CHAPTER VII

CONCLUSION AND POLICY IMPLICATIONS

7.1. Summary and Conclusion

The mid hills of Nepal, which supports nearly half of the country's population and where environmental degradation is severe, the declining production and return from the exisitng crop based systems is barely sufficient to sustain the needs of the increasing population. Considering the geoclimatic conditions, soil fertility decline and erosion from the fragile hill slopes in the mid hills, it was hypothesized that integrating a high value fruit tree such as citrus (orange) could help to improving the long term income of small farmers in the hill region of Nepal.

This study was undertaken to study both existing annual crops and integrated citrus based production systems based on the cross section data drawn from two sites: Patlekhet (annual crop based systems) and Sankhu (citrus based systems) of Kavre district in the central middle hill region of Nepal. In view of studying existing farming systems and analyzing the economic viability of citrus integration into existing crop based systems, a farm level multiperiod linear programming (MLP) technique was employed for optimum planning over a planning horizon of twenty years with and without citrus component under various economic and policy environments

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and resource endowments of the farm households. Farm plans were developed for each study site separately for four different groups of farms classified based on farm size. The model has been formulated to incorporate dynamic, complex and semisubsistence nature of hill farming systems by taking into consideration of economic life span of orange fruit. Though, the model is deterministic in nature, the risk averse behaviours of the small farmers are accounted through sensitivity analysis and maximizing cash income under conditions of satisfying basic household consumption and expenditure requirements. Econometric technique was employed to model the consumption behaviors of the farm house holds and incorporated it into programming model, which depended on family income and consumption units.

In the optimum farm plan of Sankhu site (study site II), the existing system with orange is compared with systems without orange by eliminating the orange component from the optimum plan. However, for the Patlekhet site (study site I), the optimum plan of existing crop based systems is compared with the improved systems with orange in the resource context of the same site by extrapolating the input-output coefficients of orange production from Sankhu site.

Apart from this quantitative analysis, a descriptive assessment of the economic and soil conservation aspects of the orange tree and the competing enterprises of the Sankhu site, is carried out and compared among them through matrix ranking (PRA) and farmers' views and responses.

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The study and analysis of farming systems revealed that natural as well as human resource endowments of the sampled households were almost similar in both the study areas except citrus component in the Sankhu site. The labor and capital resource endowments of the households were found related to farm size. The realtive share of off-farm income to total family income was higher in Patlekhet even though the total absolute off-farm income was higher in Sankhu site. About 50% of the active labor force of the sampled households in the study areas were found involved in off-farm activities during slack season of the farming. The correlation analysis also revealed that there was positive relationships between farm resources and citrus area in the Sankhu site.

The results obtained from the application of multiperiod programming models indicated that the incremental benefits from the orange fruit is fairly high such that the elimination of the orange enterprize from the present farming activities at Sankhu site would cause considerable loss (12-17%) depending on farm groups. Similarly, by simulating the existing crop based systems with orange in Patlekhet site, it gave 10-15% higher return (NPVI) over the existing crop based systems in different farm groups.

The programming results also show that orange and rice are competitive crop in the range of current price ratios and production technology. However, corn, wheat and mustard are not profitable in the current price ratio, resource conditions and production technology as they

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do not enter in the optimum plan in all farm size groups. The smallest (group I) and largest farms (group IV) still have some land devoted for rice production, while medium sized farms (group II and III) devote all the land for orange production.

The results of the sensitivity analysis of the basic optimal plan of citrus based systems by changing the assumed key variables revealed that off-farm income is very important in the inclusion of orange in the optimal plan. Increased price of orange by > 42% and decreased discount rate by 4% make all farm groups except group I to switch from rice to orange. However, price decrease of orange by 28% and increasing discount rate by 4% make all farm groups to compeletely substitute rice to orange as orange becomes more profitable.

The programming results also revealed that orange is profitable for group III and IV (medium and large farms) even under projected yield and price decline after middle of the planning horizon. However, for group I and II the adverse situation of yield and price decline will lead the complete switching of existing orange area to rice as growing orange is not possible because of its high capital investment as compared with rice under the existng resource and technological base of the small farms.

In fully upland situation when rice is withdrawn from the model, the enterprise mix will contain only the orange and off-farm income. In the situation where off-farm labor demand and wage rate falls more than

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50%, then in such case area under rice increases as farm households will not have enough fund to invest more on orange production.

There is no need of credit supply as income from off-farm is sufficient for meeting consumption requirements and investment on citrus. However, if employment in off-farm income drastically reduces, then investment in citrus fruit will not be possible without credit supply. These results demonstrate the possibility for the hill farmers to combine farm and off-farm work to achieve maximum net present value of family income under existing resource endowments and constraints of the households. The composition of enterprise mix suggested by the programming models are not far away from the one that the sample farm households in Sankhu usually do for income earning by engaging their family labor to farm (orange, rice) and off-farm work.

In addition, the results of descriptive assessment also revealed that orange is more profitable to competing enterprize maize. Besides its economic benefits, farmers also do recognize the importance of orange tree in soil conservation. The matrix ranking of the orange with other common enterprises of the locality such as maize, wheat, mustard and livestock also revealed that among all the enterprises orange is highly preferred by the farm households not only because of its higher monetary benefits but also of many other socio-economic and soil conservation merits.

Despite the potential economic benefits of orange in improving

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income of small farm households, its integration has not been very successful in Nepal's mid hill region. A number of socioeconomic and agronomic constraints were found to prevent farm households to adopt, integrate and expand orange into the present farm systems.

The assessment of the constraints revealed that maily the factors such as lack of technological information and poor marketing systems were impeding the integration of citrus into existing farm systems. The high initial capital investment and long time lag before seeing returns are also the major barriers to the small farmers to entering into fruit farming. However, government intervention through appropriate policies and strong institutional support services would make it possible in removing the present constraints in the integration of citrus in many mid-hill regions of Nepal.

From the results of this study, nevertheless, the study concludes that it is econmoically possible to integrate orange (citrus) into the existing crop based systems and productivity of Nepalese hill farming systems coul be possibly improved if the systems are partially commercialized and integrated with perennial high value crop such as orange.

Thus, it is apparent that there is a need for policy makers to put greater emphasis on the production of citrus and citrus based production systems in the mid-hills of Nepal. This is important in view of three factors:

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(a) The potentiality of citrus in augmenting family income, employment and nutrition of small farm households in the hills.

(b) A suitable fruit tree for import substitution and export promotion.

(c) As a perennial tree crop, for checking soil erosion, and maintaining ecosystem stability by utilizing marginal sloppy land.

7.2. Policy Implications of the Study

This study examines the economic consequences of two policy alternatives on long term family income and employment in Kavre district of mid-hill region Nepal. These policies are the complete specialization on traditional annual food crop -based production systems or integrating high value perennial fruits such as citrus (orange) into the existing systems. The results of the investigation both through descriptive assessment and quantitative programming technique show that;

(i). It is economically possible to increase farm household's income (NPV) through integration of orange (citrus) into existing production systems and resource endowments of the households.

(ii). Land is the most scarce resource consequently has very high shadow prices as indicated by the programming model. Its proper allocation in high pay-off enterprize such as orange is crucial in increasing farm income and sustaining poor farm households as there is no further possibility of expanding the crop acreage in the mid-hill region of Nepal.

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(iii). Off-farm employment is very important for citrus integration and also the economic viability of hill farming systems. Without (or with less than 25% demand) actual off-farm employment even the large farm households would be worse off as their family income substantially dropped to invest on orange production.

(iv). Policy changes particularly changes in output price, wages and discount rate also have effect on farmers income. Improved marketing practices have greater impact than the use of improved technology (improved planting materials) which demands more use of hired labor and purchased inputs. The higher price of orange obtained from improved marketing practice would favor more conservation work on existing agricultural land as land resoure is now more valuable.

(v). Credit plays important role in the economic viability of existing citrus based farming systems only when off-farm employment is not remunerative. When existing off-farm work days in the off-season are reduced to less than 25% of the original base demand, then without credit borrowing investment on orange is not possible.

(vi). The finding of this study indicates that although emphasis on citrus based farming systems in the mid-hills area can immensely benefit the small farmers, many institutional factors could play crucial role in the success of such systems. Institutional services such as availability of disease free planting materials, purchased inputs, technical services, credit and marketing of the products are important.

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(vii). This study suggests that government policies such as emphasis on fruit based farming systems and encouraging small farmers in the mid-hills to integrate citrus (orange) into existing crop based systems could benefit the small farmers more than will the present government policies which stress mainly improved cereal crop technologies.

(viii). The present land scarce and labor surplus situation in the hills of Nepal is likely to worsen in the future due to population pressure and resource degradation. The considerable and constant labor requirements of citrus fruit will make excellent use of sloppy marginal land and family labor in the slack period of the crop production cycle.

(ix). Emphasis on citrus integration is also imperative to improve country's deteriorating economy in the long run through import substitution and export promotion of orange fruit as it has comparative advantage to grow in the mid- hills of Nepal.

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7.3 Limation of the Study and Further Research Areas

Despite the appropriateness and potentiality of multiperiod programming in planning the tree based production systems following limitation were visualized for further research.

(i) The construction of multiperiod linear programming model as the name implies is based upon the assumption of linear relationships among variables. However, in reality the relationships among variables may also be non linear which could not be accounted in this study.

(ii) The problem of divisibility which leads the solution to come out with decimal and small values is difficult to apply in real situation. For example land size. However, round up figure to a quarter of ropani is meaningful for farmers in the hills of Nepal since 0.25 ropani is equivalent to one matomuri and 0.1 khet muri and 1 ropani is equivalent to 16 aana. The rounding up to matomuri and khetmuri or aana provide same direction of planning except magnitude of return which however, would change. Use of dynamic integer or mixed integer programming could overcome the problem of divisibility.

(iii) Because of the long gestation period, time dimension involved in the production, heterogeniety in resource use and intertemporal profit maximization of the tree crop, the investment on fruit tree such as orange is a risky undertaking. However, in this study, due to lack of

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information, risk could not be incorporated directly into the model. The study only attempted to account risk factors indirectly through sensitivity analysis of lower price and yield conditions. The other forms of mathematical programming model such as quadratic programming could be used to incorporate risk directly into actual model.

(iv) Since, this study assumes that, the available land types of the farmers are homogenous in terms of quality, further research should be focussed on the quality differences in the land resources. This could be incorporated in the programming model by treating each land type quality as a different resource with its own set of activities and right hand side requirements.

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