

EVALUATION OF GREEN JOBS IN AGRICULTURE SECTOR OF PAKISTAN



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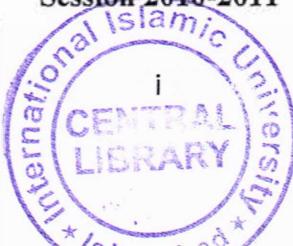
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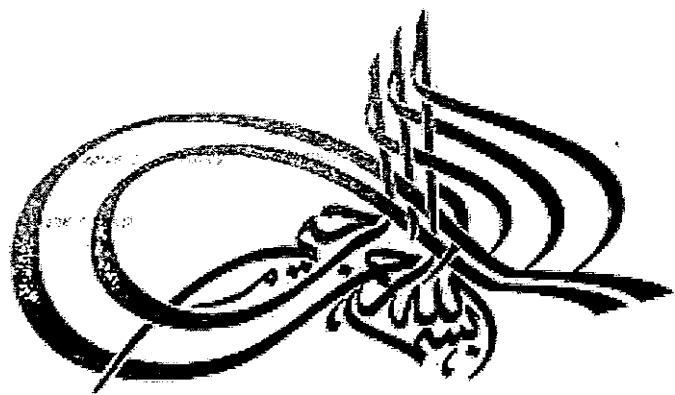
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Supervisor: Professor Dr. Muhammad Irfan Khan

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IN THE NAME OF ALLAH, THE MOST MERCIFUL AND BENEFICIAL

DEDICATION

This research work is dedicated to my beloved, respected, caring and loving parents and my dear brothers, sisters, relatives and teachers (Professor Dr. M. Irfan Khan, Kanwar Muhammad Javed Iqbal & Gulbaz Ali Khan), whose love enabled me to reach at this zenith in my life.

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LIST OF ABBREVIATIONS

Abbreviation	Full Name
CO ₂	Carbon dioxide
CH ₄	Methane
N ₂ O	Nitrous Oxide
Ppm	Parts per million
Ppb	Parts per billion
GHG	Green House Gas
GoP	Government of Pakistan
GOP	Government of Punjab
UNEP	United Nations Environment Program
FAO	Food and Agriculture Organization
PWP	Pakistan Water Partnership
FFA	Framework For Action
IPCC	Intergovernmental Panel on Climate Change
GDP	Gross Domestic Product
SDF	Sustainable Development Foundation
ILO	International Labor Organization
ITUC	International Trade Union Confederation
R & D	Research and Development
CDM	Clean Development Mechanism
DNA	Designated National Authority
CN Net	Climate Neutral Network

WED	World Environment Day
UNFCCC	United Nations Framework on Climate Change
NCS	National Conservation Strategy
CIDA	Canadian International Development Agency
PAK	Pakistan
Mha	Million Hectare
MINFAL	Ministry of Food, Agriculture and Agriculture
NEQ,s	National Environmental Quality Standards
PEPA	Pakistan Environmental Protection Act
ADBP	Asian Development Bank of Pakistan
T.V	Television
NARC	National Agriculture Research Center
FO & S	Farm Operations and Services
ZTBL	Zari Taraqiat Bank Limited
PARC	Pakistan Agriculture Research Council
SDPI	Sustainable Development Policy Institute
FYM	Farm Yard Manure
KP	Khyber Pakhtun Khwa
NWFP	North West Frontier Province
Kg	Kilogram
N	Nitrogen
Ha ¹	Per Hectare
ARGOS	Agriculture Research Group on Sustainability
ROAP	Regional Office for Asia and Pacific

VCA	Value Chain Analysis
WCC	Waste Concern Consultants
U.S	United States
TVET	Technical and Vocational Education and Training
DES	Department of Environmental Science
IIUI	International Islamic University Islamabad
ET	Environmental Technology
GMT	Global Mean Temperature
EI	Environmental Intensity
GMO,s	Genetically Modified Organisms
IFOAM	International Federation of Organic Farming
LDO	Light Diesel Oil
Rs	Rupees
TR	Total Revenue
NR	Net Revenue
TC	Total Cost
C.F.C	Carbon Foot Print
WTO	World Trade Organization

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ABSTRACT

According to a research study of Intergovernmental Panel on Climate Change (IPCC) the world mean temperature have roused because of the industrial upheaval at a rate of 0.6 $^{\circ}\text{C}$, specifically because of the greater amount of GHG in the surroundings. Agriculture sector releases an average of 12.5% Green House Gas (GHG) around the world. Green Jobs are the activities in agriculture, research and development manufacturing, administrative, and service activities to minimize the challenging ecological problems realized by the people. Particularly, but not totally, this consist of activities that assist to minimize water and materials use and to conserve environment and biodiversity, through effective policies; decarbonization of the economy and prevention of pollution and waste excretion. The objectives of the research are: to increase awareness and highlight importance about green jobs in Pakistan and the creation of new job opportunities in agriculture sector of Pakistan. The results show that the total cost per hectare in conventional farming was higher than the organic farming and GHG emissions were also greater in conventional farming. However, in agriculture sector, the activity where maximum numbers of green jobs were found is organic farming. The conclusion showed that the evaluation was made on the basis of existing agricultural practices. Yet, some more jobs might be found in the transportation and processing part provided that the total value chain analysis (VCA) of a commodity is carried out. It is recommended that more study and regular information gathering should be bring out to identify the best potential sectors for green jobs leading to greener economy.

Chapter 1

Introduction

1.1 Climate change, its causes and impacts

The concentration of carbon dioxide, CH_4 and nitrous oxide (N_2O) in the air has augmented obviously due to anthropogenic actions throughout the world. The concentration of CO_2 , Methane and nitrous oxide has increased from 280 ppm to 389 ppm, 715 ppb to 1782 ppb, and 270 ppb to 320 ppb respectively in 2006. Agriculture sector releases an average of 12.5% Green House Gas (GHG) around the world. The main cause is the persistent application of N fertilizers and manure to meet demand for food for increasing population. As a consequence of rise in concentration of GHG the world temperature will increase from 1.8°C to 4°C by the end of twenty first century. Climate change will result in mean sea level rise between 0.18 to 0.79 m which will increase flooding and saline intrusion in the south (IPCC, 2007). According to a research study of IPCC the world mean temperature have roused because of the industrial upheaval at a rate of 0.6°C , specifically because of the greater amount of GHG in the surroundings (IPCC, 2001). Similarly IPCC in one of its research study concluded that these big changes in temperatures will also affect different sections e.g. water, health sector, agriculture sector, biodiversity and forestry sectors in different regions of the globe either positively or negatively. In some areas climate change also causing extended arid spells and severe heat waves, which reduce crop production by resulting in humidity and thermal pressure, mostly in serious periods of agricultural production (Rounsevell *et al.*, 1999 in the IPCC, 2001).

Generally wheat production in Pakistan decreases under specific conditions of climate change (GOP/UNEP, 1998; Hussain *et al.*, 2005; Watson *et al.*, 1997). Agricultural productivity is dependent on crop type and growing periods as well as on variations in temperatures systems and annual rainfall (FAO, 2004; Parry, 1990; Watson *et al.*, 1997). Climate change can affect river discharger from many ways: on the one hand it causes high flooding, whereas in other areas where rainfall decreases or ice or glaciers are melting, it may responsible for decreasing trends (Booij, 2005; Dankers *et al.*, 2007).

Floods and droughts are the prominent effects of global warming on water resources as well as the quality of upper water sources is too disturbed global warming (Delpla *et al.*, 2009). The current situation of Pakistan from water resources point of view is such that the overall resources of water in Pakistan are insufficient to accomplish its agricultural and extra water necessities, because of lack of proper strategies to enhance the water resources in the coming times (PWP, 2001).

With the passage of time man started using different sources of energy. In current days, the government interest in energy and environmental problems has guided to the development of such resources which can be easily renewed like for example biomass is a form of renewable energy, which do not emit GHG in atmosphere, in comparison to non renewable resources e.g. oil, petroleum etc (Ramachandra *et al.*, 2004 and Chang *et al.*, 2003).

About sixty-seven percent of population in Pakistan is living in villages. The main sources of energy of these poor people's are firewood, dung and crops remaining, which are very helpful in fulfilling the daily energy requirements for them in Pakistan (GoP,

2005-06). About 14% of global energy demand is fulfilled by Renewable energy sources (Ramachandra *et al*, 2004 and Bridgwater *et al*, 2002), and these technologies perform a vital function in global warming mitigation (Ramachandra *et al*, 2004 and Ghosh *et al*, 2002), as well as ensure energy provision and environmental safety actions (Omer, 2005 and Tsai and Chou, 2005).

The rapid degradation and unsustainable use of land, water, and other resources had made it hard to supply enough food for the fast growing populations over the globe. In coming years this problem would become more worsen due to unwanted changes in climatic patterns (Rosenzweig and Hillel, 1998).

Early researches on climate change and their influences on crop productivity were mainly concentrating on the consequences of a high CO₂ level, followed by investigations that were performed on the combined climatic change and their causes, such as elevation in the average world temperature as well as variation in precipitation concentration (Porter and Semenov, 2005) studied different secondary data from the literature on both regional and national level, using a world trade model to determine the reason of changes in the crop production. They concluded that the yield was less in new emerging states, as compared to the yield of urbanized nations.

The two main reasons for changes in crop production are temperature and precipitation Monteith, 1981). The high differences in average heat and rainfall are projected to rule over coming variations in environment, because they have an impact on crop yield. From different research works on climate changes, it is resulted that global warming is responsible for weather changes, due to which changes occurs in crop productions. (For example Semenov *et al.*, 1993; Porter and Semenov, 2005).

1.2 Climate Change in South Asia and Pakistan

The glaciers of the Himalayan regions are vanishing very rapidly, which will result in harsh floods, human casualties, loss of domestic animals, damage to agriculture as well as to other life services in our country and other neighbor states including Bangladesh, Nepal, and India. These changes in weather patterns will affect the whole sectors including agricultural, human being, forestry and power sectors. Some other zones like ecological, biological and coastal zones of the globe would also be affected, but agricultural sector will be more severely affected due to climatic change. Therefore it is significant to point out the major current happenings that have occurred in Asia (Hanif *et al*, undated).

Agriculture is the most ancient financial occupation and is dependent on natural resources, so agriculture is more susceptible changes in climate. Many social, economic and environmental problems are caused by climate change in Pakistan and in the whole world. The major population of Pakistan is reliant on agricultural sector, so our country population is extremely vulnerable to climatic changes. In 2006, the agriculture productivity was very low and the main cause was considered the climate change. The role of agricultural sector was also not satisfactory during 2007-08. The reasons included higher precipitation in during May 2007, intense heat in August, and September 2007, as well as little availability of water for irrigation (Economic Survey 2007-08).

1.3 Background and concept of green jobs

Green jobs give an opportunity to kill two birds with one stone- climate change and economic recession (Kojola, 2009). Green jobs represent the activities that add to protecting or conserving ecological standards and keep away the Earth's ecosystems from more harm (Renner *et al*, 2008).

According to a report of ITUC/ILO/UNEP "Green Jobs are the activities in agriculture, research and development manufacturing, administrative, and service activities to minimize the challenging ecological problems realized by the people. Particularly, but not totally, these consist of activities that assist to minimize water and materials use and to conserve environment and biodiversity, via effective policies; decarbonizing the economy and preventing pollution and waste generation. For achieving sustainable development, a fruitful policy should be needed for full cost pricing of materials and power inputs to green our economy (UNEP paper on green jobs, 2008). The Green jobs Program was a combined Project of the UNEP(United Nations Environment Programme), ILO(International Labor Organization) and ITUC (International Trade Union Federation and its objectives were to evaluate, examine and encourage the job creation as an outcome of the current environmental and climatic change strategies (UNEP paper on Green jobs, 2008).

Green jobs could be a solution to two of the most burning challenges occurring throughout the world: global climate change and global economic decline. Despite all the public speaking and capability for green jobs there have been inadequate study of what green jobs are? Green jobs could be used to promote reindustrialization, create decent employment, strengthen unions and develop alternatives (Kojola 2009).

In developing countries, most of the workers work in “informal” situations manifest by minimum pay, harmful environment, and no life security. (Renner *et al*, 2008).

The concept of “green job” is not very common. The main focus of green job concept is on climatic change and its impacts on earth. It also finds the ways for sustainable financial and societal development and for protecting environment at national and global scale. According to a report of ILO, 2009 green jobs was defined as “that those activities that are assist to protect and conserve ecosystem and bio-diversity and to reduce waste production, minimize pollution and reduce green house gases emissions (Rahman, 2009).

Monter TRAK, the online global career and recruitment service in 2007 conducted a survey on its users and it was noted that, “ 80 % of new workers were involved in getting an occupation which has less influences on surroundings and 92 % were interested in to work for a industry that is ecologically and environmentally sound(Washington, DC: 3 Oct 2007). Due to climatic change man has suffered many environmental problems (IPCC, 2007 & Stern Review, 2006).

To solve these environmental problems, it needs the improvement of highly gentle tools, more efficient use of power and raw materials, and environmental conservation movements. (Renner *et al*, 2008). The percentage of global unemployment is 6, affecting some 190 million people (ILO, 2008). According to the information provided by the UN, the contribution of agriculture in green house gas emissions is 15

percent and these emissions are projected to increase to 30 percent between 2005 and 2020 (Stern Review.,2006).

Mostly the agriculture jobs are identifiable by small wage, lengthy duties, and unstable agreements. The ILO stated agriculture sector is a job provider sector for about seventy percent of youngsters. The current employment in the global food system cannot be classified as green. In fact, the tendency is running from green jobs instead of towards them. Though there are more green jobs present in both world food system and in sustainable agriculture, but it is greatly dependent on the policy and departmental and organizational frameworks launched in the coming times (Renner *et al*, 2008).

The introduction of green jobs concept in developing world has a few restrictions, which need to be sorted out for implementing of green technology and green jobs promotions. There exist huge identified gaps in knowledge and available data for further progress.

1.4 Green jobs Initiative in Pakistan

The three newest countries including Pakistan, Ethiopia, and Portugal are currently entered the climate Neutral Network program, which have rising the member nations ten. These three new member states have pronounced to encourage green growth in Nairobi, 5 June 2009 via entering the CN Net. The declaration was presented on WED (World Environment Day), with a idea that “Your Planet Needs You! Unite to Combat Climate Change”. Therefore these three states offer different and modern policies to fight with global warming and to get more advantage from green and low

carbon growth. The aim of Pakistan to join the climate Neutral Network was to mitigate climate change (<http://www.waltainfo.com/index.php>).

1.5 Policies driving Agriculture

1.5.1 Environmental policy 2005 and Green Agriculture

The Pakistan environmental policy of 2005 emphasis on sustainable agriculture in the country to encourage organic farming, to avert land erosion and to refurbish and develop eroded soils. It also focuses to encourage IPM (Integrated Pest Management) and prevent the unsustainable application of agrochemicals. The policy also tries to incorporate the land use planning and zoning to protect and preserve the agricultural land from shifting for commercial purposes (National environment policy, 2005).

1.5.2 Green Agriculture under CDM

CDM is the best tool to minimize the GHG emissions and to get sustainable development in developing countries. CDM in Pakistan was started as an outcome of the UNFCCC (United Nations Framework on Climate Change) protocol known as Kyoto protocol to minimize the influences of climate change. A CDM cell has been established in Ministry of Environment to provide practical and strategic help to the government of Pakistan in Clean Development Mechanism related projects. The Prime Minister of Pakistan in 2006 signed the national operational strategy for Clean Development Mechanism implementation and to promote projects of green sustainable agriculture in Pakistan (<http://www.cdmpakistan.gov.pk/>).

1.5.3 Green agriculture under National Agriculture Policy

The goal of national Agriculture policy document 1990 is the endorsement of environment friendly sustainable development, the rights of labours and to get high production than the population growth rate and to ensure food safety, self sufficiency and to send abroad the extra food and product besides conservation and development of this natural resource for future generation after meeting the needs of present generation.

1.5.4 Pakistan National Conservation Strategy 1992

Agricultural Policies of NCS include preventing over-use of prime soil/and resources. Conservation of soil/land degradation processes. Management of water run-off/shortage to prevent soil erosion and Restoring and improving fertility/structure of degraded soils. The NCS is also suggesting some mitigation measures including the Development of soil and water conservation plans for each sub catchments area and Adopting ecologically compatible cropping systems as well as focusing on sustainable agriculture through use of organic farming and creation of environment friendly jobs like green jobs through a full support from NGO and the donors. NCS outlined a major shift in the policies of the government, (NCS, PAK).

1.6 Agriculture sector in Pakistan

The total cultivable area of the country is near to 22.1 Mha (million hectares). Out of this area 17 Mha is irrigated, which give about 90 percent crop production. The contribution of agriculture in gross domestic product (GDP) of Pakistan is 24%, and also supply crude substances for agro based companies. (MINFAL, 2004). Geographically our country is located in south region of Asia. The total population of

Pakistan is 17.51 million and it is increases at a rate of 2.05 percent per year. While the projections are made that in terms of population growth the Pakistan will achieve fourth position on earth in 2050 (Economic Survey of Pakistan, 2010). Approximately sixty two percent of Pakistan population is living in villages, and agriculture is the main source for their food requirements and other life necessities (Bhutto *et al*, 2011). Although some environmental problems are caused by agriculture, but still it has come out as central sector for economic development in our country and it is thought that it has great capability in terms jobs creations. As compared to industrial sector, agriculture sector has more job opportunities and thus it has come forward as the biggest area for economic stability in Pakistan (Bhutto *et al*, 2011).

Because of low rainfall Pakistan is divided into arid to semi-arid regions. Nearly 250 mm rainfall occurs on 68% of the total geographical area, while the rest 24% of the area receive about 500 mm of rainfall per year. Therefore there will be a need of more water for larger agricultural production that will be obtained either from artificial water sources or through water harvesting. A vital sector of Pakistan is agriculture, which supply foodstuff to the rapidly increasing population. The imported wheat in 1970/71 was 0.3 million tones, which rose to 1.4 million tons in 1997. Efficient struggles have been made to minimize this difference between crop production and population growth. The contribution in gross domestic product (GDP) is 24 % and labor capacity is 47 % of

Agriculture sector
(<http://www.pakissan.com/english/agri.overview/fao.agricultural.sector.pakistan1.shtml>)

1.6.1 The Share of Agriculture Sector of Pakistan in Green House Gases Emissions

Agriculture sector releases an average of 12.5% Green House Gas (GHG) around the world. As a consequence of rise in concentration of GHG the world temperature will rise from 1.8°C to 4°C at the end of the 21st century (Rahman, 2009). Climate change will enhance the mean sea level, which will increase flooding and saline disturbance in the south (IPCC, 2007). The annual green house gases emissions by different sectors of Pakistan are given below; Industrial processes 16.8%, power stations 21.3 %, transportation fuels 14.0 %, agriculture byproducts 12.5 %, fossil fuels retrieval, processing, and distribution 11.3 %, residential, commercial and other sources releases 10.3 % GHG to the atmosphere. An important point is that agricultural processes emit no carbon dioxide gases but releases about 40 % methane gas (http://en.wikipedia.org/wiki/Climate_change_and_agriculture).

1.7 Aims and objectives of the research study

The main aims and objectives of the research were

- To promote awareness and discussion on green jobs in Pakistan
- To assess new job opportunities in agriculture sector of Pakistan
- To provide baseline information on practicing organizations or agencies for green jobs in agriculture sector of Pakistan.

1.8 Importance and Significance of the study

As the concept of green job is new, so the study will be helpful in the creation of awareness and providing best information's about the green jobs in Pakistan. Agriculture is the largest jobs provider sector of our country. The crops generation in Pakistan has enhanced through the persistent use of fertilizers, fungicides, and irrigation water but this has already created negative impacts on environment and ground water resources. So the study will identify the clean and green technologies which have positive impacts on the environment and will help in conserving natural resources, protecting and restoring the natural ecosystems, minimizing waste and pollution production and minimizing the consumption materials and energy etc. The study will be helpful to achieve sustainable development and to identify suitable actions for encouragement of green agriculture and creation of green jobs in agriculture sector of Pakistan.

Chapter 2

Literature Review

All the relevant literature about climate change, green jobs, organic farming and other relevant literature which was studied during the research work is given below.

According to a report of ILO (2009) "Green Job Assessment in Agriculture and Forestry Sector of Bangladesh". According to this report the Green Jobs give emphases on the influences of global warming or climate change on the globe as well as finds the methods social and economic improvement and environmental conservation throughout the world. In order to generalize the idea of Green job the international labor organization arranged a seminar in Japan on Green jobs and Bangladesh too joined the seminar. In forestry and agriculture sectors five and seven activities respectively, were noticed as doing green jobs. The results were then compiled and presented a report. Therefore totally 64770 normal occupations or jobs were present in two agriculture and forestry sectors. Finally it was in report the recommendation was made that Value Chain Analysis required from production to customers to determine the impact of each activity on the environment, to take proper measures to reduce the impact and also to promote and generate more green jobs opportunities.

According to a report (2009), the preliminary assessment of green jobs in 3 sectors a) renewable energy, b) waste management, c) and construction organized by WCC. The objectives were to enhance and increase the understanding on green jobs in Bangladesh, and to generate employment and reduce poverty in climate mitigating projects, as well as the strengthness of cooperation in UN systems among United Nations Environment Program, International Labor Organization and International

Trade Union Confederation. A number of activities were carried out during this assignment and it was concluded that the green jobs is a new idea in Bangladesh and the no understanding and lack of informations as well as the lack of proper and suitable government strategies and funds is the major problem for creating green jobs in the bazaar. They further concluded that because of limit time and not easy approach to the data, the exact quantity of created jobs was not undertaken precisely.

A study was conducted by United Nations Food and Agriculture Organization (UNFAO) (2004), on the “fertilizer use by crop in Pakistan”. According to FAO, (2004), the fertilizer sector has been privatized and deregulated. Almost ninety percent of fertilizers were distributed by the private sector through a network of some 8000 dealers. Large amount of chemical fertilizer was applied on cotton, rice, sugarcane and wheat, which were under irrigation. Fertilization practice is distant from the recommended dose, which have resulted in low yields, economic loss and environmental pollution.

Umar (2003) made a comparison of manual and manual cum mechanical energy uses in groundnut production in a semi arid environment. This research was carried out to examine and evaluate the manual and manual cum mechanical in the generation of groundnuts on the basis of the inputs used. This research was done in Nigeria. The results showed that the mean amount of groundnuts obtained from the farm manual energy and from the farm manual cum mechanical energy classes were 598 and 655 kilograms per hectare. The average amount of powers spent were 1.75 and 3.49 $Mjha^{-1}$ for the generation of one unit amount of yield. Umar in his study recommended that more research work is needed to link yield and energy spent crops generation.

Jan and Maimoona (2007) studied the “the response of wheat to FYM (Farm Yard Manure) and N (Nitrogen) in rainfed situations. The study was carried out in agricultural university of Peshawar in 2003-2004 growing period. The results showed that grain and grain production, straw production, and index of harvest were greater in those areas which were treated with 30 mg FYMha^{-1} . The results describes that maximum plant height, straw production, and yield index were possible under the utilization of N at an amount of 90 kg ha^{-1} . Similarly the study found out that grain and straw production and index of harvesting were noted with application of 30 milligram FYMha^{-1} plus 90 kg Nha^{-1} application. They also recommended that more and more research studies were required to determine the influence of nitrogen over ninety kg per hectare at various moistures system.

Maine’s organic farms, presented an impact report in (2010) to assess the size and economic impact of organic agriculture in Maine. The data for the report was obtained from its 2007 census of agriculture. Organic agriculture, while small in total output relative to other types of farming, creates more jobs per farm. The number of jobs opportunities are more in organic farms than conventional farms, like for example some organic farms requires more labors per hectare for example, organic vegetable and fruit farms spend 29% and 27% of their expenses on labor, compared to the State average of 18%. This means more of these farms’ total output is ploughed back into their communities as farm workers spend their wages at local businesses.

Ashraf *et al.*, (2007) studied the Impact of small Dams on Agriculture and Groundwater Development; A Case Study From Pakistan. They described that H_2O resources improvement and development is very important for sustainable agriculture in

those areas where water is deficient. The Punjab Government of Pakistan has built about thirty two mini dams in pothwar built to accumulate and preserve water for greater crop yield. They found that later building these dams production of crops was enhanced. Water was available for irrigation purposes therefore a shift has been observed in wheat to vegetables yields.

Bhutto et al., (2011), conducted a research work on “Greener energy: Issues and challenges for Pakistan—Biomass energy prospective”. They stated that the expansion of fuel sources is most vital to deal with the energy, global warming and SD (Sustainable Development) problems, thus it is important to overcome energy issues with the adoption of using regenerative energy reserves. The study focused on the biomass usage problems in our country in terms of Sustainable Development, as well as to identify those areas that has maximum chances of biomass energy production. They concluded that in our country there is a shortage of energy, therefore more research work is suggested on RES (Renewable Energy Sources) to enhance their efficient utilization and to get more and more benefits and to fulfill the future energy requirements. They also suggested that Pakistan can fulfill their energy requirements, like electric fall, houses heating, petrol for cars running etc, but further study is required to enhance the technologies for renewable energy resources.

Greer et al., (2008), made a “Comparison of the Financial Performance of Organic and Conventional Farms”. The ARGOS (Agriculture Research Group on Sustainability) had made a comparison in New Zealand of the sustainability of conventional, integrated and organic farms by observing economic, environmental, and social factors. Though the findings showed few important variations in farm expenses and incomes, there is

higher difference in the “bottom-line” values of productivity in organic, conventional and integrated systems of farming beside across these farming systems.

According to ECORYS report “programs to promote environmental skills” (2010) more and good trainings are required for the European labour force, because they can help in developing modern tools, and to fight in new marketplace and diversify the economy. They suggested that by doing so it will increase productivity and jobs and growth. For this environmental skills training was considered one of the important tools. The report concluded that, there was a lot of variety among Member States in environmental skills programmes, as was expected due to the differing social, economical and environmental conditions of the Member States reviewed. They further concluded that the actual content of training and programmes varies across industries and is often modified to specific companies needs. Similarly companies are at the frontline of developing green skills – as they provide in-house training to staff throughout different sectors of the economy. The target group of environmental skills programmes in different Member States demonstrated the mixed nature of the course/programme, ranging from trainees to the self-employed.

Lesser, (2010), conducted a research study on “renewable Energy and the Fallacy of ‘Green’ Jobs”. He stated that the US budget is continuously moving; therefore many peoples and researchers have implemented the green jobs hymn. Dr. lesser said that these strategies forcing the customers to purchase expensive electricity from renewable energy producers, and would not be able to develop economic status. The easy economic truth is that funding for creating renewables will ofcourse minimize

financial wellbeing, as all grants perform. It was resulted that although the permitted buying and renewable financial support possibly help some one, but the bad and poor economic inflences, e.g, reducing job opportunities, were produced. Finally if the aim is only jobs, then to rephrase keynes that there are holes to be dug and holes to be filled in.

Mondal *et al*, (2010), prepared a report on the “Skills for Green Jobs in Bangladesh”. They stated that many problems has been created by climate change from the very beginning in the context of improvement, development, poverty reduction and fragile ecosystems, but the green economy strategies remains limited. They stated that Bangladesh economy and labour market has adopted green policies strongly in renewable energy, but little shifts has been made in materials management, telecommunication and transport sectors due to wrong and weak strategy and less departmental helping and add. Training for green jobs is helpful in attaining sustainable development. So a consistent strategy and policy is needed in each key sector to develop techniques for green jobs. They suggested that present TVET (Technical and Vocational Education and Training) technique is needed for making the environment and surrounding driven. The researchers more recommended that study and continuous information gathering is required for acquiring new information’s and progress in greening the economy.

Masnvelt *et al*, (1998), studied the “ comparison of landscape features in organic and conventional farming systems. The results showed that organic farms have greater of farming systems and landscapes. It observe the variety of land use, animals, fauna, flora, and labor involved. The maximum number of forms were seen in organic

farms. In context of landscape variety, the organic farming has best capability to make the agro landscape practices or management long lasting. They stated that the idea of organic farming contain the whole means to generate best landscape the food and fibre. They recommended that without the farmer's attitude and motivation the implementation of those options was not possible.

Guziana, (2010) conducted an online survey study titles as "Is the Swedish Environmental Technology sector green. This study suggested environmental characteristics of products and production as foundations for company greening and for explaining green and green-green business as well as noticing the three major incentives for enterprises in Environmental Technology area to work like green-green businesses; environmental liability and guidance. More study on this production and product aspect in the context of environmental stability and functioning is needed. It is also useful to give attention to the problem of how to involve companies in the environmental activity through their personal environmental outline. The researcher concluded that further research work was required on execution of these declarations on environmental programs and to enhance the awareness of environmental involvement of these companies.

Herani *et al* (2007) studied, "farming management in Pakistan: suggested techniques". The author found three types of farming in Tharparkar. These were rainfed agriculture, livestock and rangeland application. Rainfed agriculture condition was extremely poor due to the variation in annual precipitation. The rangeland and livestock were proved profitable to some extent.

The recommended suggestions for its development made by the researcher were prediction of precipitation, seed variety, growing systems, economic subsidies, storage services, GOS, and NGO,s add, water, transport and gas services, native and outside plants cultivation, regular research work, and protection of rangeland etc. the researcher concluded that the number one income source was animals, second was rangeland and farmland was the third number, provided that the recommended methods are properly utilized.

Khan *et al*, (2010), examined the “impacts of rising prices of fertilizers on crops Production in Pakistan. They stated that agriculture has a greater function in the wealth of each nation particularly for Pakistan. The industrial sector of Pakistan is also dependent on the agriculture and the GDP growth is also dependent upon crops production. The aims of the study was to look at the various economic aspects related to prices of fertilizer in Pakistan and to find out the solution of the soaring cost of agricultural inputs, particularly fertilizer, further more agricultural production was the prime motive. Four different crops like wheat, cotton, rice and sugarcane were taken as variables in order to determine the influences of values of fertilizer On these crops yield. The results showed that the farms, in which fertilizer was used, yield higher productivity than the other farms. The prices of almost all agricultural inputs and outputs substantially were increased in these years. Values of fertilizers and crops yields were linked with other inversely. The results show that fertilizer application enhances crops yields and improve agriculture sector. They recommended the following suggestions for improving equal application and suitable supervision of fertilizers and enhancing crop production and land productivity.

- A. Providing funds to farmers to help farmers.
- B. Minimizing the chemical fertilizers application and encouraging green manures application to increase crops production and soil structure.
- C. several attempts are being taken to encourage the equal and well proportioned application of fertilizers and it is expected that these attempts would result in best and suitable application of fertilizers in the future.

Hanif *et al* (undated) studied the "Economics Impacts of Climate Change on Punjab agricultural sector. The aims of the research were determining the influences of climate change to have a feasible and perpetual improvement of this sector at national scale. The results showed that average rainfall and temperature have important link with land values. The study found that fall in Rabi rain fall along with higher Rabi temperature will tend to enhance soil value in this period. In this period a rise in rainfall of 1 millimeter, agricultural land value will reduced by Rs; 860 per acre. The research had also verified the theory that climate changes can impinges the value of agricultural soil and that is changeable for total returns. It was projected that the combined influences on crops production would be minus by the end of this century, and developing nations were considered most vulnerable.

Tahir *et al*, (2010) made a research work on " Biomass Fuel Burning and its Implications; deforestation and GHG emissions in Pakistan. The objective of the study was to evaluate the current forest wood utilization scale by 6000 brick kilns founded in Pakistan and its consequences in the context of deforestation and GHG emission. They concluded that the per year utilization of wood and the resulting tree cutting because of

6000 brick kilns was projected to be 298000 tbmy^{-1} and 1378000 m^3 respectively. They recommended that the data of this research may be helpful for more research to involve additional basis of green house gases emissions in pakistan for making a countrywide record list.

Hitz and Smith, (2004) had conducted a research work on “estimating global impacts from climate change. They studied coastal resources, agriculture, energy, terrestrial biodiversity, marine ecosystems productivity, water resources human health and forestry sectors. Results showed that the interactions in global mean temperature and influences were not steady in different areas. Some segments showed high unwanted influences with rising global mean temperature (GMT), especially flora and fauna, coastal and aquatic ecosystem yield. The researchers told that there were some doubts in the researches examined which stop them from accurate detection of the crucial heat limit, afar which the losses were bad and rising. Thus they concluded by proposing some priorities for future research work to enhance awareness to know that how influences were suitable to change with rise in global mean temperature. They recommended that Attempts should be taken to for showing influences in terrestrial , marine ecosystems and biodiversity in metrics which were useful to rulers and policy formulaters.

Alam *et al*, (2007), worked on the “Sustainable development in Pakistan in the context of energy consumption demand and environmental degradation”. The objective of this study was to examine the impacts of rising population, increasing economy, energy strength, and cities expansion on Pakistan environmental disturbances. Similarly

this had tried that to examine concurrently the impacts of over population, energy utilization, and environmental pollution on economy of Pakistan. They stated that for achieving economic stability the environmental losses should be controlled. However if environmental damages occurred, the results will be no sustainable economy, if it prevented the outcomes would be sustainable economy. The findings showed that one percent rise in gross domestic product development directs to 0.84 percent improvement in carbon dioxide emissions, and an increase of 1% in the energy intensity growth rate represent 0.24 percent boost in concentration of carbon dioxide. The author found that the energy intensity and carbon dioxide development coefficients were responsible for influencing scale of improvement considerably and absolutely by 0.3 percent and 1.2 percent correspondingly. This show our economy was reliant on energy consumption.

CHAPTER 3

METHODOLOGY

3.1 Literature Review

Existing strand of text on climate change, its implications on the globe and Pakistan, dynamics of conventional and organic farms, green jobs and policies related to the sustainable agriculture management in the country. Project reports and government retrospect documents are also studied.

3.2 Collection of Secondary data

The study was started by making a matrix for pre selection of different agricultural activities and departments engaged in conducting green jobs related works in agriculture sector of our country. In this sector, 4 activities were noticed as conducting Green jobs. Out of these activities organic farming was selected as for evaluating green jobs because of its high profitability, greater labor involved, no chemicals usage, eco-friendly nature and high scope of green jobs creation. This study is conducted on the analysis of the secondary information's for organic and conventional farming. The data analyzed was the field data of both farming systems during the year 2008-09, obtained from a report of directorate of organic farming entitled as production of organic wheat crop 2008-2009 as well as from the registers of FO & S (Farm Operations and Services) NARC, Islamabad. Further information's were obtained by reading previous reports and net surfing as well as by visiting different organizations like ZTBL (Zari Taraqiat Bank Limited). Organic Farm, Pakistan Agriculture Research Council (PARC), Islamabad, National Agriculture Research

Center (NARC) Library Islamabad, SDPI (Sustainable Development Policy Institute) Islamabad and ILO (International Labor Organization) country office Library Islamabad Pakistan, etc.

3.3 Collection of Primary data

Different organizations, departments and institutes were visited for collecting all the useful information's and fruitful data about green jobs and its related agricultural activities in Pakistan. The chief focus of the research was on the conventional and organic farming, therefore the specialists and professionals of organic farming and conventional farming were personally interviewed in order to collect accurate and relevant information's for achieving best results. Different organizations did not maintain their records, which make the data collection process very difficult but through interviews and discussion the required data was collected. The data was then evaluated, gathered and written in a report form.

Chapter- 4

Results and Discussion

Different parameters of conventional and organic framings for years 2008 and 2009 were compared and evaluated to assess the potentially best practice for the generation of green jobs. For this purpose the secondary data was obtained from NARC, PARC, FO & S, and ZTBL Organic Farms, Islamabad which was then scrutinized and evaluated.

4.1 RESULTS

4.1.1 Green jobs

A. Green jobs in organic farming for wheat cultivation and harvesting

In organic farming the following jobs were noticed as working Green jobs and green activities. They are, ploughing by bullocks, tillage, irrigation by canal system, bio-fertilizers application, spraying on crops, products packing, compost preparation, harvesting, manual threshing and transportation by bullocks.

B. Green jobs in conventional farming during wheat cultivation and harvesting

In conventional farming there were no such activities that were to be considered as green and green jobs. Thus it was founded that conventional farming was less labor intensive than organic farming and was not environment friendly.

4.1.2 Financial Aspect

Table 4.1 shows the cost of different activities carried out during the wheat crop production and harvesting under both organic and conventional farming.

Ploughing Cost

The ploughing cost per hectare under organic and conventional farming was PKR: 3600 and PKR: 5400, respectively. The cost of ploughing under conventional farming was more than organic farming, because in conventional farming the number of ploughs' was more than the number of ploughs in organic farming. The difference with organic farming was PKR: -1800 (table 4.1).

Tillage Cost

Table 4.1 represent that the cost of tillage in organic farming was PKR: 8476.84 and the tillage cost under conventional farming were PKR: 5600. The difference with organic was PKR: 2876.84, which show that in organic farming the cost per hectare for tillage is higher than conventional farming.

Seed Cost

In organic farming more seed is required per hectare than conventional farming, therefore its cost increases per hectare in organic than conventional farming. The seed cost for organic farming was PKR: 2933.12 and for conventional was PKR: 1930. The difference was PKR: 1003.12 (table 4.1).

Fertilizer Cost

The cost of bio-fertilizers in organic farming per hectare was PKR: 1600.98 and in conventional farming was PKR: 8473, which was too higher than the cost of fertilizer in organic farming. The difference was PKR: 6872.02.

Water Cost

The water charges per hectare in organic farming were PKR: 10800 and in conventional farming the water charges were PKR. 16200. The difference with organic was PKR: 5400 (table 4.1).

Harvesting Cost

Harvesting cost per hectare almost remains the same for both the farming systems, but may be varied with yield of the crop. In 2008-09 the harvesting charges for wheat harvesting per hectare under both organic and conventional farming were same at NARC organic farms and that were PKR: 5911.33 (table 4.1).

Labor Cost

The number of labors required per hectare were double than the conventional farming and the charges per hectare in organic farming were PKR: 8800 and in conventional farming were PKR: 4400 as is shown in table 4.1. Thus more labor is involved in organic farming than inorganic or conventional farming. The difference in labor charges with organic is PKR: 4400.

Land Rent Cost

Land rent was same per hectare for both organic and conventional farming systems and was PKR: 9700 (table 4.1).

Threshing Cost

The thresher charges for organic and conventional wheat yield were PKR: 439.8 and PKR: 399.6 respectively (table 4.1). The difference with organic was PKR: 40.

Transportation Cost per Hectare

Transportation charges for organic and conventional wheat were PKR: 150 and carbon dioxide emissions were 6.75 kg.

Total cost per hectare

The total cost of organic farming per hectare for wheat crop was PKR: 52412.07 and for conventional wheat crop the per hectare cost was PKR: 58163.93. The difference in both was PKR: -5751.86 (table 4.1).

Straw Returns

Straw production depends on the wheat production. The price of per mound straw was PKR: 300. The straw returns from organic wheat were PKR: 16500 and from conventional wheat were PKR: 15000 (table 4.1).

Yield per Hectare

Actually the yield per hectare in organic farming always remains lower than conventional farming, but here the organic yield was little maximum than the conventional farming. The organic yield was 55 mounds per hectare and the conventional yield 50 mend per hectare as is presented in table 4.2.

Total Income

As is stated in table 4.1, the total cost per hectare in organic farming was less than conventional farming. But the total income of organic is greater as compared to conventional type of farming per hectare (table 4.2).

Net Revenue

The net revenue in organic farming per hectare was PKR: 26787.93 and in conventional farming it was PKR: 4336.06 (table 4.2).

Table 4.1: Comparison between organic and conventional farming on the basis of costha⁻¹

Costha ⁻¹ in PKR			
Activity Cost/ha	Organic Farming	Conventional Farming	Difference with organic
Ploughing cost/ha	3600.00	5400	-1800.00
Tillage cost/ha	8,476.84	5,600.00	2,876.84
Seed cost/ha	2,933.12	1,930.00	1,003.12
Fertilizer cost/ha	1,600.98	8,473.00	6,872.02
Water cost/ha	10,800.00	16,200.00	5,400
Harvesting cost/ha	5,911.33	5,911.33	0
Labor cost/ha	8,800.00	4,400.00	4,400
Land rent	9,700.00	9,700.00	0
Threshing cost/ha	439.80	399.60	40
Transportation cost/ha	150.00	150.00	0
Total cost/ha	52,412.07	58,163.93	-5751.86
Straw returns/ha	16500	15000	1500
Total income/ha	79200	62500	16700
Net returns	26787.93	4336.06	22451.86

Source: Directorate of Organic Farming and FO & S, NARC, Islamabad.

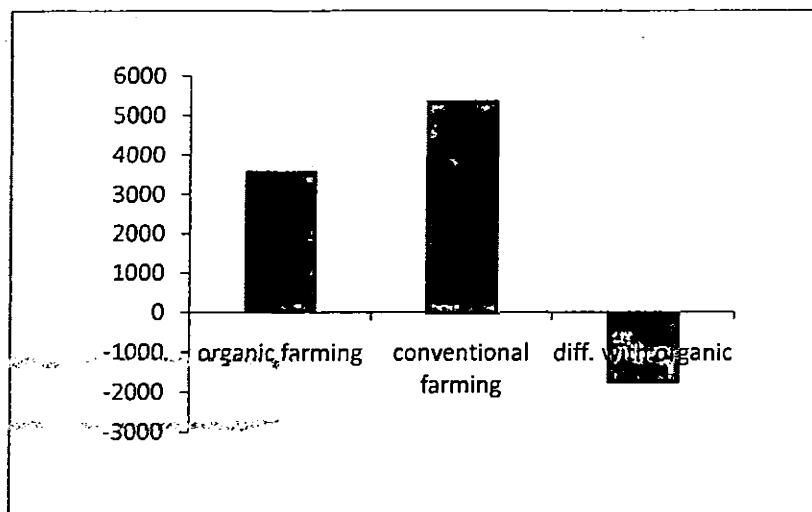


Fig 1: Ploughing costha⁻¹ in both organic and conventional farming systems

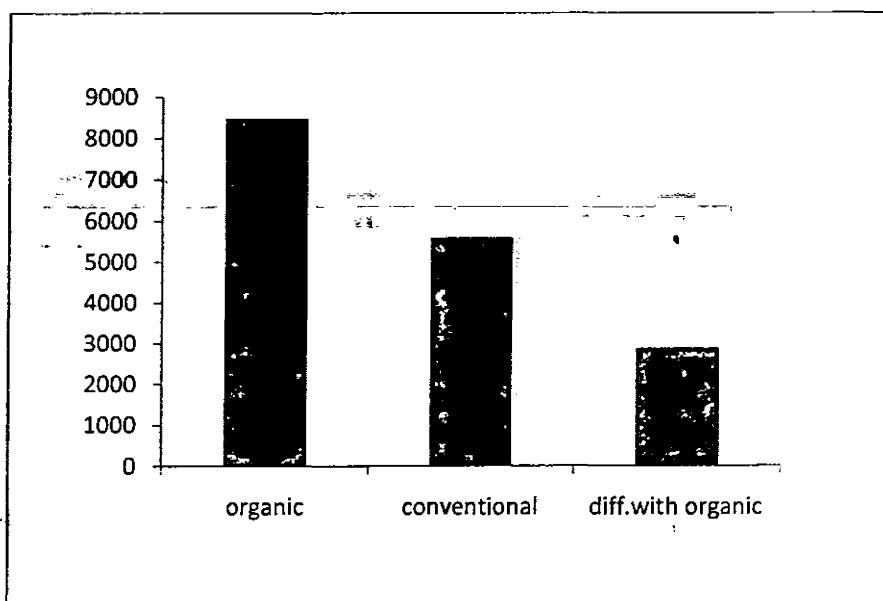


Fig 2: Tillage costha⁻¹ in both organic and conventional farming systems

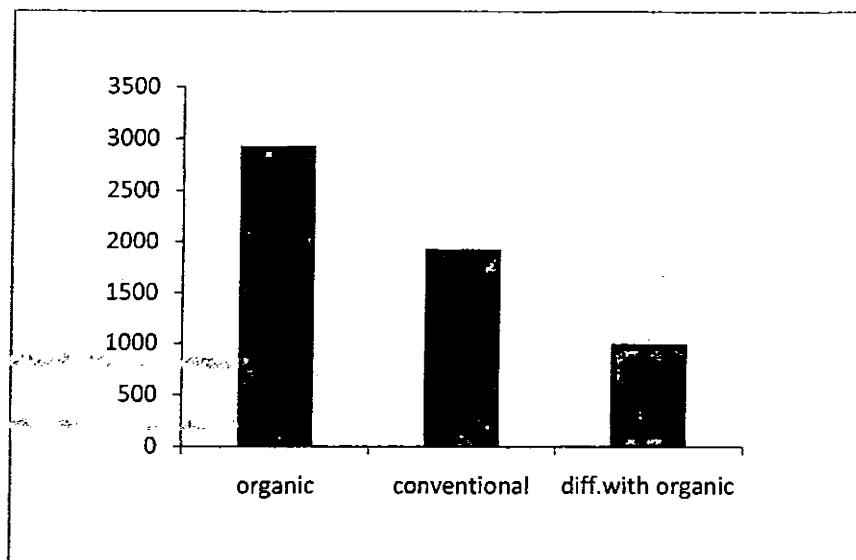


Fig 3: Seed cost ha^{-1} in conventional and organic farming systems

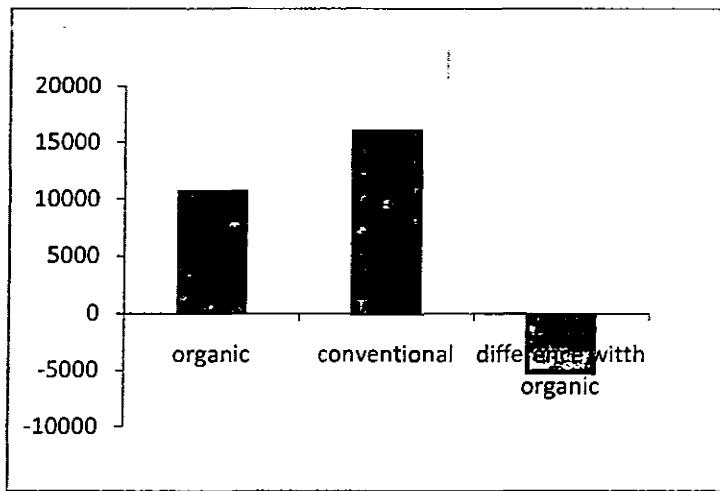


Fig 4: Water cost ha^{-1} in organic and conventional farming

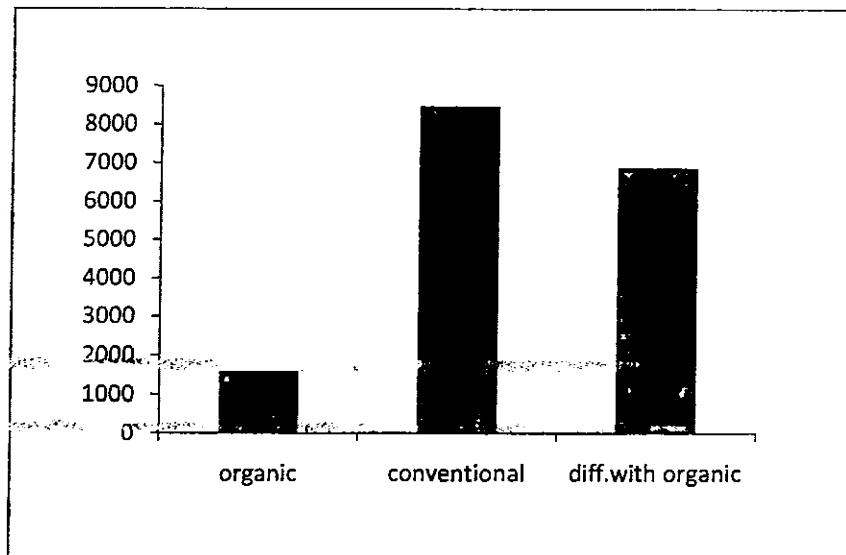


Fig 5: Comparison of Fertilizer cost ha^{-1} in conventional and organic farming

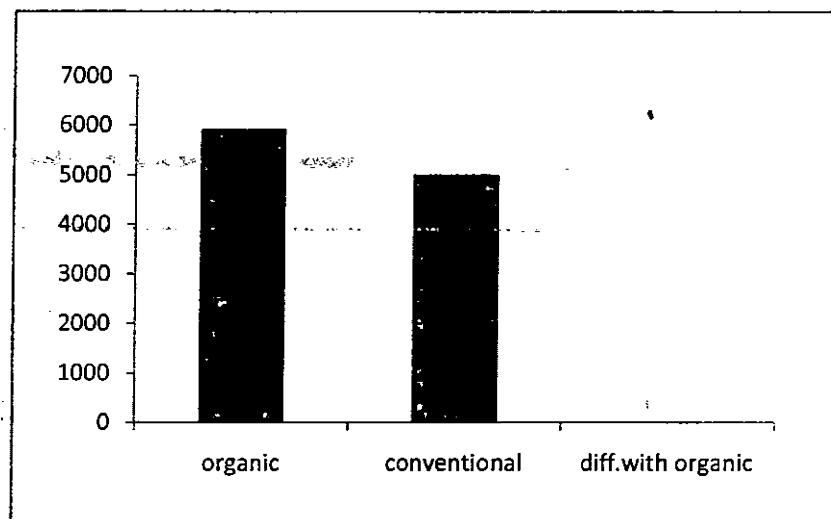


Fig 6: Comparison of harvesting cost ha^{-1} between two farming systems

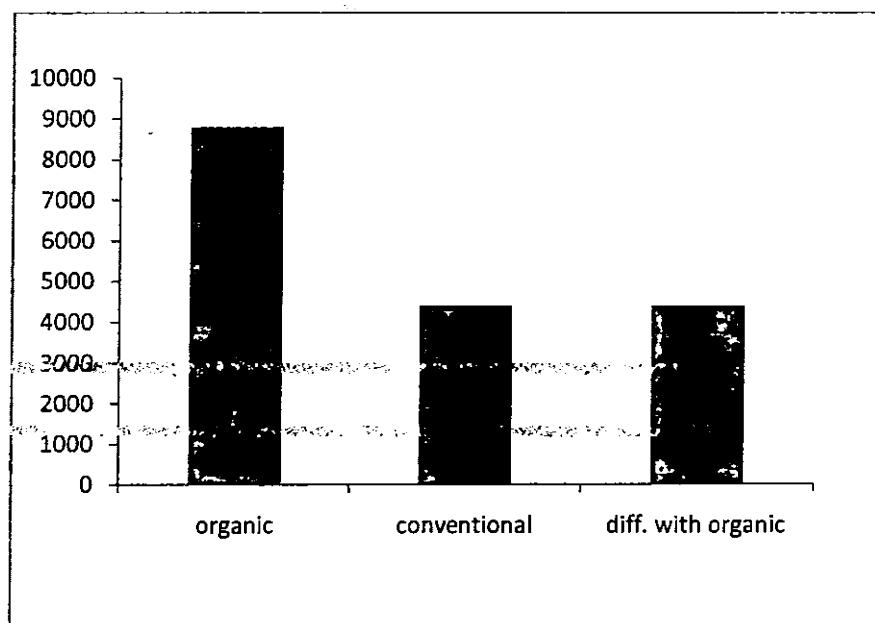


Fig 7: Labor costha⁻¹ in two farming systems

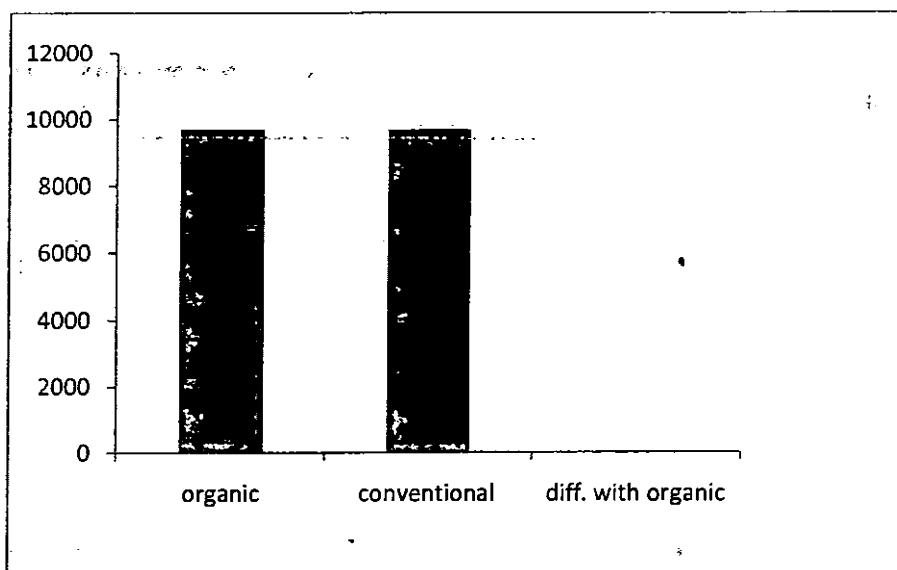


Fig 8: Comparison of Land Ret costha⁻¹ between conventional and organic farming

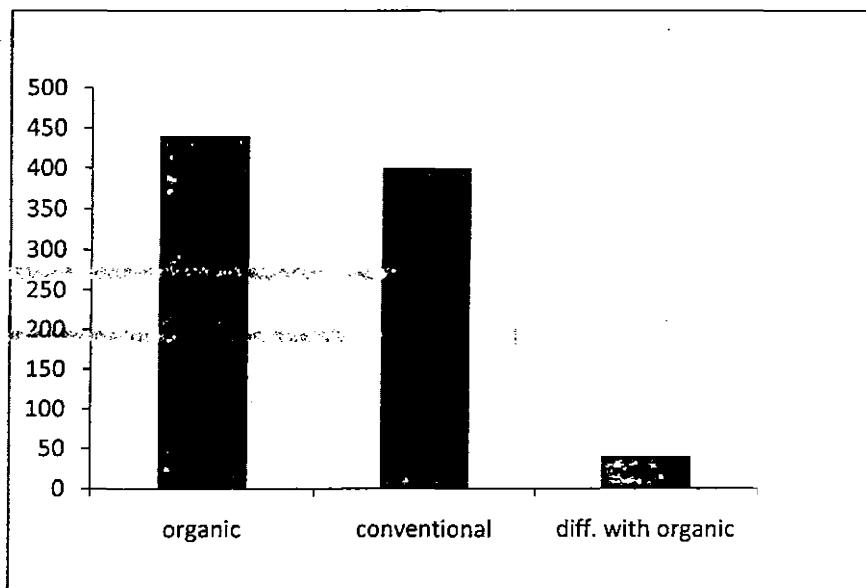


Fig 9: Threshing costha⁻¹ in organic and conventional systems of cultivation

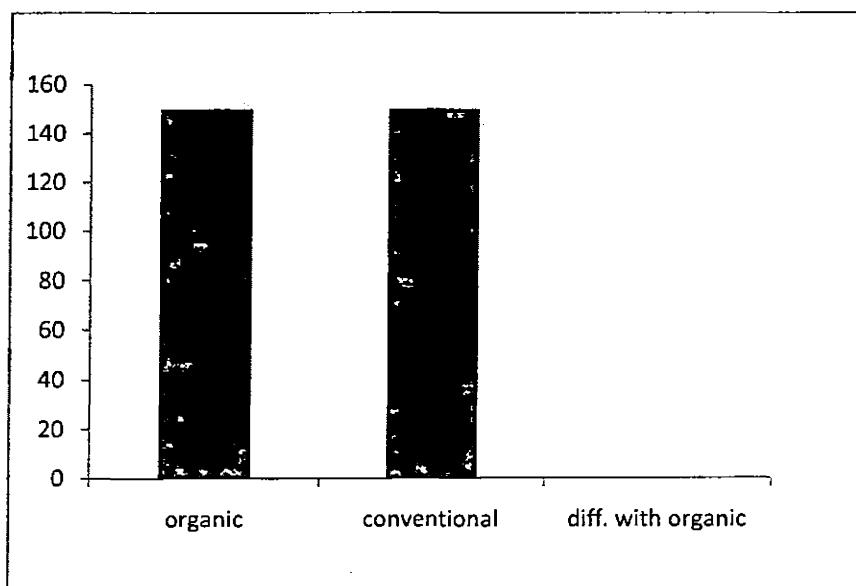


Fig 10: Transportation costha⁻¹ for two types farming

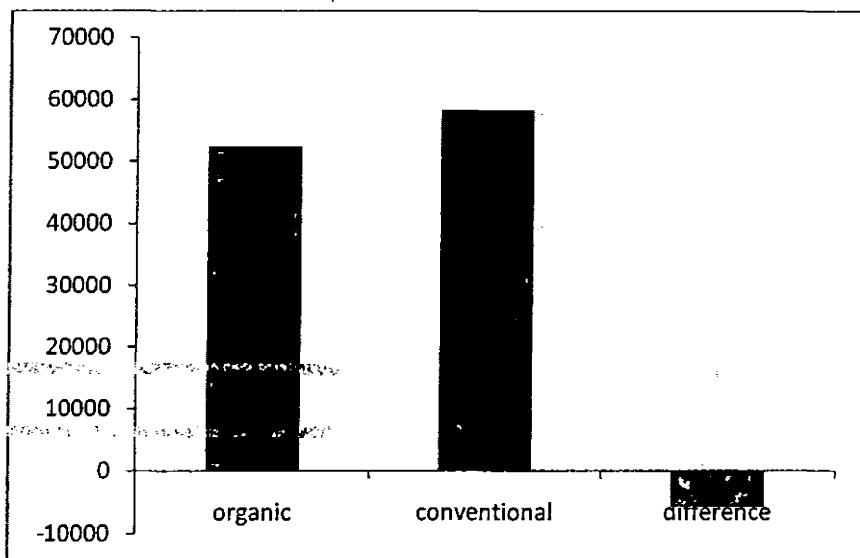


Fig 11: Comparison of Total cost costha⁻¹ between organic and conventional systems of farming

4.1.3 Comparison of conventional and organic farming on the Basis of Yield and Total Cost

The total cost per hectare in conventional farming for wheat crop was more than organic farming (table 4.1), while the yield of organic farming per hectare was maximum than the conventional farming (table 4.2).

Table 4.2: Gross and Net Revenue and yield of organic and conventional farming for wheat crop

Revenue for organic in PKR				Revenue for conventional in PKR			
Yield	Price	Gross revenue	Net revenue (TR-TC)	Yield	Price	Gross revenue	Net revenue (TR-TC)
55	1140	79200	26787.93	50	950	62500	4336.06

Source: Directorate of Organic Farming and FO & S, NARC, Islamabad.

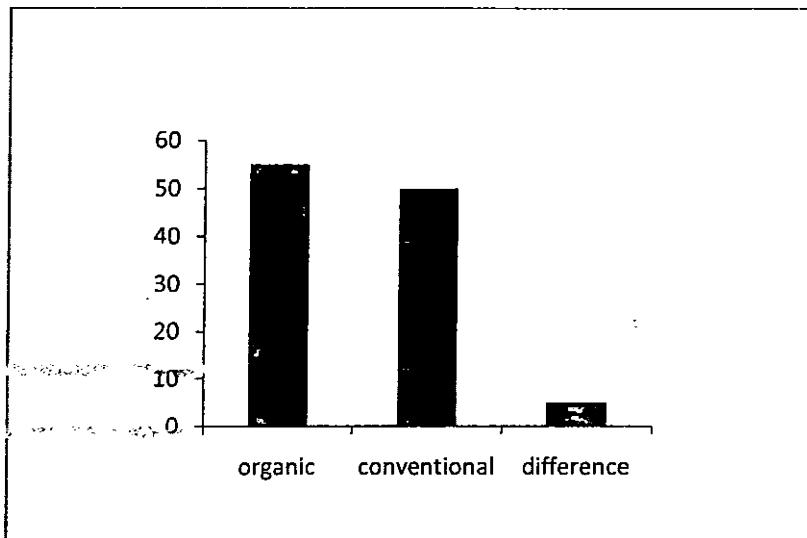


Fig12: Yield ha^{-1} in both organic and conventional farming systems

4.1.4 Productivity

The actual production of conventional farming is always maximum than the organic farming, but if proper measures for organic farming are taken then it is also possible to get higher wheat yield in organic farming than conventional farming. The organic wheat yield per hectare was 55 mounds' per hectare and that of conventional wheat was 50 mounds per hectare which shows that the organic wheat yield was little maximum than the conventional wheat yield.

4.1.5 GREEN HOUSE GASES EMISSIONS

Total GHG Emissions from Organic and Conventional Farming for Wheat Crop

The literature reviewed regarding GHG emissions from agriculture showed that the total GHG emission during wheat cultivation and harvesting under organic farming were 940.75 kg and that of conventional farming were 1260.75. Thus it is founded that

organic farming was less expensive and minimum GHG emissions were occurs during as compared to conventional farming.

Table 4.5 shows the GHG, s emissions from different activities during organic and conventional farming under wheat cultivation. It was found that the GHG, s emission in organic was greater as compared to conventional or inorganic farming method.

Table 4.3: GHG Emissions from Organic and Conventional Farming for Wheat Crop

GHG Emissions					
Activity	Organic Farming		Conventional Farming		Difference with Organic (Kg)
	Fuel consumption (Litres)	Emission in (kg)	Fuel consumption (Litres)	Emission in (kg)	
Ploughing	60	162	90	243	-81
Irrigation	180	486	270	729	-243
Harvesting	98.52	266.004	98.52	266.004	0
Threshing	7.33	20	6.66	18	2
Transportation	2.5	6.75	2.5	6.75	0
Total	348.35	940.75	467.68	1262.75	-----

Fuel Consumption Data Source: Directorate of Organic Farming and FO & S, NARC, Islamabad.

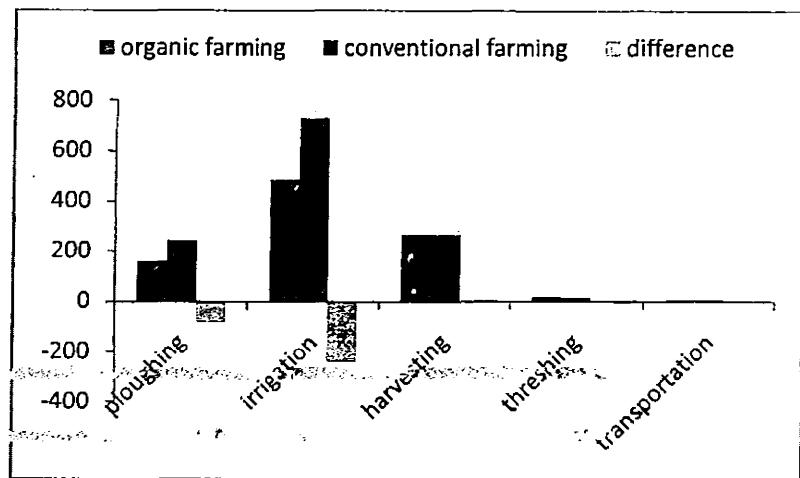


Fig 13: Comparison on the basis of GHG, s Emissions between rganic and conventional farming for wheat crop

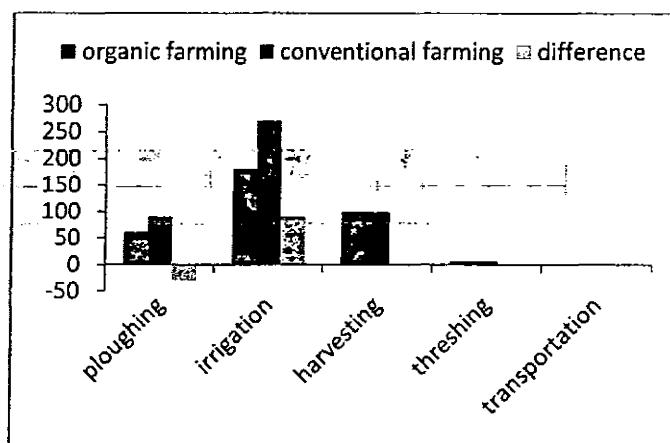


Fig 14: Comparison on the basis of fuel consumption between organic and conventional farming

4.1.6 Evaluation for Different Scenarios

Scenario 1. Ploughing with Personal Tractor

According to the experts interviews if the tractor model is MF-375. Then the tractor will take 2.5 hours for ploughing one hectare of land and will consume 6 liters of diesel per hour. Therefore, the tractor will consume 15 liters of diesel per hectare. They told that in organic farming ploughing is carried out for 4 times, so the total fuel consumption will be (15×4) 60 liters per hectare. The charges of ploughing per hectare in organic farming will be (60×60) (the price of per liter LDO (light diesel oil was 60.22 in December 2009 and here it was taken as an average for the whole year)) PKR: 3600 and CO₂ emissions will be (60×2.7) 162 kg.

In conventional farming the ploughing is carried out for 6 times, therefore the fuel consumption will be (15×6) 90 liters per hectare and charges of ploughing per hectare will be (90×60) Rs. 5400 and CO₂ emissions will be 243 kg per hectare.

Table 4.4. Ploughing with Personal Tractor

Farming type	Fuel consumption(liter)/ha	Ploughing Cost/ha pkr.	Diesel factor for C.F.P*/liter	CO ₂ emissions in kg
Organic farming	60	3600	2.7	162
Conventional farming	90	5400	2.7	243

*Carbon Foot Print

Scenario 2. If the Ploughing is done with Rented Tractor

If the tractor is hired on rent then it will cost PKR: 3000 per plough and will also include the charges or salary of the tractor driver, which is about PKR: 4000/month. The

salary of the driver is very low because according to the government policy the minimum salary of the labor should be PKR: 7000 per month.

Table 4.5. Tractor Hired on Rent

Farming type	Fuel consumption(liter)/ha	Cost/ha PKR.	Diesel factor for C.F.P*/liter	CO ₂ emissions in kg
Organic farming	60	12000	2.7	162
Conventional farming	90	18000	2.7	243

Scenario 3. Ploughing by Bullocks in Organic Farming

If in organic farming the ploughing is carried out by bullocks and in conventional farming it is carried out by tractor. If the ploughing is carried out by bullocks, then the charges of ploughing per hectare in organic farming will be PKR: 2000 and will emit zero percent CO₂. While in conventional farming the ploughing charges per hectare will be PKR: 5400 and CO₂ emissions will be 243 kg per hectare. Thus it is founded that in both situation organic farming is less expensive and more environment friendly.

Table 4.6. Ploughing by Bullocks

Activity	Fuel consumption (liter)	Ploughing Cost/ha PKR.	Diesel factor for C.F.P*/liter	CO ₂ Emissions(kg)
Ploughing by Tractor	90	5400	2.7	243
Ploughing by Bullocks	0	2000	2.7	0

Scenario 4. Irrigation by Tubewell

According to the experts interviews, if the tubewell is of 30 horse power OR if its delivery is of 4 inches and if it is run by diesel. Then the tube will take 10 hours per hectare for irrigation and will consume 30 liters per hectare (the tubewell consume 3 liters per hour). In organic farming water is given for an average 6 times per cropping season. So the tubewell consume a total of (30×6) 180 liters of diesel for one cropping season. Therefore the water charges per hectare in organic farming will be PKR: 10800. (Here the diesel price per liter is taken as PKR: 60). The Green House Gases emission from organic farming during irrigation will be (180×2.7) 486 kg (the diesel factor for carbon foot print per diesel liter is equal to 2.7 kg).

Similarly the experts told that in conventional farming water is given for an average of 9 times. But in both farming systems the water giving is dependent on rainfall. i.e. if it's higher rainfall in cropping season then less water will be needed to the wheat crop. In conventional farming the total fuel consumption by tubewell will be (30×9) 270 liters per hectare. Thus the water charges will be PKR: 16200 and the GHG emissions will be 729 kg. More water is required in conventional farming system than organic farming system for wheat crop because in organic farming green manure is given which can maintain and retain the moisture content of the soil for long time and can improve the soil structure. Therefore it is founded that conventional farming is high-priced and emit greater amount of GHG as compared to partially organic methods of farming system.

Table 4.7. Irrigation by Tubewell

Farming type	Source of irrigation	Fuel consumption (liter)	Water Cost/ha PKR	Diesel factor for C.F.P*/liter	CO ₂ emissions in kg
Organic Farming	Tubewell	180	10800	2.7	243
Conventional Farming	Tubewell	270	16200	2.7	0

Scenario 5. Irrigation by Canal System

If in organic farming water is given through canal system and in conventional farming water is given through tubewell which is run by diesel oil. In canal system the water charges per hectare per year are PKR: 250 and there are no GHG OR CO₂ emissions. While in conventional farming the water charges per hectare are PKR: 16200 per cropping season and it emit 729 kg CO₂ emissions.

Table 4.8. Irrigation through Canal System

Farming type	Source of irrigation	Fuel consumption	Cost/ha PKR	Diesel C.F.P.* Factor/liter	CO ₂ emissions
Organic farming	Canal system	0	250	2.7	0
Conventional farming	Tubewell	270	16200	2.7	729

Scenario 6. Irrigation Fifty Percent by Tubewell and Fifty Percent by Canal System

If water is given fifty percent by tubewell and fifty percent by canal system in organic farming. If we go on such a situation where fifty percent water is given by canal system and fifty percent by tubewell then the situation will be such that in organic farming water will be given for three times, therefore the water charges will be reduced to PKR: 8730 and CO₂ emissions will be reduced to 243 kg per hectare.

Similarly if in conventional farming the water is given fifty percent by canal system and fifty percent by tubewell, then in conventional farming the water charges per hectare will be PKR: 13095 and CO₂ emissions will be 364.5 kg.

Table 4.9. Irrigation Fifty Percent by Tubewell and Fifty Percent by Canal System

Farming type	Source of irrigation	Fuel consumption (liter)/ha	Cost/ha PKR	CO ₂ emissions(kg)
Organic Farming	50% canal system	0	250	0
	50% tubewell	90	5400	243
Conventional Farming	50% canal system	0	250	0
	50% tubewell	135	8100	364.5

Thus it is concluded that if this is not possible in Pakistan to come over on totally organic situation for water usage, then the best solution is the scenario 3 i.e. to use fifty percent water from canal system and fifty percent from tubewell. Therefore with this situation both the charges and CO₂ emissions will reduce to an optimum limit.

Scenario 7. Manual sowing

If sowing is carried out manually. In Pakistan the wheat sowing is mostly done by the farmer itself. However if the labor is hired then he should pay to the labor on daily wages. Therefore organic farming is more labor intensive and no GHG emissions will occur. More jobs would be generated.

Scenario 8. Fertilizer Spreading by Manually/ by Hand

The economic condition of the majority of Pakistani cultivators is not good and larger number of them is illiterate. The farmers are unaware of the harmful effects of the chemical fertilizers. They spread these fertilizers by hand but have no proper safety measures. Therefore these chemical fertilizers cause many health problems to them. Similarly during chemical spray (weedisides) they are exposed to harmful effects of these weedicides. Along this when they come to home and change the clothes, then these clothes are washed by their wives or girl children's and thus they are also affected by these chemicals and weedicides because during spraying and fertilizers spreading most of the chemicals and spray fall on the farmers clothes and thus become a route for the transferring these chemicals to their houses. So the organic farming suggests that fertilizers spreading should be done by hand but safety measures like proper and well covered dress as well as hand gloves should be used.

Scenario 9. Harvesting by Combine Harvester

If harvesting is made by combine harvester in both organic and conventional farming systems. Combine harvester is running with the power of an engine which consume diesel oil during harvesting and emit GHG. A tractor having a trolley is also

running along with the combine harvester in the field, because when the part of the combine harvester is filled with wheat, then it is emptied in the tractor trolley to transport it to the store or other suitable place. The harvesting charges were PKR: 5911.33 and consume 98.52 liters of diesel and emit 266.004 kg CO₂. It was found that combine harvester is both economically costly and emits green house gases during harvesting.

Table 4.10. Harvesting by Combine Harvester

Farming type	Harvesting by	Fuel consumption	Harvesting Cost/ha PKR	Diesel C.F.P.* Factor/liter	CO ₂ emissions
Organic farming	Combine harvester	98.52	5911.33	2.7	266.004
Conventional farming	Combine harvester	98.52	5911.33	2.7	266.004

Scenario 10. Harvesting Manually

If harvesting is made manually in organic farming and in conventional farming by combine harvester. In organic farming harvesting is carried out manually. Therefore more labor is required per hectare and no green house gases emissions occurs. While in fully mechanized conventional farming combine harvester is used for harvesting. So less man power is needed and more green house gases are emitted during harvesting.

Scenario 11. Threshing by Thresher

If threshing is done by thresher in both organic and conventional farming. Now a day the main source is thresher for wheat threshing. The thresher is running with the help of the tractor engine therefore the thresher charges were calculated on the basis of tractor running time and fuel consumption. It was found that the thresher consumes about 4 liters of diesel per hour and threshes 30 mounds of wheat per hour. The charges depend on the yield of the wheat. If yield is maximum then charges and GHG emissions will also be higher. Here the organic wheat yield was 55 mounds per hectare. If for 30 mounds the thresher take one hour (60 minutes), then for threshing 55 mounds of organic wheat the thresher will take 110 minutes and will consume 7.33 liters of diesel. The thresher charges were (7.33×60) PKR: 439.8. The conventional wheat yield was 50 mounds per hectare, so for 50 mounds the thresher will take 100 minutes and will consume 6.66 liters of diesel. The thresher charges for conventional wheat were (6.66×60) PKR: 399.6. The CO₂ emissions in both organic and conventional farming were 20 kg and 18 kg, respectively.

Table 4.11. Threshing by Thresher

Farming type	Fuel consumption (liters)	Threshing Cost/ha Rs	Diesel C.F.P.* Factor/liter	CO ₂ emissions
Organic farming	7.33	439.8	2.7	20
Conventional farming	6.66	399.6	2.7	18

*Carbon Foot Prints

Scenario 12. Manual Threshing

If in organic farming threshing is done manually and in conventional farming by modern thresher. In ancient times threshing method was such that the wheat crop after harvesting was spread in an open space and then animals specially bullocks would be run over it till the wheat grains fully separated from the wheat straw. Then these would be flown over in the air with the help of a long wood instrument. Thus the wheat grains would fall on the ground and the straw due to less weight travel to some distance and make heap of the straw there. In this method more labor had to be required and no machinery was used, therefore no fuel consumption would be occurred. While in mechanized threshing the less labor is required and more fuels is consumed. But now that old method of threshing is impossible in this modern age and for large wheat production, but can also be adopted for small scale threshing.

Scenario 13. Transportation by Tractor

Transportation charges depend on the market space from the field and the weight loaded. Here the transportation source is tractor and is of own. The tractor consume 1 liter per 4 kilometers. So if the market is at a distance of 10 kilometers then the tractor will consume 2.5 liters, so the transportation charges were (2.5×60) PKR: 150 and CO₂ emissions were 6.75 kg.

Scenario 14. Tractor Hired on Rent for Transportation

If the tractor is hired on rent then the situation will change. Then the per 40 kg bag cost PKR: 10. then the transportation charges in conventional farming were (50×10) PKR: 500 and in organic farming the transportation charges were (55×10) PKR: 550. It should be remembered that these charges will also include the fuel charges. While the tractor consume 1 liter/4 km distance, and emit (2.5×2.7) 6.75 kg of CO₂.

Table 4.12. Tractor Hired on Rent for Transportation

Farming Type	Transportation cost/40 kg bag	Fuel consumption (liter)	Yield (mounds/ha)	Total transportation cost PKR	CO ₂ Emissions(kg)
Organic Farming	10	2.5	55	550	6.75
Conventional Farming	10	2.5	50	500	6.75

Scenario 15. Transportation by Bullocks

If it is possible to transport the production through bullocks, then the charges of per 40 kg bag will be PKR: 5. So in organic farming the transportation charges will be (55×5) Rs. 275, and for conventional will be (50×5) PKR: 250.

Table 4.13. Transportation by Bullocks

Farming type	Transportation cost/40 kg bag	Yield(mounds/ha)	Total transportation cost PKR	CO ₂ emissions
Organic farming	5	55	275	0
Conventional farming	5	50	250	0

Thus during bullocks transportation no GHG emissions occur and the charges will also be lower than the tractor transportation charges.

4.2 DISCUSSION

An organic farm managed by National Agriculture Research Center (NARC) was visited for the determination of green jobs incentives in organic farming. The key activities involved in organic farming include the removal of inorganic fertilizers, pesticides and herbicides and reduction of soil erosion. An organic farmer can reduce production cash costs by engaging family labor into the farm. The crops are secured from the use of chemical fertilizers in organic farms by the use of leguminous plants as green manures. The green manures prevent the use of chemical fertilizers, which are carcinogenic in their nature in long terms. The conventional food may be cheaper and better in cosmetic look, but it is poisonous in nature.

In this study a cross comparison was made between organic and conventional farming for wheat crop, in order to know that which farming system is cheaper and more jobs creative as well as most environment friendly. For this purpose the cost of different activities during wheat cultivation was determined and analyzed.

The ploughing cost in conventional farming was more than the organic farming and conventional farming was consuming more diesels per hectare than organic farming, therefore it was releasing more GHG than organic farming. However it was found that the tractor used for ploughing in both farming systems was personal. If the tractor is hired on rent then the charges will further rise. According to scenario 3, if the ploughing is done by bullocks then the cost of ploughing in organic farming will be too

little than conventional farming and there will be no GHG emissions and it will be thought as a green job.

Tillage cost for organic farming was more than conventional farming, but that was good because more labor is required in organic farming during tilling the land and hence more green jobs would be created. The seed charges in organic farming were little maximum as compared to conventional system. The harvesting charges, land rent and transportation charges in both farming methods, almost remains same. However if transportation is carried out by bullocks, then the transportation charges can be reduced and the GHG emissions will be zero and more green jobs would be generated. If harvesting is made by combine harvester in both organic and conventional farming systems, then it would be found that combine harvester is both economically costly and emits green house gases during harvesting. If harvesting is made manually in organic farming more labor is required per hectare and no green house gases emissions occurs. While in fully mechanized conventional farming combine harvester is used for harvesting. So less man power is needed and more green house gases are emitted during harvesting.

According to the experts at NARC organic farm, an organic farming activity generates twice the jobs i.e. around 40 man days per hectare as compared to 20 man days per hectare in conventional farming system. Presently the organic farming practice is at a very small scale in the country, either at the small farms or household level. The activity could however be enhanced by increasing the size of conversion grants for the farmers to switch to organic farming. Even though in market the organic foods are not very common, however, best values may improve the bazaar.

The water charges in organic farming were less than in conventional farming. However, if water is given through canal system in organic farming, then the water charges in organic farming per hectare will further reduce and there will be no GHG emissions. While in conventional farming the water charges per hectare will remain higher than organic farming. However, if we go on such a situation where fifty percent water is given by canal system and fifty percent by tubewell then the water charges will be reduced and CO₂ emissions will also be reduced per hectare. Similarly if in conventional farming the water is given fifty percent by canal system and fifty percent by tubewell, then in conventional farming the water charges and CO₂ emissions per hectare will be reduced to half. Thus it is concluded that if this is not possible in Pakistan to come over on totally organic situation for water usage, then the best solution is the scenario 6 i.e. to use fifty percent water from canal system and fifty percent from tubewell. Therefore with this situation both the charges and CO₂ emissions will reduce to an optimum limit.

The cost of fertilizers application in conventional farming is too high than organic farming system. The chemical fertilizers are both expensive and environment destructive. Chemical fertilizers have no impacts on water logged and salt-affected soils, while organic fertilizers improve the health of salt affected and water logged soils and improve productivity even with the use of poor quality waters. Thus during bio-fertilizers application more labor is required and no harmful impacts on environment can occur. Thus it is more green jobs creative system.

The thresher charges depend on the yield of the wheat crop. If yield is maximum then charges and GHG emissions will also be higher. According to scenario number 12,

if in organic farming threshing is done manually , then in manual threshing more labor had to be required and no machinery was used, therefore no fuel consumption would be occurred. While in mechanized threshing the less labor is required and more fuels is consumed. But now a day that old method of threshing is impossible in this modern age and for large wheat production, but can also be adopted for small scale threshing. Thus manual threshing is more green jobs creative.

Replacement of crops and inter cropping is considered to enhance land productivity, and green jobs are created in promoting these activities. The use of biomass, green fertilizers and composts enhance the land fertility and ensure protection of the crops from pests attacks. The objectives of such low paid and green farming include the development of greater labour involvement, high production, good and sound organic farming. Agricultural inspectors can also play important role to improve organic farming. These workers require guidance to encourage organic farming in Pakistan. But few of the green workers have entrée to organizational schooling, because no free teaching department on organic farming is established in Pakistan. However the number of these workers involved in organic farming is projected to rise considerably in future.

4.3 FINDINGS

From all the above results and discussion the following findings were achieved.

1. Green jobs are a new and nascent concept in the country.
2. Some of the traditional methods are still useful in today's agriculture.

3. The Organic methods are more environment friendly than conventional methods for wheat production.
4. The Organic farming methods are less expensive than conventional farming methods.
5. Greater GHG emissions occur in conventional farming than organic farming.
6. More green jobs could be generated by encouraging the organic farming methods.
7. Organic farming discourages the use of highly technological farming system.
8. Organic farming gives preference to Green manuring, compost and other organic and bio-fertilizers application.
9. Organic farming improves soil quality, and prevents water pollution and air pollution.
10. If proper measures are taken then organic yield can be maximized than conventional farming yield.
11. The application of artificial synthetic chemical fertilizers and GMOs is prevented by organic farming to rouse development of agricultural crops having zero influences on surrounding environment.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

In this study the agriculture sector of Pakistan was evaluated for the presence and potential for green jobs. The main focus was given to the organic and conventional farming and a comparison was made on the basis of financial charges and GHG emissions, as well as from yield perspective, to know that which one is more jobs generator and environmentally safe. The results show that organic methods of farming are more productive and generator as compared to conventional methods of farming in provisions of jobs and production ha^{-1} . It is concluded that, as compared to conventional, organic farming releases little quantity of GHG and is more environment friendly. In agriculture sector the organic farming is the most job generator activity.

It is also concluded that the farmers doing organic farming requires training, because they are not familiar with clean and green technology; to develop environment-friendly skills.

Finally, it may be concluded that the evaluation was made on the basis of agricultural practices. Yet, some more jobs might be found in the transportation and processing part if the total value chain analysis (VCA) of a commodity from producer to consumer is carried out.

5.2 RECOMMENDATIONS

1. It is recommended that great struggle, covering the total relevant and appropriate sectors and tools are required to lessen the GHG emission issue.
2. It is recommended that a market based strategy should be developed for generalizing and enforcement the concept of carbon tax in order to mitigate the GHG emissions.
3. It is also recommended that more study and regular information gathering is required to identify the most potential sectors for green jobs.
4. It is recommended that the application of bio-fertilizers should be promoted in agriculture sector for crops cultivation at regional, national and international level, to enhance soil fertility and to prevent land degradation.
5. Conventional farming practices such as the application of chemical pesticides and the excessive use of water and fossil fuels, and repeated planting of single crops should be discouraged, because In long-term, conventional methods are not sustainable.
6. Organic farming methods such as application of bio-fertilizers, generalizing the canal system for irrigation etc, should be promoted. Environmentally sustainable farming is fruitful for the planet, farmers and the consumers. It does not introduce chemicals into the surroundings and minimizes the utilization of non-renewable materials. It also provides the consumer with nutrient-rich food, instead of low-quality crops.
7. Finally it is recommended that a policy relevant to green jobs in sustainable agriculture should be developed for preserving green sustainable agriculture and to ensure economic wellbeing by adjusting to issues created by climate change.

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Annexure-1

Table 1 Pre-Selection Matrix

Activity/ Technologies	Part I Impact on environment				Part II Scope of green job creation			Govt. priori ty
	Use of chemic al fertiliz er	Use of chemica ls for plant protecti on	Labor involv ed	Eco- friend ly	Scope of green job creati on	Profitabil ity	Future potenti al	
Sericulture	Almost nil	Nil	Mediu m	Yes	Yes	Medium	Yes	-
Agro- forestry	Nil	Nil	-	Yes	Yes	Medium	Yes	-
Organic farming	No	No	16	Yes	Yes	High	Mediu m	Mediu m
Composting	No	-	-	Yes	Yes	Medium	Mediu m	Low