CHAPTER VIII: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

8.1. Summary

The unprecedented fact of the day is the rapid urbanization of the world population. In terms of the pace and level of urbanization, however, there was considerable difference among developed and developing countries. The rate of urbanization is lower in developed countries because the great majority of the people in the developed world are already urbanized. On the other hand, developing countries are less urbanized but running fast for catch-up. Today, only 17% of Ethiopian population lived in urban centers but urbanization is increasing at the rate of 4.4% to raise the share of urban residents to 42.1% by 2050. Rapid urbanization is likely to impact the nature of agricultural food demand in two ways: in intensity and structure. Studies show that urban dwellers throughout the world tend to prefer, among other things, a year-round supply of vegetables. But rural farmers of developing countries like Ethiopia are not expected to sufficiently respond to the growing urban market demand for vegetables due to the perishability of the product and inefficient transport and marketing system. Thus, farmers located in and around urban areas are the first to respond to the growing and unique feature of urban food demand. Peri-urban (PU) vegetable farming plays an important role in providing the necessary nutritional needs, ensuring food security, and creating employment opportunity to farming household and local communities. To sustain this indispensible role of PU vegetable farming, the government should recognize its importance and provide basic institutional support to the subsector. However, PU Vegetable farming of Ethiopia is not only the most neglected but also the most marginalized subsector. This is partly due to apparent lack of empirical research that clearly shows the importance and performance vegetable farming in PU areas of Ethiopia. Specifically, the state of farm efficiency as well as sustainability of vegetable farming around urban centers of Ethiopia is unknown.

This paper, therefore, was intended to analyze the efficiency and sustainability of vegetable production in peri-urban areas of central Ethiopia. The specific objectives of
the paper are to describe the socioeconomic characteristic of PU vegetable farmers; to evaluate the technical efficiency PU vegetable farmers; to find out the determinants of technical efficiency among PU vegetable farmers; and to evaluate the sustainability of the sub-sector as a viable livelihood to peri-urban farmers.

The paper used both primary and secondary data. Questionnaires specially designed for this study and Focus Group Discussion (FGD) guidelines were used to collect the primary data. Sampled farmers are selected through two-stage sampling techniques. In the first stage, three towns namely Bishoftu, Holota, and Woliso were selected from the emerging towns of central Ethiopia. Because of their geographical proximity to central market, these towns have relatively large number of peri-urban vegetable producers. Furthermore, their proximity to the capital Addis Ababa and their expansion of the towns gave birth to stiff competition between PU farmers and construction sector for peri-urban land. In the second stage, a total of 324 PU farmers were selected using simple random techniques. The data was analyzed using various techniques: simple statistical techniques (such as measures of central tendencies, measures of dispersions, ratios, frequencies, and percentages), ANOVA and regression analysis were extensively used where necessary.

The study showed that the PU vegetable farmers had varied demographic and social characteristics. Men farmers were highly predominant accounting for more than 75% of the farmers. This is a clear rejection of the null hypothesis that says PU vegetable farming is disproportionately represented by women. Furthermore, PU vegetable farming was dominated by adults (31-50 years). The elders and youngsters constituted only 17% and 13% respectively. The average family size of the PU vegetable farmers was 4.61 though varied between 1 and 11. This may indicate that in spite of the clear ignorance to PU agriculture at national and local levels, the subsector continued to support quite a large number of populations. PU vegetable farmers are found to have varied educational level - from one that is illiterate to college/university graduate. The average years of schooling is 6.03 and the large majority (66%) of the farmers had attended primary school and above. The varying level of farmers’ education implies, among other things, that PU agriculture was not a marginal activity but an alternative source of livelihood not only for illiterates but also for graduates ones that could have alternative job in other labor market. Unlike
the case in other regions of the world, PU vegetable farmers in central Ethiopia were dominated by non migrants as the overwhelming majorities (91%) of the farmers reported to have grown in or around the concerned town.

The study also revealed that 95% of PU vegetable farmers identified themselves as full time agriculture workers with vegetable farm experience of 2-35 years, averaging at 12.7. This implies that PU vegetable farming was a real battle field between over experienced and new entrant farmers. Interestingly, large proportions (87.1%) of the sampled farmers felt that they were always food secured, and the other 9.8% reported that they were food secured more often than not. The survey data showed that farming was the primary source of family food and income for almost all PU vegetable farmers. It was also shown that only 20% of the farmers had non agricultural income and vegetable production accounted for nearly 45% of the family income. The contributions of vegetable to family income become so high because on average, 82% of the vegetables produced in were supplied to the market. This implies that most of the farmers produce vegetables mainly for market than for home consumption.

It was also shown that most of the farmers had used either their own land or their families land; only 13.4 % of the farmers used rented lands. But the land size of PU vegetable farmers was generally small: on average, each sampled farmer grew on less than half hectare (0.44 hectare). Furthermore, access to credit seems limited as most of the PU vegetable farmers financed their vegetable production by themselves. Only 10% of them received loan from MFI, and other 10% of them received financial assistance from their own family members or friends. But farmers sold their vegetable products either on farm, at own house, at local market, at town market, or combination of these. However, 80% of the PU vegetable farmers sell their products to retailers at local market. By and large, PU vegetable farming of central Ethiopia had faced complex and multidimensional problems including input problems (shortage of land, seed, water, labor and fertilizers), market problems (rise of input prices and low output prices), environment/weather problems (prevalence diseases due to change in climate), institutional problems (lack of trainings and technical support, limited access to credit and financial shortage) and infrastructure problems (lack of transport facilities and designated vegetable marketing place).
Farmers’ technical efficiency was estimated using stochastic frontier model where Translog Stochastic Production function was specified under half normal distributional assumption. The result showed that other things remain constant, vegetable yield was elastic to plot size and fertilizer. The sum of partial elasticities was found to be 1.083 (increasing returns to scale). The mean technical efficiency score of vegetable farmers was only 62.46%, with the minimum and maximum score of 17.85% and 87.48%, respectively. This shows that on average each farmer can increase their vegetable production by 37.54% just by adopting technologies and techniques used by the best practice vegetable farmers. The estimation result also showed that more than half of the farmers were producing at above average efficiency level. To sum up, the estimates of the stochastic frontier model showed that two third of the sampled farmers had efficiency level ranging from 50% to 75%, implying that there is still a room for productivity improvement, at least for the short run, even with the technology/techniques at hand.

An attempt is made to evaluate whether there is significant difference in input utilization among farmers of different efficiency score groups. The computed input used per hectare for each farmer shows that farmers in ‘lower efficient group’ (TE<0.5) used relatively lower land size, fertilizer and hand tool than those in ‘higher efficiency group’ (TE>0.75). Members of the former group, however, employed more labor than their counterparts in the latter group. The overall impact of differences in input application was that the more efficient farmers produced 40% higher than lower efficient farmers. Furthermore, potential yield and yield gap of each farmer was computed based on their actual yield and their technical efficiency. The potential yield computation result showed the existence of large gap between actual and potential yield among all efficiency categories. The potential yield of the least efficient group (TE<0.3) was nearly three times their average actual yield. On the other hand, the actual yield of the most efficient group (TE>85%) is nearly close to their potential yields. In general, although there was considerable yield gap among both efficient and inefficient farmers, it was getting smaller as the level of technical efficiency increases, and vice versa.

The final exercise in the econometric analysis was identification of the major determinants of technical efficiency. This was done using two limit Tobit model. The
result showed that while educational level of the household head was strongly significant (at 1% level), age and access to extension were significant at 5% level and gender was marginally significant (10% level). All other variables did not have significant impact on the efficiency score of vegetable farmers. But those variables that were found to be significant did not have similar impact; gender (being male), education, and access to extension service had a positive impact whereas age had negative impact on technical efficiency of vegetable farmers. The negative relationship between age and technical efficiency implies that the older farmers tend to be less efficient. This is because older farmers are often slow in adopting new technologies than the younger ones and/or younger farmers are comparatively more educated and hence had a greater access to the extension services. The positive coefficient of gender implied that being male headed household improves farm efficiency may be because women allocate fewer time to vegetable farming as they share their time to farm and domestic works. The positive coefficient of education implies that farmers with more years of formal schooling are more efficient than their counterparts. This is because, well-educated farmers better manage their farm, easily understand the advice of DAs, and are willing to try new technologies much faster than their counterparts. The positive coefficient for the access to extension variable implied that regular extension visits by extension workers led to improved technical efficiency.

Finally, an attempt is made to evaluate whether PU vegetable farming is a sustainable livelihood strategy or not. The three major elements of sustainability are used for the assessment: Economic and Financial elements, Health and Environmental elements, and Social and political elements. The economic and financial assessment considered the potential of peri-urban vegetable farmers to satisfy domestic need, to generate considerable income and profit, and to create employment opportunity.

The survey showed that on average a vegetable farming household earned more than 20,000 Br per year and vegetable income accounts for nearly 45 % of the family income. The contribution of vegetable production to household income could have been higher if we would account for fungible income. Profitability of vegetable farming was also computed objectively and the result shows that the activity was highly profitable,
yielding average profit of nearly 17,000Br per year. An attempt was made to examine whether the farmers were able to produce enough vegetables to domestic (own) consumption. The data revealed that most farmers produce vegetable in excess of their domestic consumption. On average, about 82.5% of the vegetables produced by each farmer were sold implying that vegetables were produced mainly for markets. The study also showed how important vegetable farming was in creating opportunities to the household and the urban dwellers. Nearly 53% of the members of sampled households appeared to be engaged in some kind of vegetable production. Furthermore, about 47% of the farmers had hired labor to their vegetable farming, and creates job opportunities to more than 400 people. But the role of PU vegetable farming in employment creation is not limited to the direct employment opportunities mentioned above. It produces a wider multiplier effect by generating employment in related and supportive activities such as input suppliers, transport activities and so forth.

The assessment of PU vegetable farming with respect to environment and health considered farmers’ awareness on the potential impact of vegetable farming on human health and the environment, and the practice and tendency of farmers in using chemical inputs and polluted water. The result revealed that most (60%) of the farmers considered that their activity had no negative environmental impact. Rather they believe that vegetable cultivation has environmental benefits though they were concerned about the long term impact of intensive use of chemical inputs such as inorganic fertilizers, pesticides and herbicides. Farmers believed that inorganic fertilizers reduce future soil fertility whereas pesticides and herbicides pollute the air and kills useful organisms. However, almost all farmers were using chemical fertilizers. The use of manure for vegetable farming was very limited due to government’s promotion for extensive use of chemical inputs. The DAs, instead of training farmers on preparation and application of compost and other organic fertilizers, were engaged in provoking the use of inorganic fertilizers and other chemical inputs. Access to water was one of the major problems PU vegetable farmers were facing. Most of the farmers were obliged to produce only once in a year due to shortage of water. Yet, unlike many of the peri-urban vegetable farming, use of polluted water was negligible. In the long-run, however, the shortage of water
coupled with the increasing demand of vegetables may push farmers to use any types of water accessible to them including the polluted waters.

The major issues considered in assessment of sociopolitical/institutional aspect of PU vegetable farming were land security, access to credit facilities, access to extension services, capability/right to establish association. The study revealed that most of the farmers tilled their own lands. As a result, farmers did not feel any risk of eviction (at least in the short run). Practically, however, all the farmers were always under risk of eviction, even if the farmers are using the land under their procession. This is because none of the farmers had true ownership of land, as the constitution grants land ownership to the government. This means that when the land is needed for any development activity, the government can evict the farmer and give the land to the one it liked.

Credit facilities were hardly accessible to most farmers. Though 37.5% of the farmers reported to have access to credit facilities, only 26.3% of them had received loan. This was due to inadequate number of credit providing institutions and their lengthy bureaucratic systems in awarding loan. Besides, the high interest rates coupled with the group collateral system makes the credit facility unattractive. Access to extension service is very good. The data showed that DAs were assigned to most of the villages and they were the primary provider of extension services. In the absence of DA farmers took advice from fellow farmers (especially model farmers of their locality). On the other hand, PU vegetable farmers had good access to product market. They can sell their products at farm, at own house, at local/village market, or at town though town market was primarily used by most of the farmers. Since only few farmers sale their product at their own home, they played a little role in setting vegetable prices. Though vegetable marketing is a simple affair, it suffered from problems such as fall of vegetable prices during the major harvesting season, inadequate transport facilities and perishability of vegetables.

Finally, PU farmers’ membership to farmers’ association and/or cooperative societies were assessed. Though such institutions are important to influence policy and the market, there was neither vegetable farmers association nor marketing cooperative societies that
farmers could join. More than a quarter of the vegetable farmers were members to one or more of social institutions such as *Uqubi* and *Iddiri*. These institutions are systems of helping each other and working together but do not have any objective of improving or safeguarding the benefit of the vegetable farmers.

### 8.2. Conclusion

This study was set out to assess the technical efficiency of peri-urban vegetable farmers of central Ethiopia. The sub-sectors sustainability was also assessed from different dimensions. The following conclusions can be drawn from the findings of the study.

The demographic characteristics of the sampled farmers have refuted many of the public view on PU agriculture farmers. First, the fact that three out of four vegetable farmers being men was sufficient enough to reject the claim that PU vegetable farmers are dominated by women. Second, like all sub-sectors of agriculture, significantly large number of vegetable farmers was in working age. This rejects the null hypothesis of elders’ dominance of PU vegetable farming. Third, in contrary to many of the claims of previous studies, PU vegetable farmers were not migrants but the indigenous local people. PU vegetable farmers are not a community of illiterates as large majority of them had attended primary school and above.

The study has also shown that PU vegetable farming was the dominant source of livelihood to large number of peri-urban population. Its contribution to family income and food was significant. No other sub-sector had contributed to household income more than vegetable production. It had made nearly all of the sampled households food secured. In general, PU vegetable farming was not destined to be the livelihood of the minorities. Rather, it is the source of family food and income to many people regardless of their gender, age, wealth, and education status.

Peri-urban vegetable farmers showed typical characteristics of smallholder farmers: more than half of the farmers had less than half hectare; most farmers used own or family land;
and family capital was the single most important source of finance. Shortage of water coupled with weak tradition of irrigation made vegetable farming more of rain-fed and seasonal. There were a number of problems that challenged the sufficient production of vegetables in peri-urban areas of Ethiopia. While problems such as shortage of land, change in climate/weather, rise of input prices, and low output prices are common to agricultural sector, limited access to credit, perishability, lack of suitable transport facilities, and underdeveloped marketing systems were problems peculiar to vegetable farming.

One of the most significant conclusions emerged from this study was the existence of lower technical efficiency among all the sampled farmers. This in turn gave birth to the availability of higher yield gap (deviation of potential yield and actual yield) among all farmers although the gap was declining with efficiency score. Thus, there is a wide room to significantly improve vegetable production in the study area if the techniques of the most efficient farmers are adopted. This means, each farmer can get more yield without using more of any of the inputs but just by rearranging the already employed inputs. But mere increase in some of the inputs does not guarantee a proportionate increase of vegetable yield. The study showed that vegetable production was inelastic to all major inputs except to plot size and fertilizer though its response to simultaneous change of all inputs was found to be more than proportionate. The study also revealed that PU vegetable farmers’ efficiency was affected by both demographic and institutional variables. Among the demographic variables gender, age and education of the household head had significant impact on farm efficiency. Access to extension services was the only institutional factor that significantly affected farmers’ technical efficiency.

Beside farm efficiency, safety of PU agricultural product is top concern of the day. The concern is more serious especially on agricultural goods produced in or around urban centers. This is due to the public view that urban agriculture may use urban wastes and polluted waters that have serious impact on human health. The study, however, showed that PU vegetable farming had imposed no risk on human health, at least in the short run, as the use of urban wastes and polluted water for peri-urban vegetable production was
negligible. But the acute shortage of water coupled with high demand of vegetables would likely initiate farmers to use polluted waters in the near future.

It is interesting to note the awareness of farmers on the potential impact of PU vegetable farming on the environment. The study showed that nearly all of the farmers were aware of the negative impact of using chemical inputs such as inorganic fertilizers, herbicides and pesticides. Much of the credit of creating awareness goes to the government although some NGOs that were working on health and environment had contributed. Though farmers awareness on this particular issue is paramount important, awareness creation per se is not an end. There should have been further actions to make the farmers to produce and use environmentally safe inputs. In this regard, the initiatives and the actions taken so far are negligible. Instead of encouraging farmers to use more of organic fertilizers and less of inorganic ones, the government promote the intensive use of chemical inputs especially inorganic fertilizer. As a result, all farmers used inorganic fertilizer for vegetable production. In general, the intensive use of inorganic fertilizers may result in a long term impact on sustainability of the business as it reduces the natural fertility of the soil.

Equally important issue worth considering in sustainability assessment is tenure security. Land ownership remains one of the most controversial and debatable issue in political economy of Ethiopia. Amazingly, most of the farmers felt that their land ownership was secured because, according to the farmers, they were using their own or family land. However, PU vegetable farming was under risk of eviction, as the government had absolute right over any land and has the tradition of evicting peri-urban farmers for urban expansion. This risk of eviction emanated from the current (1991) constitution of Ethiopia that granted the government to own all the lands (on behalf of the people) and allowed individuals and institutions to have only use-right. Thus, the government has full authority to dispossess the use right of anybody on any land at any time. This made urban centers of Ethiopia to continuously expand at the expense of peri-urban agriculture. This is because the urban municipalities had little difficulty in offering peri-urban lands (which were under the possession of peri-urban farmers) to residential and other construction projects with minimum compensation. Thus, it is a common phenomenon to
see peri-urban farmers evicted from their agricultural land in the name of development project or urban expansion. This is exactly what was observed in the study area.

The importance of farmers’ access to extension and credit services was well documented in many theoretical and empirical works. This had influenced many governments to create access to these two facilities to all farmers. In the present study area, although the extension coverage was nearly complete, access to credit facilities was very limited. This is due to inadequate number of credit providing institutions as well as the bureaucratic bottlenecks of the available institutions. The closeness of PU vegetable farms to urban centers eased the physical access to market. There were times when transaction took place at farm or farmer’s home. But PU vegetable farmers suffer from several market problems. Output price fall, inadequate and convenient transport system, and lack of facilities that preserve the vegetables were the major marketing problems. Lack of vegetable farmers association and marketing cooperatives had also limited farmers’ bargaining power in product market. Had there been such associations or cooperative societies, farmers could have influenced policy makers and local administration so that due recognition and necessary support could be extended to the subsector.

To sum up, PU vegetable farming was an important source of family food and income to large number of PU households, regardless of their demographic and socioeconomic differences. But most of PU vegetable farmers were not efficient in production. As a result, there was significant yield gap that implies the possibility of improving vegetable production in the areas by rearranging the existing inputs. The sustainability assessment yield mixed results: the economic/financial aspect was promising; the environmental and health aspect was moderate (no threat in the short-run); and socio-political (institutional) aspect was full of problems.
8.3. Recommendations

This study revealed important information that can be used to develop targeted interventions that would help in improving farm efficiency and pave ways for sustainability of vegetable production around urban centers.

Based on the findings of the study, the following major recommendations were forwarded so that the efficiency and sustainability of PU vegetable farming will be improved.

- First, the municipality has to recognize the role of PU agriculture in general and vegetable farming in particular in meeting a variety of social, economic, political, environmental, and health objectives and provide due institutional support to the subsector. Furthermore, central government has to take the responsibility of crafting laws and policies that can promote the outcomes of PU agriculture. Thus, local administration and central government has to give due recognition and support for sustainable development in PU agriculture.

- It is essential to increase the participation of women in PU vegetable farmers. The government, NGOs, and civil societies have to encourage and support women to take part in the production and marketing of vegetable farming. Extension services must target women farmers and involve their participation; this should include training more female extension officers but also training male officers to meet the needs of women farmers and equip them with communication skills. Governments must ensure that women farmers can access financial services, including credit at all levels, at interest rates that are affordable to smallholder women farmers.

- It was revealed by the study that years of schooling had a positive correlation with technical efficiency. The implication is particularly important for Ethiopia because the free primary education policy being implemented will ensure increased enrollment in primary schools. But the impact of free primary education policy in raising farmers’ level of education might be limited in the short-run. Rather, the government has to consider alternative systems such as adult and/or
continuing education. In the short run, intensifying farmer training programs through various innovative and vocational education programs and extension delivery systems would be more practical. In the medium long term, policies should be geared towards promoting formal education as a means of enhancing efficiency in agricultural production.

- The positive effect of access to extension services implies that enhancing smallholder farmers’ access to information and new technologies will improve the level of technical efficiency. Policy makers should, therefore, introduce different techniques of addressing extension need of farmers. This may include launching farmer field schools and using ICT and mass media to supplement and complement extension workers efforts.

- NGOs and civic societies have to advocate for appropriate legislation to encourage commercial and microfinance institutions to accommodate small agricultural producers. The government has to encourage and support mobilization of financial resources through savings and credit organization and other community based lending systems. Furthermore, the state government should strengthen local institutions that would enhance sustainability through locally managed credit systems and technical assistance, local production and distribution facilities for inputs, appropriate equipment, and marketing and distribution systems.

- PU vegetable farmers have to get organized into farmers associations and marketing cooperatives so that they can influence public policy and improve their market power. To exploit the expected benefits of access to information more effectively, such producer associations formed should be federated at all levels up to national level. It is also a responsibility of the government to foster the formation and development of farmers’ associations, and improve the community mobilization and management skills of the farmers.

- Local and international NGOs have to lend hands to vegetable farmers in exploring alternative water sources. This will relieve farmers from rain water dependence and ensure a year round production of vegetables. It also reduces the
likelihood of using urban waste waters for vegetable production and builds public confidence on safety of vegetable products.

- There is possibility of producing enough vegetables to feed a growing urban population, without risking the environment just by supporting small-scale farmers with sustainable techniques—like using organic fertilizers and drip irrigation techniques. Thus, the government in collaboration with national research organizations and non-governmental organizations should develop environmentally sound farming technologies that enhance crop yields, maintain land quality, recycle nutrients, conserve water and energy, and control pests and weeds. More importantly, the government has to encourage the use of organic fertilizers instead of running for raising large revenue via excessive sale of inorganic fertilizers at the expense of agricultural land’s natural fertility loss. The extension officers have to be trained on environmentally friendly farming techniques so that they will promote the use manures and train farmers on easy way of preparing compost and other organic fertilizers.

- Land tenure system has an impact on food security, environmental sustainability, and social security. Thus, the governments should arrange institutional and legal systems that ensure land security to PU farmers.