4).

Willingness to Compensate Deterioration

Willingness to Compensate Deterioration as estimated in this study is the desire of farmers to improve the fertility of land through capital investment in natural assets. The average willingness to Compensate Deterioration among those farmers who have elicited such willingness is estimated to be Rs.26752.16 per acre (Equation 5.2). However, farmers revealed that they could undertake this investment only if bank loans are available (conditional elicitation) as nothing is left with them from their past savings.

Education and Willingness to Compensate Deterioration

Educational attainment is a crucial factor that affects the Willingness to Compensate Deterioration. The present Educational Attainment status of farmers was regressed with the elicited values of Willingness to Compensate Deterioration. It was found that as the Educational Attainment status steps
up from one level to the next level, the Willingness to Compensate Deterioration increases by Rs. 4878.8 (Equation 5.2).

The knowledge of cultivation that farmers possess in the Idukki district was entirely derived from their ancestors, other farmers, shop keepers and media of different kind. They hardly receive scientific and authoritative information on cultivation from the government or government approved agencies (Chart 5.6).

**Investment in Natural Capital**

Farmers in the Idukki district did not foresee the possible adverse impacts of their agricultural practices and they never thought that such practices might culminate into a crisis. Therefore they did not undertake significant action or make investment in natural capital to avoid this crisis. Of course they could prevent, these adversities, if they were properly informed and educated at the right time and were assisted in the right manner.

Farmers could undertake permanent land terracing during periods of good crop and fair price. However, due to lack of vision and right wisdom, they spent nothing for permanent land improvement from their past earnings. Now farmers are not in a position to undertake any such land improvement programmes as now they are resorting to subsistence farming.
Government Policy

The policy of the state government conforms to the policy of the Central government in making agriculture in the state of Kerala sustainable. The central government, in principle, has recognized the need for organic farming in the country. This is evident from the appointment and constitution of various committees and forums in which the National Centre for Organic Farming (NCOF) and its regional offices (RCOFs) are important (Chapter 6). The Department of Agriculture and Co-operation (DAC), Ministry of Agriculture, Government of India launched a new Central Sector Scheme in 2004 entitled National project on Organic Farming (NPOF) with a view to build capacity through service providers, to impart financial support to organic input producing units, to impart training to farmers, to create model organic farms, to take initiative in market development and demonstrations and to create awareness among farmers. However, the budget allocation for the project was as low as Rs. 57.05 crore during the 10th plan. Though it was stepped up to Rs.150 crore during the 11th plan, it continues to be meager to implement a nation-wide project.

The number of approved certifying agencies all over India is quite insufficient to monitor and organise the certification process allover the country. More over, the number of service providers also is insufficient to
provide training to farmers and organise market for their products. Therefore
the pace of movements towards organic farming in the country is very slow.

The peculiar characteristic of organic farmers in Kerala especially in
the survey area is that they are isolated. The government did not dare to
introduce any certification scheme or to grant symbols to these farmers who
are converted into organic cultivation. In Kerala, we have a little market for
organic farm products. The demand and supply of such products are almost
zero. Consumers are unaware of the net benefits of using organic farm
products. No mechanism now exists at the government level to demarcate
the organic products from their inorganic counterparts.

Now we do not have a nation-wide policy on soil conservation and
programmes to prevent soil degradation and consequent adverse
environmental issues. Soil conservation and management is now included in
the 11th schedule of the constitution and is a subject handled by local bodies.
Very often, these local bodies do not have enough funds to implement any
soil conservation programme.

**Availability of Bio-Fertiliser in the Idukki District**

Availability of bio-fertilisers is a crucial factor in the progress of
organic movement. In the Idukki district the sole source of organic inputs is
the farmers themselves and the sole item of organic input available is the
cow-dung. About 92 per cent of farmers surveyed use organic input for cultivation and 73 per cent of farmers use either own source or local sources. The remaining 19 per cent farmers makes use of own sources as well as sources from distant area (Table 6.4). The KADS, a service provider in the Idukki district prepares to start a bio-fertiliser unit and has been imparting training to farmers to produce vermin-compost. The Peermade Development Society also provides training to farmers to produce vermin-compost. However, the practice has not yet been popular among farmers.

**7.2 Inferences and Conclusions**

The findings of the study lead to the following inferences and conclusions.

1. Land fertility or the potential of land is to be considered as a capital input which directly influences agricultural production through productivity is likely to deteriorate and has direct linkages with the rural farmers’ welfare.

2. Cultivation in the Idukki district during the last 45 years disproved the contention of Ricardo that the power of soil is ‘original and indestructible’. Indeed it is perishable by human activity in the long-run. During 1960s or 1970s agriculture development was considered to be a panacea for all economic ills of the poor in the developing
world whereas now agriculture poses severe threat to even the existence of poor communities in these countries.

3. The major threat to land fertility in the hill district of Idukki comes from the reckless practices, without undertaking due soil conservation measures, which lead to soil erosion.

4. The agricultural practices followed by farmers are not in conformity with the hill features and specificities peculiar to the Idukki district. Moreover, the agriculture policy of the government also does not consider these features.

5. Chemical usage in fertile land contaminates the soil and destroys its ecological features leading to productivity loss. This kind of human engineered development is destructive, even violent, to nature.

6. Farmers have genuine desire to break the productivity crisis they face. Farmer education and extension activities are capable of motivating farmers for an Evergreen Revolution. However, the researchers are tied up within their universities and laboratories rather than extending their findings and solutions to the farm and farmers; the integration between research and cultivation is very low; both are dichotomized.
7. Now farmers are in a dilemma to undertake capital investments to raise the soil fertility as the surplus generated from farming is virtually zero.

8. The Central Government initiatives towards an Evergreen Revolution in the Country are quite insufficient and the pace of such a movement is very slow.

Therefore, the conceptual as well as practical approach towards agriculture needs to be drastically changed. A vision accommodating the needs of future generations without compromising the needs of all the sections of the present generation is the need of the hour. The approach should be to conserve soil from erosion and contamination; motivate farmers to switch over to organic farming; undertake long term capital investment for conserving and improving the land asset; conduct and organise farmer awareness programme; and enrich farmers with scientific knowledge and conventional wisdom. Who must monitor and undertake the initiative? No doubt; it must be the government but shall not be entirely through its organs. The services of specially constituted Non-Governmental Organizations (NGOs) in which the real beneficiaries are administrators and members can be made use of for implementing any programme for agricultural improvement. This is the answer to another set of questions; whether
farmers are the best judge of themselves; is market always capable of protecting the environment etc. The answer, indeed is, ‘no’.

7.3 Suggestions

1. Agriculture being the single prime occupation of more than 74% of population who are either marginal or small-farmers for their livelihoods in the country, soil deterioration should be legally prevented to realise the objective of sustainable agriculture. Soil fertility is one form of natural capital. Deliberate practices which deteriorate soil quality need to be penalised. Before introducing such a law, the government must make arrangements to provide environmental education to all farmers. However, neither the law nor judiciary is able to prevent people from committing those practices which are detrimental to the quality of environment which adversely affect the health, vitality and vigor of the people.

As pepper cultivation is the prime agricultural activity of the small and marginal farmers in the Idukki district, and productivity of pepper mostly depends upon the bio-mass content in the soil, any activity that contaminates soil should be legally banned and such offences need to be penalised.
2. This dilemma could be resolved through massive informal environmental education campaign across the country. Environmental awareness is the prime concern of the safety of natural capital especially in the pepper growing areas. For the creation of environmental awareness among the rural poor in the Idukki district, they must be educated about the significance of ecology in human life and trained to know the skills of preservation and protection of environment. For the accomplishment of this goal, the role of media, government, and private agencies is vital. In addition to fulfilling legal and control measures, proper education and awareness about environmental degradation and its consequences can combat the environmental problems that exist for pepper farmers in the Idukki district.

3. In addition to enacting laws, certain levels of control measures can be implemented. For example, the property rights of agricultural land for pepper cultivation can be linked to the protection and preservation of soil and environment. For it the property right must be confined only for pepper cultivation and it must be granted only to those farmers who maintain land fertility intact. If these conditions were not fulfilled, the right of a farmer on his farmland ceases automatically.
4. A system of tax exemptions and subsidies can serve the objective of sustainable agriculture well in the Idukki district. In western countries, farmers receive a lot of assistance from the government as compensation for admitting the environmental degradation caused by the activities in other sectors and countries. The governments in developing countries should also ensure such compensation from the developed world for such damages as global warming and climate change which are beyond the control of farmers in the developing countries. The government must ensure compensation to affected pepper farmers in the Idukki district with a condition to spend the same for permanent land improvement.

5. The organic movement in the country should be encouraged and the budget allocation for the National Project on Organic Farming (NPOF) should be stepped up. Those farmers who adopt organic farming should be assisted with granting them financial complements proportional to the quantity of organic output being produced. A separate fund needs to be allocated jointly by the Central and State Governments for promoting organic pepper farming in the Idukki district.
6. Production and distribution of bio-fertilisers and bio-pesticides need to be assisted by granting long-term loans at subsidized rates of interest to establish such units. Financial assistance must be given to progressive pepper farmers in the Idukki district and/or voluntary agencies to start the functioning of bio-fertiliser and bio-pesticide producing units in the district itself.

7. Subsidies must be granted either to pepper farmers who purchase organic fertilisers and pesticides and use them or to producers of such inputs to lower its supply price for promoting its application.

8. Extend the interest subvention scheme which is available to short duration crops such as paddy and vegetables to cover the pepper cultivation also with a larger time span. The time duration for repayment with subsidy should be defined in terms of the lag period required for pepper harvest. In essence, the interest subvention scheme should be set at least for a period of 8 years in the case of pepper farmers.

9. Special subsidies must be granted to purchase cattle to all pepper farmers who possess land above a certain pre-defined area. This would enhance the availability of organic manure for pepper cultivation within the farmland or at least within the local area.
10. In the Idukki District, in order to overcome the impending crisis, the Central government needs to declare a special package of assistance for pepper cultivation which must contain the following types of assistances.

   a. Assistance for permanent land improvement (capital investment)
   b. Assistance for replanting pepper
   c. Assistance for promoting organic farming

11. The Government should create a capital fund for financing the long-term capital needs of the agricultural sector. Those farmers who subscribe to the fund could avail themselves of long-term loans at subsidised rates for meeting the investment requirements that are likely to emerge in future. If farmers do not avail themselves of such loans, the amount subscribed should be repaid with normal profit and interest that they might get if these funds were invested elsewhere. A fund of this kind must be instituted for promoting saving among the pepper farmers and for meeting capital investment requirements in the long-term.

12. Another solution to the shortage of funds for the capital investment in order to reviving the pepper cultivation is to impose a capital tax in
liew of using the land. The tax proceeds would form as a fund. Those farmers who protect the soil fertility without contaminating it shall be reimbursed the amount so collected as tax with interest at a later date on the one hand and this fund can be used to grant loans to needy farmers on the other.

13. The Employment Guarantee Scheme of the Central government could be extended to create community assets among the rural farming community in the Idukki district. For example, land terracing in the Idukki district can be assisted by extending the scheme to include this work also. However a theoretical problem that stands against introducing such a system is the nature of the assets created. How is government fund utilised for creating private assets? Agriculture in the own farm definitely is a private activity; but one cannot undermine the social benefit of keeping agricultural productivity intact especially in areas where the predominant crop cultivated is pepper which bring much foreign exchange to the nation. The productivity problem in the Idukki district grows as a social issue. From the social point of view the land fertility needs to be defined as a public good and thereby assets created for land fertility become community assets.
14. A Pepper Research Centre, like The Cardamom Research Centre at Pampadumpara, should be launched specially for the Idukki district with provision for sufficient field work and extension and education to farmers. Technical support to farmers must take a different form from what most of the government agencies now do. Instead of supplying pepper vines prepared in polythene covers, teach farmers to prepare such vines themselves and, instead of supplying compost, motivate and assist farmers to produce such items and monitor their endeavor. In other words, the farmers should be made ‘progressive farmers’ suitable for a new era of sustainable agriculture without compromising their profit and without leaving them as mere ‘collectors’ of items supplied and subsidies given by research centers and government agencies respectively.

15. Policy makers and planners must develop a strategy of farming suitable for hills with the precious knowledge of the rural folk. It will enhance the practicability of implementing a particular development strategy successfully. While framing development policy and concrete action for implementation, due attention must be given to hill specificities such as agro-ecological or climatic zones, inaccessibility,
fragility, marginality, diversity, heterogeneity, niche and the human adaptation mechanisms.

The slogan that one can raise for an ‘Evergreen Revolution’ is to ‘go back to nature’ and promote all natural growth instincts in agriculture. It is strongly felt that the time has come for added focus on improving productivity and sustainability of farming on the marginal lands in the hillside of Idukki district for the prime purpose of improving the livelihoods of marginal hill farmers in sustainable ways without doing harm to the environment. At this juncture the government of Kerala can adopt the policies and practices undertaken during the last 40 years by the Government of Himachal Predesh, a hill state in India for the betterment of the hill agricultural folk as a model for inspiration. If Himachal Predesh has succeeded in maintaining their agriculture, the state of Kerala can do better.