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Process of Commercialization of Agriculture in Amhara Region-Ethiopia: Prospects and Constrains

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Process of Commercialization of Agriculture in Amhara Region-Ethiopia: Prospects and Constrains

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Abstract- The growth in total output and productivity in the last fifteen years in the Amhara region are not accompanied by significant changes in the marketed surplus of cereal crops. The use of improved seeds and biological and chemical inputs have increased; but not at the rate required to commercialize the agriculture to produce high marketed surplus. For instance, the proportion of grain marketed was 19.65 percent in 2001/2 and it was 20.3 percent in 2009/10. In the case of cereals, the proportion of output marketed has increased marginally from 12.99 percent to 15.2 percent during this period. The proportion of pulses marketed has increased from 18.66 percent to about 23 percent. The proportion of oilseeds marketed has declined to 45.77 percent in 2009/10 compared to 49.36 percent. The farm technology is still predominantly traditional. The percentage of acreage of grain crops in the total acreage has come down in the past fifteen years. Small farmers' market orientation is seen in terms of increase in the acreage allotted for pulses, oilseeds, vegetables, sugarcane, coffee and chats.

What is required is big push for creating infrastructure like dams or drainage system to accelerate the process of commercialization of agriculture in the region. Input markets must be reformed to enable private, public agencies and cooperatives to act competitively to provide needed agriculture inputs such as improved seeds, biological and chemical inputs to the farmers so as to reach higher level of yield and output.

The significant proportion of crop land is used for cereal crops perpetuating subsistence farming. There is persistence of integrated farming. Diversification of crops is seen on the larger size of holdings.

SECTION- 1

I. INTRODUCTION

In recent years, there is resurgence of interest on Ethiopian agriculture focusing on processes and constraints on commercialization of peasant agriculture (Tanguy Bernard, David J. Spielman, Alemayehu Seyoum Taffesse, and Eleni Z. Gabre-Madhin (2010); Jaleta, Gebremedhin and Hoekstra, 2009; Bongor, Gabremehin and Babu 2002). The need for commercialization of peasant agriculture stems from the fact that it leads to specialization in crop production, improvements in farm management techniques in traditional agriculture, high marketable surplus and high income for the small farmers. Agricultural

commercialization results in product choice and input use decisions based on the principle of profit maximization (Pingali and Rosegrant (1995). Commercial orientation of agricultural production occurs for cereals as well as for high value cash crops. Commercialization of agriculture leads to greater market orientation of farm households and a greater substitution of non-traded inputs for purchased inputs. Commercialization of agriculture is generally accompanied by the decline of integrated farming system and emergence of specialized enterprises for crop, live-stock and poultry signifying higher value addition (Pingali, 1997). Binswanger and Braun (1991) noted that normally, technology and commercialization stimulate agricultural growth, improve employment opportunities, and expand food supply—all central to the alleviation of poverty. However the authors argue that through “social engineering” the benefits from technology and commercialization can easily be targeted toward the poor.

II. STRUCTURE OF THE REGION'S ECONOMY

The Amhara region, located in the Northern parts of Ethiopia is largely an agrarian economy. The contributions of agriculture, industry and services sectors to the region's domestic product respectively are 57.91%, 22.91% and 19.18% in 2004/05. With total regional domestic product of 19.45 million ETB and total population of 18.68 million, the per capita income was 1042.50 ETB per annum (AmharInfo, 2010). It is estimated that of the 18.68 million populations in Amhara region, 87.1 % of the population resides in rural areas and they largely engaged in agriculture and agriculture related activities (AmharInfo, 2010). The small scale and micro enterprises dominate the economic landscapes in the region. There are a few large scale and medium sized manufacturing industries found in beverages, furniture and other non-metallic enterprises, textiles and leather processing plants. The public sector manufacturing enterprises are not numerous to absorb a rising labor force in the region. In terms of cropping area and agricultural production, Amhara region contributes respectively about 30% and 33 % of Ethiopia's cropping area and total agriculture output (AmharInfo, 2010). The food security for the

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growing population at the rate of 1.7 % per annum is the major concern for the Governments at the Federal and the Regional levels. It is estimated there are 2.5 million people in the region who are chronically food insecure in addition to 3.3 million people who are vulnerable to food shortages (Amharainfo, 2010).

The rest of the paper is organized as follows. The section two presents the statement of the problem, methodology and sources of data used for understanding the commercialization of agriculture. The following four sections discuss the concept of commercialization, farm size and farm organization, the growth of area, production and yields of principal cereals crops, pulses, oilseeds and vegetables and root crops in the region followed by the discussion on the proportion of marketed surplus of cereal crops and other crops to understand the level of commercialization of agriculture. The section seven presents the persistence of integrated farming and diversification of crops by the size of holdings. The section eight presents the strategy to be formulated for intensification of use of modern agriculture input in agriculture and the prospects of commercialization in the region. The final section summarizes the findings.

SECTION- 2

III. STATEMENT OF THE PROBLEM

While there are a number of studies which deal with pace and processes of commercialization of traditional agriculture at the macro level, at the regional level there is hardly any study with the processes, constraints and prospects of commercialization of agriculture. This study attempts to fill the void in the growing literature on the commercialization of small farm agriculture in Amhara region in the past 15 years in the context of various institutional changes implemented by the Federal and Regional Governments. This study analyzes changes in cropping pattern, intensification of use of modern inputs, the diversification of crops by size of holdings and nature and characteristics of commercialization of agriculture. Further, this study discusses various institutional constraints that hold back the pace of commercialization of peasant agriculture in the region.

IV. OBJECTIVES OF THE STUDY

- To describe the processes of commercialization of cereal crops in Amahara region from 1995-96 to 2009-10.
- To identify the diversification of crops by the private land holders in Amhara region from 1995-96 to 2009/10
- To identify the institutional constraints that holds back the process of commercialization of agriculture in Amahara region.

V. METHODOLOGY

This study is purely descriptive analysis. It is based on secondary data collected by the Central Statistical Authority (CSA), an organ of the Federal Democratic Republic of Ethiopia. The analysis is conducted for Amhara region with respect to changes in cropping pattern, farm management practices and land utilization by peasant private land holders from 1995/96 to 2009/2010³. The information obtained from the Reports on Land Utilization and Farm Management Practices are used for describing changes in diversification of crops by the size of holdings and constraints on intensification of use of modern agriculture inputs. Using data from the Farm Management Practices, we identify the level of commercialization by using various indices. The growth rates are computed for whole time periods, and two sub- periods i.e., 1995/96 to 2001/02 and 2003/04 to 2009/10. In order to find out growth rates of area, production and yields of various crops, the regression model for finding the growth rates take the form $\ln Y = a + b(t)$, where $\ln Y$ is the area or production or yield transformed into natural logarithm, 'a' is constant and 'b' is the coefficient of time variable.

VI. QUANTITY DECOMPOSITION

In addition to an analysis of cropping pattern changes by using growth rates, we also utilize decomposition method to understand the changes in output due to changes in yield and changes in cropping areas. Tafesse (2008)⁴ applied the decomposition methods for cereal crops in four regions of Ethiopia namely Amhara, Oromia, SNNP and Tigray. In addition to cereal crops, we use decomposition methods for pulses, oilseeds, vegetables and stimulant crops for

³ The Central Statistical Agency has not collected data on area, production, and yield, as well as farm management practices and land utilization pattern of peasant households for the year 2002/03 as that was the Census year.

⁴ The quantity of output of crop i (Q_i^t) is the product of yield (Y_i^t) and acreage allocated to its production (A_i^t). Decomposition can take the following approximate form:

$$dQ_i^t = A_i^t dy_i^t + y_i^t dA_i^t$$

The decomposition identifies relative contribution of changes in acreage and changes in yield to changes in the quantity of output. There are two ways of applying it with periodic data (t standing for 'time'):

$$dQ_i^{t2} = y_i^{t2} dA_i^{t2} + A_i^{t2} dy_i^{t2} \quad \text{Or,}$$

$$dQ_i^{t2} = y_i^{t-1} dA_i^{t2} + A_i^{t-1} dy_i^{t2}$$

three time periods, i.e. 1995/6 over 1994/5 , 2004/5 over 2003/04 and 2009/10 over 2008/9.⁵

SECTION -3

VII. CONCEPT ON COMMERCIALIZATION

The process of commercialization is defined by various scholars depending on the level or the degree of participation of peasant farmers in the product and in the factor markets. Since all small farmers are not homogeneous, Miracle (1968) proposed seven criteria for identifying subsistence farmers⁶; depending on the strengths and weaknesses of these factors, the author noted that these forces would either perpetuate subsistence production among small farmers or make the small farmers be innovative and progressive. Hayami and Herd (1977) in their study on the market price effect on the subsistence rice producers in Philippines classify large and small farmers based on the proportion of output they sell. Given the same rate of adoption of technology for the small and large farmers and given the fact that an impact of technology is neutral small farms are those who sell 20 percent of output produced and large farmers are those who sell 80 % of the output produced. In contrast, Pingali (2001) uses multiple indices to capture nature of commercialization of agriculture based on heterogeneity of farmers' production behavior. Peasants are classified as subsistence farmers, semi-commercial farmers and fully commercial farmers depending on farmers' objectives, source of uses of agriculture inputs, product mix, sources of household income, human nutrition, and their level of use of farm yard manure and fertilizer. In subsistence systems, farmers main objective is attaining food self sufficiency by producing a wide range of agriculture produce by using inputs which are (non-traded) household generated. The farmers obtain their nutrition predominantly from home produced. In case of semi-commercial system, the objective of semi-commercial farmers is surplus generation by producing moderately specialized products by using mix of traded and non-traded inputs. The semi-commercial farmers' sources of income are agriculture and non-agriculture.

⁵ The separate time period analysis will provide better information on isolating the factors contributing to the output change.

⁶ 1. Isolation from the market place 2. Chronic low level of living. 2.1 Chronic mal-nutrition traceable to the level of production. 2.2 Fairly frequent occurrence of seasonal food shortage. 3. Economic stagnation. 3.1 Little increase in per capita production in the last ten years. 3.2 Little increase in production sold per capita. 4. Weak commitment to agriculture. 4.1 Off-farm activities outside of agriculture and commerce. 4.2 Off-farm activities in commerce or elsewhere in agriculture. 5. Insecurity of land tenure. 5.1 Insecure land tenure discourages land improvement. 5.2 Insecure land tenure restricts enterprise combinations. 6. Labor dependency. 7. Capital dependency.

Unlike subsistence farmers, semi-commercial farmers obtain nutrition both from home produced and purchased. The semi-commercial farmers use farm yard manure and chemical fertilizers. In case of commercial farming system, farmers' objective is the profit maximization; farmers produce highly specialized products by using predominately traded inputs; the household income is derived predominantly from non – agriculture operations; they obtain their nutrition which is purchased from the market. They use chemical fertilizers for their agriculture operations (Pingali, 2001 cited in Bernard, *et al.* 2010). In the context of Amhara region, in characterizing farmers as subsistence farmers and semi-commercial farmers, will be a suitable criteria.

The third definition will be difficult to defend on the ground the size distribution of private peasant holdings is small and specialization of production is not yet deep rooted. Since off –farm economic activities in rural areas as well as in urban areas is not well developed for the absorption of farm family labor, the opportunity cost facing peasant family farm labor is not high enough to neglect their farm operations. In fact, an organization of farm production is largely based on use of family labor; peasants use simple farm techniques; they rely less on purchased inputs. Using data from the Farm Management Practices, we identify nature and degree of commercialization of agriculture as subsistence farmers or semi-commercial farmers. We also utilize Land Utilization data to indicate a degree of commercialization of agriculture by size of holdings in Amhara region. Further, we use the level of specialization of farmers in terms of cultivation of mono crop as commercial farmers, or in cultivation of multiple crops as semi-commercial farmers. Similarly, if farmers combine livestock management and farm management, they may be called subsistence farmers; on the other hand, if farmers separate farm production from livestock management, they will be identified as commercial farmers as each operation requires specialized knowledge and skills.

a) *Size of land holdings*

The total number of private peasant holders has increased from 2583.81 thousands in 1995/96 to 3588.21 thousands in 2009/10. While 83 % of peasant holders with less than 2 hectares of land occupied 57.53% of crop area in 1995/96, in 2009/10, 80 % of peasant holders with less than 2 hectares of land hold 54.69 % of the cropping land. The average size of holdings had decreased marginally from 1.17 hectare per holder in 1995/96 to 1.15 hectare per holder in 2009/10. It suggests an increasing pressure on agriculture during this period. All crop land has increased from 3010.18 thousand hectares in 1995/96 to 4109.138 thousand hectares in 2009/10. The average area per holder across the size of holdings has

decreased during this period possibly due to an increase in the number of holders.

Table 1: Total number of holders, total crop land, (in hectare)

Size of Holdings	1995/96			2009/10		
	Number of holders	Average area/holder	All crop land area ('000)	Number of holders	Average area/holder	All crop area ('000)
Less than 0.10	190.33	0.03	6.09	220.967	0.04	8.122
0.10-0.10	564.56	0.31	173.89	642.829	0.26	166.61
0.51-1.00	643.31	0.75	482.11	824.019	0.66	549.827
1.01-2.00	750.35	1.43	100.42	1194.761	1.28	1528.021
2.01-5.00	419.92	2.81	1179.95	669.356	2.45	1637.351
5.01-10.00	14.58	5.97	87.06	33.021	5.55	183.219
>10.00	**	**	**	**	**	**
Total	2583.81	1.17	3010.68	3588.211	1.15	4109.138

Source: CSA 1995/96 & 2009/10

** Not available

b) Organization of farm production

Commercialization of agriculture depends on risk taking behavior of peasants which in turn determined by size distribution of landholdings and types of crops being cultivated by peasant farmers. The size distribution of land holdings largely determines the nature of crops whether they are subsistence crops or commercial crops. The farmers with large land holdings will be able to bear more risks to cultivate commercial crops as they have more capacity to undertake multiple crops in order to increase their income levels. This risk bearing attitude through diversification of crops reduces price uncertainty facing large farmers. In contrast, small land holders who are generally risk averse due to resource constraints will try to avoid market price uncertainty and rather cultivate food crops to meet first their own family consumption than to cultivate crops for the market. One can hypothesize an unequal asset distribution in combination with forces of urbanization accelerates the pace and processes of commercialization of small holder agriculture. At the same time, if small farmers have already met their target of food security for household consumption and have equal access to markets, they can have positive attitude toward crops which have a commercial value. Our hypothesis is that though farmers are small land holders, they cultivate multiple crops taking into account the needs of their household consumption and market demand⁷. An organization of farm production is based on use of family labor than hired labor or wage labor; use of simple farm techniques rather than use of tractors, power tillers, and threshers and or any other capital intensive production process. Farmers keep

their farm lands ready well in advance for the next season by tilling the land just after one pre-monsoon shower. A large percentage of land holders use animal power by using oxen/ horse/donkey and bullocks as draught power / energy for tilling the land as well as for transportation of farm products. Farmers use largely their own seeds saved from the previous harvest and natural fertilizers like leaves and farm yard manure. However, what is witnessed in the region is responsiveness of peasant farmers to market incentives by combing traditional inputs and improved farm inputs such as high yielding varieties of seeds and chemical fertilizers for higher yield and production.

SECTION 4

VIII. AREA, PRODUCTION AND YIELD OF CEREAL CROPS IN THE AMHARA REGION

The grain crops constitute cereals, pulses and oilseeds. Among the cereals⁸, Teff, barley, wheat, maize, sorghum, and finger millets are principal cereals produced in Amhara region. The area under grain crops was 2933.08 thousand hectares in 1995/96 and has increased to 3997.75 thousand hectares in 2009-10. The share of cropping area under cereals was 81.16 % in 1995/96 whereas it was 72.81% in 2009-10. Among cereals, the cropping area under Teff has decreased from 30.08 % in 1995/96 to 24.40% in 2009/10, though in absolute terms, the cropping area under Teff has

⁸ These cereals are major staple food for thousands of farmers and millions of consumers and a source of income to the thousands of peasant farmers. The significant proportion of total cropped area is devoted to these cereals in Meher season which is the main cropping season from September to February which has long rainy season. The Belg season which has short rainy reason takes less cropped area from March to August.

⁷ Commercialization of agriculture does not necessarily imply a development of capitalistic mode of production. Capitalistic mode of production refers to use of more hired labor on farms. The hired labor in agriculture is to be paid a wage at the prevailing market rate.

increased from 882.28 thousand hectares to 1001.03 thousand hectares during this period. The cropping area under cereal crops has increased at the compound growth rate of 2.32 % per annum during 1995/96 to

2009-10. The cropping area under major cereal crop, Teff, has increased at the compound growth rate of 1.31 % per annum during the same period.

Table 2: Compound Growth Rates for Grain and Cereal crops

Crop Type	CGR for the period 1995/96 to 2009/10			CGR for the period 1995/96 to 2001/02			CGR for the period 2003/04/ to 2009/10		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
All Crops	3.14	7.68	4.39	1.61	3.56	2.02	4.08	8.98	4.70
Grain Crops	2.94	6.82	3.76	1.40	2.94	1.40	3.98	9.41	5.54
Cereals	2.32	6.18	3.87	0.40	1.91	1.51	3.97	9.30	5.44
Teff	1.31	5.44	4.18	-0.30	1.40	1.71	3.76	9.96	6.92
Barley	3.35	7.87	4.39	1.10	2.63	1.51	0.50	5.65	4.81
Wheat	7.14	12.18	2.43	5.75	9.74	3.76	6.18	10.18	3.35
Maize	2.43	5.12	2.63	2.53	3.97	1.40	6.50	11.51	4.91
Sorghum	1.00	4.60	3.56	2.83	-3.23	-0.40	2.42	6.18	3.66
Millet	-0.60	3.56	3.87	0.10	0.60	0.50	3.14	10.18	7.57
Oats	-1.21	2.73	28.01	5.02	8.22	2.94	-1.10	8.22	4.18

Source: Authors computation based on CSA data (various years)

The production and yields of each of the cereals at any time period are influenced by factors such as rainfall, types of soil, quantum of fertilizers use, pesticides and insecticides and use of high yielding varieties of seeds. The production of cereals was 24774.23 thousand quintals in 1995/96 and it has increased to 46301.97 thousand quintals in 2009/10. The share of cereal production in total crop production was 86.58 % in 1995/96 and had come down to 74.79 % in 2009/10. The share of production of Teff, barley, wheat, maize, and sorghum respectively was 24.22%, 8.77%, 8.09%, 19.81% and 19.85% in 1995/96 and they were respectively 20.77%, 8.19%, 14.47%, 12.94% and 12.80% in 2009/10. The analysis of production and yields of cereals show divergent growth rates over the period 1995/96 to 2009/10. In general, an increase in production of cereal output is directly correlates with an increase in cropping area under cereals. While total area under cereals has increased at the rate of 2.32 % per annum, the production of cereals output as a whole has increased at the compound growth rate of 6.18 % per annum. While cropping area under Teff has increased at the compound growth rate of 1.31 % per annum, the Teff output has increased at the compound growth rate of 5.44 % per annum during this period. The output of barley, wheat, maize and sorghum respectively has grown at the compound growth rates of 7.84%, 12.18%, 5.12%, and 4.60 % per annum during the period 1995/96 to 2009/10.

A significant variation in individual crop output under cereals is related to variations on the adoption of improved farm management practices by the peasant farmers. The yield of Teff per hectare- which is a

measure of improved farm management practices has increased from 7.86 quintal per hectare in 1995/96 to 12.85 quintal per hectare in 2009/10. Similarly, yield of maize per hectare has increased from 19.56 quintal per hectare in 1995/96 to 22.53 quintal per hectare in 2009/10.

The yield of wheat per hectare was 8.92 quintal per hectare in 1995/96 and increased to 16.34 quintal per hectare in 2009/10. Nevertheless, the yields of wheat and maize per hectare are far lower than the yields obtained in other developing countries requiring strong public action to improve yield levels in the region. The yields of Teff, barley, wheat, maize and sorghum respectively have grown at compound growth rates of 4.18%, 4.39%, 2.43%, 2.63% and 3.56% during this study period. Other crops in cereal group have not experienced significant growth in yields due to lack of breakthrough in high yielding varieties of seeds. The growth rates of yields for individual crops in the second sub-period are higher than the growth rates observed in the first sub-period. The comparison of growth rates of area for two sub periods show that an increase in cropping area under teff, wheat, and maize are high in the second sub-period compared to the first sub-period. The growth in production can be largely attributed to area expansion for teff, wheat, maize and millet in the second sub-period compared to first sub-period. In spite of low rate of growth of cropping area under barley in the second sub-period, the growth of barley output is higher due to higher growth rate in yield level. It is seen from the decomposition analysis (Appendix 5) at three points of time an increase in yield has brought about an

increase in output higher than an increase in cropping area under Teff.

a) *Marketable surplus of cereal crops*

One of the indices for measuring the level of commercialization of agriculture is the proportion of cereal output marketed. The proportion of output marketed depends on the resource base of the farmers. Hayami and Herd (1977) in their study on the market price effect on the subsistence rice producers in Philippines classify large and small farmers based on the proportion of output sold. Given the same rate of adoption of technology for the small and large farmers and given the fact that an impact of technology is neutral, the authors assumed small farmers are those who sell 20 percent of output produced and large farmers are those who sell 80 percent of the output produced. Inderjit Singh (1971) in the context of transformation of traditional Punjab agriculture in India into commercial agriculture noted the marketed surplus of wheat as a percentage of total production increased from 53.4 percent in 1952 to 80.3 percent in 1965, indicating that whereas 47 percent of the production of wheat was for subsistence in 1952, only 18 percent of the production was for the same purposes in 1965. Based on proportion of output marketed we can find the degree of commercialization of agriculture in the region. We utilize the crop output utilization data collected by the CSA for two points of time, 2001/02 and 2009/10 for observing changes in the production of various crops and their utilization to suggest an emerging pattern of commercialization of agriculture. The farmers generally utilize crop output for (1) household consumption, (2) seed for reproduction, (3) sales, (4) wages in kind, (5) feed for animal and (6) others. Since a number of authors use proportion of output marketed as the indicator of the marketable surplus to gauge a degree of commercialization along with the reduction of wage payment in kind, we follow the same approach.

In 2001/02 the production of grain was 33.7 million quintal; the percentage utilization of output for household consumption was 64.25 %; for seed 13.15 %; for sale 19.65 % and for animal feeds and for others accounted for less than 3 %. In 2009/10, the production of grain was 57.1 million quintals; of which 61.64% was utilized for household consumption which is lower than household consumption level in 2001/02. There is marginal increase in the percentage of output utilized for seed indicating increased reliance on own and indigenous seed. The percentage of output utilized for sale in the market was almost constant in spite of increase in the production levels. Payment for wages in kind was almost one percent.

In the case cereals, the marketed sale has increased from 12.99 percent to 15.2 percent during the period while the consumption of the same has decreased marginally from 68.42 percent to 66.93

percent. It is observed percentage utilization for household consumption has come down for all crops in recent years especially for Teff from 61.19 % to 57.89%. The percentage of crop output for seed is almost constant in the two periods suggesting farmers' dependence on own seed for crop production either due to lack of improved seeds or high cost of improved seeds in the market.

This finding suggests that commercialization has not taken place in full form in the region. Farmers are not producing enough grains due to technological and institutional bottlenecks. The expansion of cereal output and higher marketable surplus requires large doses of the biological and chemical inputs and hybrid varieties of seeds with assured irrigation. Taking into account the increasing urbanization and population growth in coming years, it is imperative to commercialize the traditional agriculture in the region.

An emerging pattern is that for cereal crops as well as for other types of crops, the percentage of crop output utilization for payment as wages in kind had come down in 2009/10 as compared to 2001/02 suggesting an emergence of wage labor in the village economy and to some extent an increasing monetization. Also we find decrease in the percentage utilization of crops for animal feed and others in 2009/10 as compared to 2001/02. It may also suggest that farmers buy animal feed from the market rather than using the crop output.

b) *Input constraints*

i. *Irrigation for cereal crops*

The commercialization of agriculture presupposes availability of assured irrigations for all crops. In fact, assured irrigation would act as catalyst for farmers in the adoption of improved farm management practices. The slow expansion of irrigated area under cereals slows down the process of commercialization of agriculture in the form of purchase of improved seed, fertilizer and pesticide.

In case of Teff, as against 1001.03 thousand hectares of cropped area in the region, the irrigated area under Teff was 4.414 thousand hectares in 2009/10. Total cropped area under Teff has increased from 826.443 thousand hectares in 2003/04 to 1001.028 thousand hectares in 2009/10 by 21.12%. However, the percentage of irrigated hectares of Teff in total cropped area of Teff in 2003/04 was 0.24 % and it was 0.44 % in 2009/10 suggesting farmers' heavy dependence on monsoon. Assured irrigation will enable peasant farmers to apply improved seed, modern chemical fertilizer and obtain higher yield. The teff being the staple food for the millions of Ethiopians, only through a large scale modernization of traditional agriculture one could witness a growth of enough buffer stock for food security in the region. The modernization leading to full-fledged commercialization of teff production requires

multi-pronged strategy from R&D, creation of irrigation, involvement of local institutions and government agencies.

The cropped area under barley was 357.174 thousand hectares in 2003/04 and increased to 387.862 thousand hectares in 2009/10. Year to year fluctuations in area under barley appears to be due to fluctuations in the amount of rainfall and resource constraints facing farmers. The irrigated area under barley fluctuates widely. The percentage of irrigated area under barley in total cropped area of barley was 1.3% in 2003/04 and it was 1.14% in 2009/10. As against 387.86 thousand hectares of cropped area under barley, only 4.32 thousand hectares were under irrigation.

Total cropped area under wheat has increased from 332.645 thousand hectares in 2003/04 to 434.386 thousand hectares in 2008/09. In 2009/10, the area under wheat has fallen to 334.524 thousand hectares from 434.386 thousand hectares in the previous year. A decrease in total cropped area under wheat appears to have been picked up by barley whose cropped area has increased to 387.862 thousand hectares from 347.72 thousand hectares in the previous year.

The percentage of irrigated area under maize in the total cropped area of maize was 1.56 % in 2003/04 and it was 0.74 in 2009/10. As against 355.51 thousand hectares of cropped area under maize, only 2.621 thousand hectares of land under maize were under irrigation. As noted above, lack of irrigation facilities operate as a significant bottlenecks on the diffusion of modern cultivation practices in the region.

ii. *Improved seeds for cereal crops*

One of the features of commercialization of agriculture is the participation of farmers in the input markets. The farmers' participation in the input market implies purchase of modern inputs for obtaining higher yield and output. An improved seeds provide higher yields than the local seeds. Though a significant breakthrough in high yielding varieties of seeds was seen for wheat and maize, they were not used intensively, extensively and consistently over the period. A use of quantum of high yielding varieties of seeds for wheat is reduced from 23.10 thousand quintals in 1996/97 to 12.74 thousand quintals in 2009/10. In contrast, use of local seeds has increased from 217 thousand quintals to 884.62 thousand quintals in 2009/10. The reason for a decrease in the use of an improved seed and rise in the local seed could be attributed to non-availability of an assured irrigation for wheat as well as high cost of inputs and a competitive crop of maize. The percentage of area under improved seed for maize in total cropped area under maize was 28.56 % in 2003/04 and it was 35.20% in 2009/10. A use of improved seed variety for maize has increased from 2.34 thousand quintals in 1996/97 to 30.60 thousand quintals in 2009/10. Per hectare use of

improved seeds for wheat was 141.47 kg in 2009/10. Per hectare use of high yielding varieties of seed for maize was 24.46 kg in 2009/10.

iii. *Fertilizer use for cereal crops*

Similar to use of high yielding seeds, farmers' purchase of fertilizers is an indication of increasing commercialization of agriculture. In 2009/10, as against total cropping area of cereals of 2986.622 thousand hectares, 51.23 % of cropped area used all fertilizers inclusive of natural fertilizers, DAP and Urea. An application of all fertilizer per hectare amounted to 104.54 kg. The shares of hectares of land using natural fertilizer DAP, and Urea in total cropped area respectively was 12 %, 10.75% and 4.58%. The share of hectares of land using both DAPs and Urea in total cropped land was 23.85%. An application of DAP and Urea per hectare respectively was 88 kg and 81.48 kg. The use of Urea and DAP per hectare was 169.43 kg.

SECTION-5

IX. AREA, PRODUCTION AND YIELDS OF PULSES, OILSEEDS AND VEGETABLES

a) *Pulses*

Pulses⁹ are the second important group of crops after cereals in Amhara region. In fact, pulses are major commercial crops and they have significant commercial value to peasant farmers. The production of pulses has grown from 3101.19 thousand quintals in 1995/6 to 8541 thousand quintals in 2009/10. Peasant farmers grow pulses in dry seasons. The crops do not require assured irrigation and they can be grown with little soil moisture. While cropped area under pulses has grown at the compound growth rate of 5.23 % per annum, production of pulses has grown at the compound growth rate of 9.41 per cent per annum during the period 1995/6 to 2009/10. Despite lack of significant breakthrough in high yielding varieties for dry crops such as pulses, higher growth rates for individual crops under pulses are seen in the second sub-period. The yields of pulses per hectare have increased from 8.02 quintal per hectare in 1995/6 to 12.30 quintal per hectare in 2009/10. From the Table-4, it can be seen rate of growth of cropping area was higher in the first sub-period compared to the growth rate found in the second sub-period. On the other hand, growth rates for individual crops output under pulses are higher except

⁹ The crops under pulses are horse beans, field peas, haricot beans, chick-peas, lentils, and vetch. These products are widely consumed by population as they provide a great amount of protein. The production of pulses is for home consumption as well as for domestic markets. These are cultivated with limited soil moisture and they are generally cultivated in dry season. A large number of peasant farmers obtain cash income from selling pulses in the domestic market. Pulses have high export potential too.

for horse beans in the second sub-period than in the first sub-period.

Table 3: Compound Growth Rates for Pulses

Crop Type	CGR for the period 1995/96 to 2009/10			CGR for the period 1995/96 to 2001/02			CGR for the period 2003/04/ to 2009/10		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Pulses	5.23	9.41	3.97	6.18	9.30	2.83	4.49	9.52	5.23
Horse beans	6.39	9.19	2.73	7.46	12.07	4.18	3.76	4.18	0.90
Field peas	4.70	9.63	4.81	5.54	9.19	3.35	-0.50	4.18	4.91
Haricot beans	6.18	12.97	6.39	8.43	15.48	6.50	4.60	19.12	14.11
Chick peas	2.63	7.46	4.81	4.60	5.75	1.10	4.08	11.60	7.46
Lentils	7.14	10.18	3.04	**	**	**	**	**	**
Vetch	3.56	8.43	4.70	3.97	4.49	0.50	7.89	14.79	6.39
Soya beans	-24.35	84.41	48.43	**	**	**	**	**	**
Fenugreek	7.14	11.85	4.91	4.49	7.78	3.14	19.12	26.74	10.07
Gibto	17.46	36.20	14.45	**	**	**	**	**	**

Source: Authors computation based on CSA data (various years)

The decomposition analysis shows that a positive growth in cropped area and yield in pulses in 1995/6 over 1994/5 resulted in positive growth in output; an increase in cropped area under pulses has resulted in an increase in output greater than a positive growth in yield in 2005/4 over 2004/3; a fall in cropped area and yield in 2010/9 over 2009/8 resulted in fall in output.

The share of cropped area under pulses in total cropped area of the region was 13.19 % in 1995/96 and it has increased to 16.93 % in 2009/10. The cropped area under pulses was 386.8 thousand hectares in 1995/96 and it has increased to 694.672 thousand hectares in 2009/10. The cropped area under pulses has increased at the compound growth rate of 5.23% per annum during 1995/96 to 2009/10 which is higher

than the growth rates for grain crops and cereal crops. Within this group, the significant proportion of area is devoted to horse beans.

The irrigated areas under pulses were 0.98 thousand hectares as against total cropped area of 385.66 thousand hectares in 1997/98 and it has increased to 2.436 thousand hectares in 2009/10 as against total cropped area under pulses of 694.672 thousand hectares. The irrigated areas under oilseeds were 0.744 thousand hectares in 2008/09 as against cropped area of 23.325 thousand hectares; vegetables and root crops were 5.48 thousand hectares in 2009/10 as against total cropped area of vegetables and root crops of 26.020 thousand hectares.

Table 4: Compound Growth Rates for Oilseeds

Crop Type	CGR for the period 1995/96 to 2009/10			CGR for the period 1995/96 to 2001/02			CGR for the period 2003/04 to 2009/10		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Oilseeds	5.02	11.4	6.39	3.66	4.60	0.80	3.66	10.73	8.65
Neug	-1.61	2.63	4.28	4.18	3.14	-1.00	-10.96	-1.51	10.18
Linseed	0.5	4.81	4.08	-9.96	12.52	-2.42	-3.66	7.78	10.40
Sunflower	34.98	4.39	12.74	8.43	34.98	17.35	-7.46	1.81	8.00
Sesame	29.17	38.12	5.12	10.73	18.88	6.92	36.88	38.54	3.04
Rapeseed	12.86	12.74	3.04	12.74	-0.10	-2.02	-4.60	-3.66	3.35

Source: Authors computation based on CSA data (Various years)

b) Oilseeds

The peasant farmers cultivate different types of oilseeds¹⁰ for household consumption as well as for market. As with the case for pulses, oilseeds have high internal and export demand. Nevertheless, cropping area under oilseeds is relatively less. In spite of suitable environmental conditions for production of oilseeds in the region, a significant amount of edible oil is being imported by Ethiopia every year incurring heavy foreign exchange. But due to low yield, uncertain market conditions and lack of processing plants in the edible oil sector, compounded by lack of knowledge on the market potential outside their domestic market, farmers devote less cropping area for oilseeds. The share of area under oilseeds in total area of cropped area of the region was 5.33% in 1995/96 and has increased to 7.71% in 2009-10. The area under oilseeds occupied 156.3 thousand hectares in 1995/96 and which has increased to 316.46 thousand hectares in 2009-10. With an increasing domestic demand for edible oils due to changing consumption behavior in urban areas, the role of extension agencies in propagating a commercial value of crops is important in motivating peasant farmers to increase more area under oilseeds.

The decomposition analysis shows a decline in output of oilseeds in 2010/9 over 2009/8 is largely due to fall in cropping area. In 2005/4 over 2004/3, a positive growth in cropped area has brought about a positive growth in output which is higher than positive change in yield level of oilseeds crops. It is known from three points of time; a change in output is largely due to a change in cropped area rather than a change in yield.

c) Vegetables

The vegetables¹¹ are not widely cultivated by peasant farmers in the region despite favorable climatic conditions. The food habits of consumers also partly determine the cropping area under vegetables. Better knowledge about nutritional benefits of fresh vegetables will significantly alter production and consumption pattern of peasants and others in rural and urban areas. The share of cropping area under vegetables in total cropped area of the region was less than one percent in 2009/10. In absolute terms, the total area devoted to vegetables was 37.12 thousand hectares in 2009/10.

¹⁰ The major oilseeds are neug, linseeds, rapeseed, and safflower. Though the Amhara region is suitable for oilseeds production, the cropping area devoted to the oilseed is relatively low. The commercial value of oilseeds is yet to be recognized by peasant farmers in the region.

¹¹ The production of vegetables depends on immediate disposal of the products. Since vegetables are perishable, they require to be transported to nearby market place for immediate consumption. The infrastructure facilities like cold storage facilities and well-developed transport network between villages and urban consumption centers are prerequisite which will go a long way in motivating peasant farmers to devote more area under vegetables crops.

Only in second sub-period (2003/04 and 2009/10), the area under vegetables has increased at the compound growth rate of 11.8 % per annum from 17.28 thousands hectares to 37.12 thousand hectares suggesting market profitability of crops.

d) Marketable surplus of pulses, oilseeds and vegetables

i. Pulse

The production of pulses has increased from 5.07 million quintal in 2001/02 to 8.54 million quintal in 2009/10. The percentage utilization of pulses for seed was marginally higher in 2009/10 than in 2001/02. The percentage utilization for sales was higher in 2009/10 at 22.96% of crop output compared to 18.66% of crop output in 2001/02 suggesting farmers increasing orientation toward market and cash transaction. Compared to other crops, soya beans has high wage payment in kind at 5.26% of crop output in 2009/10 as against 2.61 % of crop output in 2001/02. For all other pulse crops, wage payment in kind had come down in 2009/10 compared to 2001/02.

ii. Oilseeds

Though production of oilseeds have increased, it is not adequate enough to meet rising demand in the domestic market. The percentage of oilseeds for household consumption was higher in 2009/10 at 42.46% of crop output than in 2001/02 at 38.9%; the percentage of output utilized for sale was lower at 45.77 % of output in 2009/10 as against 49.36% of crop output in 2001/02.

iii. Vegetables

In case of vegetables, the percentage of output utilized for household consumption as well as for market sale has increased in 2009/10 compared to 2001/02.

SECTION - 6

X. AREA, PRODUCTION AND YIELD OF ROOT CROPS, FRUITS CROPS AND STIMULANT CROPS

a) Vegetables and root crops

The major root crops¹² produced in Amhara region are beetroot, carrot, onion, potatoes and sweet potatoes, Garlic, taro/ godre. These root crops are largely for market sales. Effectively marketed either on cooperative line or by private or public institutions, some of these products of root crops can be exported either in raw form or in processed form. The share of area under root crops in total cropped area of the region was 0.08% in 2009/10. The total area under root crops was 36.34

¹² These root crops are used widely by consumers in rural and urban areas along with the staple food grains. These products add flavor and aroma to the foods besides providing tastes to the food items. Especially, garlic has medicinal value.

thousand hectares in 2009/10. The area under root crops has increased only in the second half of the study period from 15.88 thousand hectares in 2003/04 to 36.34 thousand hectares in 2009/10.

From the decomposition analysis a yield increase in root crops resulted in a significant increase in output in 2005/4 over 2004/3 and 2010/9 over 2009/8. The major fruit crops¹³ in Amhara region are avocados, bananas, mangoes, oranges, papayas, and lemons. A share of area under fruit crops in the total cropped area in the region was 0.07 percent in 2009/10. In absolute terms, the cropping area under fruit crops was 2.84 thousand hectares in 2009/10. Though the cropping area under fruit crops in absolute terms has increased from 1.80 thousand hectares in 2003/04 to 2.85 thousand hectares in 2009/10, the compound growth rate for the fruit crops has shown a negative growth rate of 6.61 percent per annum due to high fluctuations in cropping area between two time periods. An institutional arrangement for storage of fruits is scanty in rural areas scaring peasant farmers away from wide spread cultivation of fruit crops. The fruit crops require a large area like orchards for a profitable operation. They have a potential of high export earnings in the long run. The government initiatives in recent years in leasing out large parcels of land to private entrepreneurs to develop horticulture, floriculture and orchards is in the right direction to optimize the resources in the region and to commercialize agriculture on large scale for employment generation and for export earnings.

The decomposition analysis for fruit crops reveals that a positive growth of area and yield resulted in higher output in 2010/9 over 2009/8. There was a negative growth in area and yield resulting in negative output growth in 2005/4 over 2004/3.

The number of farmers cultivating stimulant crops such as coffee and chats are larger than farmers cultivating fruits. Cropping area under stimulant crops such as chats and coffee have increased respectively from 2.72 and 4.27 thousand hectares in 1995/96 to 6.44 and 5.42 thousand hectares in 2009-10. Cropping area under hops another stimulant crop in the region has marginally increased from 13.48 thousand hectares to 15.19 thousand hectares during this period. Cropping areas under chat, coffee and hops respectively have grown at compound growth rates of 17.70%, 5.33% and 1.40 % per annum during 2003/04 to 2009-10. Another significant crop in this group is coffee whose area has increased in recent years. Demand for coffee has shown an increasing trend both in domestic and in international markets in spite of an increase in the number of competitors in the African continent. A growth in number of farmers cultivating coffee and an increase

in cropping area under coffee clearly signify an emergence of commercial motives of peasant farmers' towards market.

Decomposition results for chats show that a change in output is due to positive change in cropping area. The overall negative growth in output is due to negative growth in both cropping area and yield. Similarly for stimulant crops there was positive growth in cropping area and yields of coffee and hops resulting in positive growth in output.

¹³ These crops are largely cultivated by private land holders in small plots. These are purely commercial crops as large proportions of these products are for sales in the market.

Table 5: Compound Growth Rates for Vegetables and Root crops

Crop Type	CGR for the period 2003/04 to 2009/10		
	Area	Production	Yield
Vegetables	12.29	14.11	1.81
Head cabbage	23.98	24.48	-2.42
Ethiopian cabbage	15.83	13.65	-2.12
Tomatoes	9.08	-6.28	-11.07
Green peppers	16.88	13.2	-2.12
Red peppers	11.96	14.91	2.73
Swiss chard	29.17	-10.84	-34.04
Root crops	7.57	5.44	2.02
Beetroot	11.62	10.29	-8.54
Carrot	1	12.29	-11.96
Onion	3.04	0.7	-2.83
Potatoes	7.14	5.97	-1.1
Garlic	13.43	7.46	-4.28
Sweet potatoes	4.81	-7.89	-19.96

Source: Authors computation based on CSA data

b) Commercialization of sugar cane

The cropping area under sugar cane is very marginal compared to other crops in the region¹⁴. The total cropping area under sugar cane was 0.69 thousand hectares in 1995/96 and increased to 1.07 thousand hectares in 2009/10. At present, sugar cane is generally transported to nearby urban areas and market places for retail consumption. There is no sugar processing factory in the region to process raw sugar cane to obtain final product - sugar. Though it is cash crop, an assured irrigation and an establishment of sugar factory will spur the expansion of area under sugarcane in the region and can earn much higher profit than any competitive crop.

c) Marketable surplus of root crops and permanent crops

i. Root crops

Root crops are beet root, carrot, onion, potatoes and garlic which have shown an increase in production in 2009/10 than in 2001/02. The percentage utilization of crop output as a whole for household consumption has increased to 65.91% in 2009/10 from 62.7% of crop output in 2001/02. As a result of an increase in the household consumption, there is a fall in the market sale of root crops in 2009/10. There is significant fall in market sale of carrot, beet root, onion

and garlic in 2009/10 as compared to 2001/02. On the other hand, there is a significant rise in the market sale for potatoes.

ii. Permanent crops

In case of permanent crops, there is a marginal reduction in the percentage utilization of crop output for household consumption. In 2001/02, the percentage of crop output utilized for household consumption was 58.47% and which has decreased to 55.91 % of crop output in 2009/10. The percentage of crop output for market sale was 37.69 % of crop output in 2001/02 and increased marginally to 40.97% of crop output. Coffee which is an important cash crop showed increased percentage utilization for home consumption leading to reduced market sale in 2009/10 compared to 2001/02.

It is known there is a decrease in percentage utilization of cereal crops for household consumption leading to increased market sales; in case of root crops and oilseeds, there is decrease in percentage utilization for market sales and an increase in household consumption; in case of vegetables, there is an increase in market sales as well as household consumption. One can infer whenever there is an increase in cropping area leading to increase in production, there is a consequent increase in household consumption and market sale. The farmers' food habits are slowly undergoing a change due to income change and awareness about the nutritional benefits of certain crop output leading to decline in market sale.

¹⁴ Cultivation of sugar cane requires an assured irrigation. It is long gestation crop running into 11- 12 months. It is cultivated by small peasant holders in the region.

Table 6: Compound Growth Rates for Fruit crops and stimulant crops

Crop Type	CGR for the period 2003/04/ to 2009/10		
	Area	Production	Yield
Fruit crops	-6.61	60.48	-48.73
Avocados	4.39	-101.98	-77.71
Bananas	6.82	36.07	24.23
Guavas	3.76	29.17	23.98
Lemons	5.23	-1.4	-3.25
Mangoes	22.38	50.53	21.4
Oranges	2.02	57.45	54.8
Papayas	3.14	92.7	69.21
Chat	17.7	24.35	5.75
Coffee	5.33	20.8	13.88
Hops	1.4	10.18	7.46
Sugarcane	98.55	-442.49	-774.95

Source: Authors computation based on CSA data (various years)

SECTION – 7

XI. PERSISTENCE OF INTEGRATED FARMING IN THE AMHARA REGION

At the advance stage of commercialization of agriculture, farmers can specialize either in crop only or livestock management. In 1995-96, a significant proportion of farmers (76.24%) had involved in production of both crops and livestock, followed by crop only (20.86 %) and livestock only (2.90%). In 2009/10, there was an increase in the number of farmers who were involved in both crop production and livestock management (86.63%) followed by crop only (11.32%) and livestock only (2.05). The Farm Management Practices in 1995-96 and 2009/10 suggests clearly subsistence and semi commercial farming systems and reinforce the fact small farmers have not divorced cropping activities from livestock management in the region. It is no surprise given the fact that fluctuations in monsoon contributes to fluctuations in the income levels of the farmers; the importance of livestock /allied sector for small farmers provides cushion to tide over an adverse weather conditions and keep farmers to smooth their income and consumption in times of economic adversity.

a) *Crop diversification a sign of commercialization in the region*

Another characteristic used to measure the degree of commercialization of agriculture is crop diversification by farmers by the size of holdings. We can find some emerging trends on the diversification of crops across the size of holdings at three points of time, 1995/96, 2001/02 and 2009/10. We have grouped crops

under major categories such as cereals, pulses, oilseeds, vegetables, root crops, temporary crops and permanent crops.

In 1995/96, the peasant farmers have concentrated on cereal production by allocating a large percentage of crop area for the cereal production in the two lowest size classes of holdings to the level of 71% of 2380.35 thousand hectares of total cereal cropped land. The area under cereal crops was concentrated in two size classes of holdings below 0.50 hectares followed by pulses and oilseeds.

The increase in the area under cereals in the size classes of 1.01 – 2.00 and 2.01 – 5.00 appears to be due to rising market prices for cereal output and market profitability and the need to protect themselves from the rising market prices. The increase in cereal area in the two size classes of 1.01 to 2.00 and 2.01 to 5.00 hectares is due to reduction in the cropping area in the two lowest size classes of holding less than 1 hectare and also from an additional increase in the total cropped area during this period. The total cereal crop area has increased from 2380.35 thousand hectares in 1995/96 to 2986.62 thousand hectares in 2009/10. In 2009/10, 77.49% of the 2986.62 thousand hectares of cereal cropped land was cultivated in the two size classes of holding 1.01 to 2.00 and 2.01 to 5.00 hectares.

The cropping area under pulses and oilseeds was less significant in the total cropping area. No specific information is available for area under vegetables and root crops which are commercial crops. The area under pulses has increased from 381.99 thousand hectares in 1995/96 to 694.67 thousand hectares in 2009/10. It is seen small size holdings less

than 0.50 hectares had cropping area under pulses in 1995/96. In contrast, in 2001/02 and 2009/10, an area under pulses had come down in the size classes of holdings less than 0.50 hectares. On the other hand, the area under pulses has increased as the size of holdings increased up to the size classes of 2.01- 5.00 hectares suggesting market orientation of farmers in the larger size of holdings. The area under oilseeds has increased from 165.97 thousand hectares in 1995/96 to 316.456 thousand hectares in 2009/10. Similar to an increase in cropping area under pulses with the size of holdings, the area under oilseeds has increased with the size of holdings up to 5 hectares. It signifies large size holdings take to a crop diversification strategy due to opening of market opportunities.

The cropping area under vegetables and root crops which are largely commercial crops and can fetch immediate cash have increased ; the former from 18.13 thousands hectares in 1995/96 to 37.12 thousand hectares in 2009/10 and the latter from 16.25 thousand hectares to 36.34 thousand hectares during the same period.

In 1995-96, irrespective of the size of holdings, farmers have devoted more cropping area for temporary crops. The cropping area under permanent crops was very insignificant in 1995-96. The farmers who had small land holdings below 0.50 hectare used less cropping land for permanent crops. Of the total cropping area of 3010.68 thousand hectares in 1995/96, 99.10 % of cropping area was used for temporary crops and 0.90 % was used for permanent crops. The percentage utilization of cropping area for temporary and permanent crops was almost constant in 2009/10; of the cropping area of 4109.14 thousand hectares, 99.22% and 0.78% respectively used for temporary and permanent crops in 2009/10. The peasant farmers with size of holdings less than 1 hectare were cultivating all crops suggesting there was no commercialization and persistence of subsistence farming systems in 1995-96. There was no separation of production decision from consumption decision by farm households in 1995-96. Farmers were producing almost all crops such as cereals, pulses, oilseeds and other crops and simply there was no specialization of crops. Even in large size classes of land holdings, no noteworthy of cropping area of commercial importance could be seen suggesting less commercialization.

SECTION- 8

XII. PROSPECTS OF COMMERCIALIZATION

a) *Prospects for Price policy*

In the context of peasant agriculture, in order to achieve the objective of food security and price stability, the government must have a region or an area specific approach for intensive crop production. Price instrument would accelerate the process of commercialization in

certain regions where resource endowments are favorable in terms of irrigation, market access and availability of modern inputs. It has to be noted that while price incentive may benefit large farmers with surplus production, in contrast, a widespread adoption of modern farm technology will benefit all farmers irrespective of size of holdings and consumers at large. In order to reach the objective of food security, price instrument must be effectively utilized to induce farmers to intensively apply modern inputs for higher marketable surplus which is required in the initial stages of economic development.¹⁵ The experiences of Asian countries clearly bring out the role of price incentives in adoption of modern technology in agriculture. The stable agriculture price policy combined with the institutional and infrastructural development triggered high rate of adoption of modern farm practices by a large farmers followed by small farmer contributing to food self sufficiency (Rosegrant and Evenson 1992; Ray, Cummings and Herdt (1979).

b) *Prospects for Irrigation development*

Hayami and Ruttan (1970) noted investment in land development such as irrigation and drainage will be necessary to obtain full return from the new biological and chemical technology. Lack of assured irrigation in the region acts as a great bottleneck on adoption of modern agriculture inputs. Main sources of irrigation in the region are rivers, ponds, lakes and watersheds. A greater proportion of cropped area in the region depends on monsoon. Assured irrigation is dismally low for most of the cereal and other crops in the region. At the regional level, though cropping area under irrigation has increased from 76 thousand hectares in 2001 to 348 thousand hectares in 2009, yet a greater proportion of cropped area is un-irrigated. As a result of lack of assured irrigation, farmers are constrained to apply modern inputs on their farms. A significant percentage of even food grains crops in the region do not come under assured irrigation. In 1995/96, as against 2380.35 thousand hectares of cereal crops in the region, only 14.87 thousand hectares were under irrigation. In 2009/10, as against, 2986.62 thousand hectares of cereals, 14.60 thousand hectares were under irrigation. The situation is similar for almost all individual crops.

¹⁵ In the liberalized economic environment, it is difficult to say that terms of trade is against agriculture and in favor of industry as there is no massive industrialization in the region to demand any discriminatory price policy to promote import substituting industry or to provide subsidized wage goods to the industrial labor force or urban consumers.

Table 7: Crop Type All – Irrigation, Improved Seed and Extension Package

Years	Total cropped area	Irrigated hectare(000)	%	Improved seeds	%	Extension package	%
2003/04	3264.949	27.085	0.830	92.874	2.844	403.861	12.369
2004/05	3474.371	28.061	0.808	106.293	3.059	545.406	15.697
2005/06	3683.566	28.297	0.768	11.039	3.122	789.902	21.44
2006/07	3750.473	28.817	0.768	125.819	3.394	748.59	19.957
2007/08	3969.559	41.619	1.048	163.165	4.11	674.302	16.986
2008/09	4092.989	31.178	0.761	163.439	3.99	816.536	19.949
2009/10	4109.138	30.777	0.748	148.371	3.61	991.908	24.139

Source: Authors computation based on CSA (various years)

Table 7 above shows the percentage of irrigated hectares of all crops in total cropped area in Amhara region. The percentage of irrigated hectares of all crops in total cropped area was 1.78 % in 2001/02 and decreased to 0.75 % in 2009/10. While total cropped area has increased from 3200.28 thousand hectares to 4109.138 thousand hectares by 28.40% during this period, the percentage of irrigated lands had decreased by 64.40% during this period. The area under improved seeds for all crops has increased from 87.033 thousand hectares in 2001/02 to 148.371 thousand hectares by 70% in 2009/10. However, if we relate the cropping area under improved seeds to total cropped area, we can find the share of all crops for improved seed in the total cropped area was 2.72 % in 2001/02 and there was a marginal increase of 3.61 % in 2009/10.

An extension package has covered a large percentage of cropped area. The percentage of cropped area under an extension package in total cropped area was 12.37 % in 2003/04 and almost doubled to 24.14% in 2009/10. An impact of extension package is yet to be felt in terms of real increased area under improved seeds and on crop yields.

Farmers cannot make much investment in irrigation due to lack of credit for long term investment, uncertain demand for output, price uncertainty for crops and rising cost of modern farm inputs; public investment in irrigation and attractive farm prices will motivate farmers to invest in irrigation on their farm. Public investments in restoration of canals, water bodies, lakes and water sheds will contribute to conservation and storage of rain water. Assistance to farmers associations at field level may make farmers to monitor and protect water bodies and regulation of waters to individual farmers. An institutional arrangement at the field level requires strong support from the government. The peasant associations, farmers groups, NGOs, and Governments' must have common approach to address irrigation management and address irrigation problems. The collective actions will

bring a larger area under irrigation and motivate farmers to cultivate various cash crops.

The governments' initiatives in creating more irrigation facilities will bring forth private investment as complement to public investment for wider coverage of cropping area under irrigation. Investments in irrigation sector have to be stepped up by the governments to accelerate the pace of transformation of traditional agriculture from subsistence and semi-commercial to commercial form of organizations. An assured irrigation will contribute to desired change in the cropping pattern in the region accordance with the domestic and international market prices of agriculture commodities. With an assured irrigation facilities, the peasant farmers would shift to more remunerative cash crops without sacrificing food security for the region.

c) Prospects for adoption of improved seed varieties

The region has been experiencing a slow diffusion of modern agriculture inputs contributing to moderate rise in yield and production. A number of modern farm management practices have been introduced in the past fifteen years. However, a number of institutional constraints hold back a high rate of diffusion and adoption of modern agricultural techniques (Spielman, 2008). Major factor which has contributed to raising a yield in Teff, wheat and maize is the gradual improvements in the adoption of improved high-yielding varieties of seeds. Various institutions such as public institutions, private institutions and cooperative institutions have been involved in seed industry so as to reach out to farmers in accessing and availing high yielding varieties of seeds though to a limited extent.

At the regional level, an application of improved variety of seeds and local seeds for all crops show that the improved seeds has increased by 55.41 % whereas use of local seeds has increased by 99%. A crop specific use of improved seeds for various crops show that in 1996/97, the quantity of improved seeds for cereals was 32.58 thousand quintals as against the total cereal cropped area of 2487.41 thousand hectares. The

use of local seed for cereals amounted to 1257 thousand quintals. The use of an improved variety of seed increased to 49.94 thousand quintals as against total seeds of 2322.47 thousand quintals for the total cereal cropping area of 2986.62 thousand hectares in 2009/10. An increase in the use of quantum of improved variety of seeds does not show any commensurate change with an increase in cropping area under cereal crops. A significant proportion of cropping area under cereals depends on a use of local variety of seeds. There might be various reasons for low level of adoption of improved seed variety for cereal crops such as lack of credit for purchasing improved seeds, high cost of improved variety of seeds, and non availability of improved seeds in time and suspicion about the efficacy of improved seeds. Due to lack of infrastructural facilities, private seed companies may find high marketing cost in terms of establishing distribution network in rural areas. The private seed companies can have more involvement in seed sector provided government extends fiscal incentives and credit facilities on par with other institutions involved in the business. Efficiency in seed sector in terms of delivery and prices can be improved by introduction of strong competition of private sector with the Ethiopian Seed Enterprise. With wide diffusion of high yielding varieties of seeds, the yield and production of cereal crops are expected to reach higher scale.

d) Prospects for fertilizers use

There are multiple agents in domestic fertilizer market such as Agriculture Inputs Supply Enterprise (AISE), private organization, traders, cooperatives. From Farm management practices in 2009/10, it is known in order of importance, farmers reportedly purchased fertilizers from the government, followed by others (may be cooperatives), traders and private organization.

At the regional level, the total consumption of chemical fertilizers (DAP Urea) for all crops was 114.11 thousand quintals in 1995/96 and which has increased to 1327.17 thousand quintals in 2009/10. The table-7. Shows an application of fertilizer has increased consistently only in the second period compared to first period marked by high fluctuations. An increase in application of fertilizer does not correlate with the use of improved variety of seeds. Farmers appear to use more chemical fertilizers in combination with use of local seed variety. Thus, an intensity of use of fertilizer and improved seed is limited by irrigation constraints in the region. In general, a combined use of irrigation- high yielding varieties of seeds - fertilizers would virtually transform traditional agriculture into commercial agriculture in the region.

At the individual crop level, chemical fertilizer (DAP + Urea) was used for teff, wheat, and maize. Barley and Sorghum received less dressing. Further,

quantum of fertilizer used was higher for teff, wheat, and maize in the second sub-period than in the first sub-period.

Not only cropping area under chemical fertilizers covered is low in total cropped area, but even area under natural fertilizer in total cropped area, besides per hectare use of natural and chemical fertilizer is low for all individual crops. The enabling policy regime would make many stake holders to participate in the fertilizer market to provide needed services to the farmers in the region. Moreover, most of the crops are affected by insects and pests. Farmers face severe problems in accessing pesticides in rural areas in time and in adequate quantity, besides facing lack of technical know-how on an application of pesticides and insecticides for the crops.

e) Lack of Access to Capital as constraint to commercialization

A mere availability of improved agriculture technology does not guarantee high rate and level of adoption by farmers across the size of holdings. A precondition for high rate of adoption is availability of institutional arrangement for the provision of credit for small farmers. For a high rate of technological diffusion, it is important that farmers have access to credit to buy an improved variety of seeds, chemical fertilizers, pesticides, insecticides, and hiring of farm machinery for realizing higher yield and output. A modern farm management practices will have very wide acceptance only if an institutional support is found in the form of subsidized credit to small farmers at least in the initial stages of technological diffusion process. Large farmers may require higher scale of finance to mechanize their agriculture operations for higher productivity. Farm Management Practices of 2009/10 suggest among reasons for not using credit services, 1369.19 thousand holders report their failure to pay the loan is the main reason, followed by inadequate service and farmers' ignorance.

The governments' policy to provide a package of modern agriculture inputs at subsidized rates to peasant farmers is expected to have a positive impact on other farmers in the neighborhood to adopt similar package of inputs. A success of demonstration farm is expected to encourage other farmers to utilize the services of agriculture extension personnel and avail input subsidy components. Despite a great increase in the coverage of cropped areas by the extent agents, the rate and level of diffusion of improved farm management practices remains low. This can be attributed to prevalence of imperfect input market structure in the rural areas.

The recent years witnessed an impressive growth in the credit disbursed to rural areas by the Amhara Credit Saving Institutions (ACSI). The credit disbursed to rural areas has increased from mere 4.97

million ETB to 1754 million ETB in 2010; about 80% of which has gone to the agricultural development and remaining was used for non- agriculture purpose in the rural areas. The credit institutions must not limit themselves to extending the short term credit facilities to the farmers; they must extend credit for long term investment purposes like land improvement, purchase of farm machinery such as power tillers, pump sets / motors for ground water utilization and so on.

f) *Revival of cooperatives for strengthening the forces of commercialization in the region*

The role of rural institutions to provide right information to farmers to make correct decisions is crucial. Given the fact that small farmers are widely dispersed in different locations, they might face high transaction costs in product and factor markets. Cooperatives at this juncture are crucial in strengthening economic base of farmers. There are 738 cooperatives of various types; of which 452 are rural cooperative finance, credit and saving institutes in 2008/09 with the membership of 30613. In 2007/08, the cooperatives in Amhara region, marketed 1555 thousand quintals of fertilizers and 184 thousand quintals of agriculture produce. Farmers may find it a great difficulty in dealing with traders in searching and finding quality inputs for their farm outputs. At the same time, the small holders may face high transaction costs to deal with traders and may not find it remunerative to sell their produce at distant urban market. To protect and maintain a stable income, the cooperatives are important in selling quality agriculture inputs such as fertilizer, pesticides, high yielding improved varieties of seeds, marketing of outputs besides providing other information on farm practices.

The cooperatives must be reformed to participate competitively and more efficiently in the food grain market along with the private traders. Cooperatives can provide storage facilities for the small farmers for food grains and horticultural products. Due to lack of storage facilities for vegetables and horticultural products in the context of rising production and accelerating commercialization, the farmers will likely to incur losses due to high perish ability of the products. The role of cooperatives in collecting, grading, standardizing and storing the farm produce cannot be minimized. Cooperatives can participate in processing in certain agriculture produce to take an advantage of economies of scale and economics of scope. We can find successful cooperative ventures in dairy and horticulture products in both developed and less developed economies. Cooperatives can employ rural labor force and provide stable income.

Tanguy Bernard, David J. Spielman, Alemayehu Seyoum Taffesse, and Eleni Z. Gabre-Madhin (2010) in their study on the impact of cooperatives on members in Ethiopia find that marketing cooperatives provide higher

price to their members compared to free market prices; but authors observe that cooperatives are not effective in procuring or mobilizing more marketable surplus of members produce. It is real task of the cooperatives to restore the confidence of farmers in cooperatives as members controlled and business oriented. To restore the confidence of members in cooperatives, on their part, cooperatives have to be reformed on organizational, managerial and technological grounds to participate effectively in market along with private traders. In great enthusiasm to develop market forces, one cannot neglect a countervailing force of cooperatives to protect the interests of small farmers. The role of cooperatives is very significant in the years to come to commercialize agriculture as they could provide necessary wherewithal to peasant farmers in the rural areas in reducing high transaction costs and providing necessary inputs to farmers.

SECTION -9

XIII. CONCLUSION

This paper has discussed the processes of commercialization of agriculture in Amhara region in the past 15 years with respect to changes in the cropping pattern, utilization of improved seeds, chemical fertilizers and marketed surplus of cereals and other crop outputs. Since commercialization of agriculture holds high promise for small farmers to increase their income level, the Federal and the Regional governments are actively involved in introducing various reform measures in domestic and foreign front. Due to economic reforms measures in domestic markets, market forces are found to be exerting a propound influence on farmers decision making in the choices of crops, purchase of modern agricultural inputs, increased crop output and increased marketable surplus. An improvement in infrastructure facilities in the form of transportation, communication and extension packages including research and developments in agriculture are contributing to modernization of traditional agriculture leading to higher yield and production.

In spite of various reform measures, there persist semi-commercial production orientations of small farmers. While there is a significant growth in cropping area under cereals, pulses, oilseeds, vegetables, root crops and stimulant crops, the full import of commercialization in terms of generation of marketable surplus for cereals and cash crops is yet to be realized due to low level of diffusion of agriculture technology.

A marked change in marketable surplus is found for wheat, Teff, maize, and barley. Similarly, there has been an increase in sale of vegetables, root crops, stimulant crops, and sugar cane.

In spite of government's reform measures in domestic markets and foreign sector to facilitate free

play of market forces to provide economic incentives to farmers, the agriculture input and output markets are not perfect and competitive enough to ensure benefits to farmers apparently due to severe infrastructural bottlenecks such as less connectivity of roads, lack of transportation and communications in interior parts of the regions. The small farmers continue to encounter severe constraints in access to improved seeds, chemical fertilizers, pesticides and agriculture credit contributing to lower than potential yield levels of crops.

With the gradual removal of bottlenecks and continuous improvements in infrastructure, the small farmers are brought into a vortex of change and they are clearly in the process of transition from subsistence production to semi- commercial production motivated by market profitability of crops.

With a prospect of wide diffusion of agricultural technology and intensification of use of inputs, there will be a quantum jump in yields and production of cereal output leading to substantial release of agricultural land and family labor which are currently allotted for cereal crops. The release of land and other resources from cereal crops will accelerate the process of commercialization of traditional agriculture by cultivating floriculture, horticulture, pulses, oilseeds and sugar cane.

There is a large gap in yield levels between potential and actual for each cereal crop. The yields of many cereal crops are far below the levels obtained in other developing countries due to low fertilizer consumption per hectare which is far below the recommended level for many crops. Similar is the case for high yielding varieties of seeds which is less widely used across the crops. These are consequences of low irrigation facilities for crops in spite of existence of a high irrigation potential which is untapped in many parts of the region. The role of government in creating infrastructure, such as roads and transportation, communication, electricity, marketing yards, along with incentive prices and effective procurement operations will go a long way in increasing supply to match rising demand. Investments in infrastructure combined with strong thrust to technological advancement and price support operations for major crops would unlock agriculture potential for a dynamic growth in the region.

Commercialization of small farm agriculture is in an embryonic stage with less specialization in crops, non- separation of crop management from livestock management, inseparability of consumption and production decisions, a large dependence on own family labor and animal power, use of indigenous seeds and farm yard manure for crop production, and a less dependence on market for modern agriculture inputs. A full-fledged commercialization of agriculture can take place by removing institutional and infrastructural constraints that farmers face. The role of governments in creating, strengthening and developing rural institutions

is crucial for accelerating the pace of commercialization of agriculture in the region. The rural institutions such as cooperatives, credit institutions and extension agents, civil society, NGOs and other stakeholder have to play a complementary role to inform and transform the subsistence farmers into commercial farmers for overall growth of the region.

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Appendix 1: Estimates of quantity of improved seeds and local seeds by type, chemical fertilizers and Credit

Years	Improved seeds ¹ (‘000 quintals)	Local seeds ¹ (‘000 quintals)	Chemical ¹ fertilizers (DAP + Urea) (‘000 quintals)	Credit ² (in million Birr)
1995/96	**	**	114.11	4.97
1996/97	32.59	1696.20	225.32	28.63
1997/98	32.28	1628.42	169.64	41.89
1998/99	25.80	1803.97	85.70	65.81
1999/00	37.76	1824.39	127.30	94.69
2000/01	**	**	**	116.04
2001/02	25.54	**	498.51	164.12
2002/03	**	**	**	232.79
2003/04	32.08	2162.16	505.09	332.89
2004/05	44.16	2293.04	655.83	433.05
2005/06	46.28	2545.39	944.95	675.70
2006/07	39.12	2650.90	978.49	1001.82
2007/08	49.82	2982.30	1219.17	1501.52
2008/09	55.32	3018.89	1148.97	1807.36
2009/10	50.65	3175.10	1327.82	1754.41

Note: ** Indicates not available

Sources: ¹ CSA Farm Management Practices (various years)

² ASCI

Appendix 2: Irrigated land (‘000ha)

	All crops	Cereals	Teff	Barely	Wheat	Maize	Sorghum	Millet	Oats	Pulses	Oilseed	Others
1995/96	2380.35	14.87	2.61		0.78	4.36	**	**	**	0.98	**	1.33
1996/97	2487.47	**	5.04	3.82	1.29	0.97	**	**	**	**	**	3
1997/98	1907.69	11.53	1.87	**	**	3.00	**	**	**	**	**	1.16
1998/99	2395.39	7.12	0.7	2.62	**	6.14	**	**	**	0.93	**	**
1999/00	2368.69	16.56	2.11	3.87	0.89	**	**	**	**	**	0.14	3.78
2000/01	2644.91	1.77	**	**	**	**	**	**	**	**	**	**
2001/02	2216.029	**	**	**	**	**	**	**	**	**	**	**
2002/03	**	**	**	**	**	**	**	**	**	**	**	**
2003/04	2401.872	13.393	1.986	4.389	1.632	4.059	1.168	**	**	2.642	0.402	5.4
2004/05	2477.598	13.815	1.874	5.968	1.749	3.444	0.63	**	**	2.96	**	5.1
2005/06	2714.489	11.475	0.892	4.768	2.013	1.788	1.585	**	**	1.714	**	4.4
2006/07	2767.788	13.709	2.039	2.839	2.195	3.93		**	**	2.584	0.345	5.1
2007/08	2923.003	23.582	7.318	8.194	2.427	3.056	1.6	**	**	4.416	0.437	5.8
2008/09	2959.084	14.886	2.194	5.171	1.163	3.925	1.757	**	**	2.863	0.744	6.1
2009/10	2986.622	14.605	4.414	4.32	0.729	2.621	1.263	**	**	2.436	**	5.48

Source: CSA

Appendix 3: Estimation of Area under all Crops by Size of Holding 1995/96, 2001/02/ and 2009/10

Types of crops	Year	Size of Holding (hectare)							Total
		< 0.10	0.1-0.50	0.51-1.00	1.01-2.00	2.01-5.00	5.01-10.00	>10.00	
Cereal	1995/96	176.470	1514.120	532.450	131.650	14.300	**	**	2380.350
	2001/02	7.543	178.253	464.630	904.935	641.029	30.467	**	2939.592
	2009/10	5.665	123.595	405.895	1141.167	1173.279	107.613	**	2986.622
Pulse	1995/96	64.080	271.350	39.370	5.790	**	**	**	381.990
	2001/02	1.139	39.959	107.909	203.899	133.481	3.928	**	730.801
	2009/10	0.517	25.598	98.279	271.235	278.416	16.758	**	649.672
Oilseeds	1995/96	21.040	115.170	28.700	**	**	**	**	165.970
	2001/02	0.243	6.614	22.143	67.422	73.824	6.867	**	178.650
	2009/10	0.327	5.850	20.550	78.698	150.355	**	**	316.456
All temporary crops	1995/96	288.500	1926.210	603.440	138.510	15.680	**	**	2983.720
	2001/02	9.551	230.195	605.317	1195.447	862.84	42.621	8.933	2954.905
Vegetables	2001/02	0.326	1.947	3.409	7.052	5.109	0.274	0.010	18.126
	2009/10	0.465	2.496	4.470	11.929	15.222	**	**	37.117
Root crops	2001/02	0.254	2.661	4.702	5.709	2.867	0.040	**	16.250
	2009/10	0.361	3.702	7.837	13.048	10.221	**	**	36.341
Total permanent crops	1995/96	17.780	5.180	**	**	**	**	**	26.990
	2001/02	0.666	4.591	5.268	7.406	3.801	0.206	**	22.095
	2009/10	0.673	4.739	7.105	10.467	7.994	**	**	31.696
All crops	1995/96	386.280	1931.390	606.280	139.710	15.680	**	**	3010.710
	2001/02	10.216	234.786	610.585	1202.853	866.642	42.827	.9.09	2977.000

** indicates not available

Appendix 4: Crop Output and percentage utilization

Type of Crop	Total Production (Quintal)	2001/02						2009/10						
		Percent Utilized for						Percent Utilized for						
		Consumption	Seed	Sale	Wages In kind	Animal Feed	Others	Consumption	Seed	Sale	Wages In kind	Animal Feed	Others	
Grain Crops	33,762,051.00	64.25	13.15	19.65	0	0.45	2.49	57,105,217.80	61.64	14.6	20.3	0.99	0.3	2.14
Cereals	27,814,311.00	68.42	12.75	12.99	2.48	0.44	2.92	46,301,971.90	66.93	14	15.2	1.12	0.27	2.47
Pulses	5,075,582.00	61.18	15.52	18.66	1.9	0.61	1.86	8,541,004.37	56.44	17.6	23	0.79	0.48	1.71
Oilseeds	872,158.00	38.9	8.35	49.36	2.46	0.05	0.88	2,262,241.53	42.46	9.77	45.8	0.77	0.01	1.23
Vegetables	436,531.00	75.80	1.48	20.06	1.26	0.04	1.36	872,094.59	82.02	1.49	15.2	0.41	-	0.84
Root Crops	4,999,216.00	62.7	14.3	21.36	0.69	0.05	0.9	3,519,150.20	65.91	13.7	19.6	0.13	0.01	0.63

Permanent crops	105,128.00	58.47	0.61	37.69	0.22	0.02	2.99	982,127.79	55.91	1	41	0.1	-	2.01
Chat	9674	17.21	1.37	75.7	0.09	0.02	5.61	45,951.48	14.34	2.26	80.9	-	-	2.52
Coffee	12,772.00	61.52	0.31	36.56	0.27	0	1.34	19,898.17	71.31	0.23	27.3	0.29	-	0.86
Hops (Gesho)	54,740.00	66.41	0.61	29.44	0.23	0	3.31	110,276.58	65.89	0.67	31.6	0.11	-	1.75
Sugar cane	9,577.00	29.11	0.86	66.26	0.2	0.27	3.29	566,443.59	38.94	2.06	58.2	-	-	0.77

Source: CSA 2001/02 and 2009/10.

Appendix 5: Contributions to changes in quantity of cereal output by crops (1995/96 - 2009/10)

Types of Crops	Change of crop/area	1996 /95	2005 /04	2010 /09	1995/96-2009/10
Teff	Change in Crop Area	20.91	25.86	-2.92	1.48
	Change in Crop Yield	0.51	0.71	0.52	0.53
	Difference between Actual Estimated change	-5.69	-19.66	-5.92	-430.35
Barley	Change in Crop Area	-127.87	18.74	40.14	15.28
	Change in Crop Yield	0.07	0.33	-0.91	-2.77
	Difference between Actual Estimated change	-93.56	-4.31	34.51	932.48
Wheat	Change in Crop Area	-47.44	60.08	113.93	-104.3
	Change in Crop Yield	0.85	2.04	1.27	-2.67
	Difference between Actual Estimated change	41.13	124.04	-142.07	-122.47
Maize	Change in Crop Area	26.56	27.01	-11.21	-64.11
	Change in Crop Yield	-2.8	-0.56	-0.81	-4.28
	Difference between Actual Estimated change	74.31	16.65	708.43	-648.32
Pulses	Change in Crop Area	5.41	77.72	-21.92	41.99
	Change in Crop Yield	0.43	0.39	-0.45	0.47
	Difference between Actual Estimated change	-3.13	-30.64	-15.87	-374.21
Oilseeds	Change in Crop Area	45.27	52.62	18.52	37.15
	Change in Crop Yield	-0.18	0.03	-0.01	0.94
	Difference between Actual Estimated change	6.72	-2.72	0.49	-120.7

Source: Computed based on CSA Data

