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SOCIO-ECONOMIC EFFECTS OF MAIZE HYBRID ON FARMERS

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Abstract

Pakistan is facing a serious problem of increasing population therefore it is essential to increase the food production. As cultivated land resources are becoming limited the strategy for the future will have to be built around raising the productivity of existing land rather than on expanding the cultivated area as has been done in past. The most appropriate and successful ways to raise the maize hybrid productivity is through improvements in crop husbandry, better weeding, better plant configuration, use of better planting material, better soil fertility management, better timing of operations, better land use management.

Key Words: Maize, Economic

INTRODUCTION

Currently, sufficient Maize is grown in Pakistan for domestic needs and there is neither a surplus nor deficit in Maize grain supplies. After potato, Maize stands the most profitable stable and dependable crop in Pakistan (Tariq *et al*., 2010). Maize (*Zea mays*. L.) enjoys a vital position in the existing cropping systems of Pakistan. It ranks third after wheat and rice in Pakistan for its grain production. Maize is grown in almost all the provinces of the country, but Punjab and KPK are the main areas of production. It is not only consumed by human beings in the form of food grain but it is also used as feed for livestock and poultry besides being a good scavenge crop. It is also gaining importance due to being a commercial crop, where a large number of products are being manufactured out of its grain. Maize grain contains about 72% starch, 10% protein, 4.8% oil, 5.8 % fiber, 3.0% sugar and 1.7% ash (Chaudhary, 1993).

The mounting pressure on our economy to feed more people has increased the importance of utilizing the potential rain fed regions of Pakistan to improve food security (Mahmood, *et al*.1991).The increasing demand for healthy food for poor population of Pakistan, there is a dare need to produce pulses crops on larger area. Pakistan Agricultural Research council (PARC) has been focusing on hybrid seed development of important crops at federal level. This study will help to policy makers and scientist to outlook the future area and production under Maize, so that to establish such type of acts to increase the area and production under Maize in Pakistan to fulfill country food requirement. The main objective of the study was to check past and future trends of Maize area and production in Pakistan by using appropriate trend analysis model. Trend analysis studies help policy makers in taking policy decisions.Pakistan, maize yieldper unit area is very low (3.5 t/ha) with an area of 935.1 thousand hectares and production of 3261.5 thousand tons .Than 50percent area under maize is sown by varieties seed. This is due to reason that hybrid seed of maize that is extremely expensive and is un-affordable by majority of farming community. So the significance of open pollinated maize varieties cannot be denied even in this era of hybrid maize, particularly in this region, as these can better withstand the temperature extremes giving stable yields (3) in addition to comparatively very low seed and inputs costs. Hence, it needs to evolve maize varieties which can ensure comparable and stable yields, in succeeding generations as suggested by Olakojo and Iken (9) and Russel (12) for meeting seed demand of poor farmers at one hand and increasing national maize yield on the other hand. These broad base varieties ensure stable the high yields.

Quality seed holds the key to raising crop productivity. The potential of planted seed determines and caps the impact of various other inputs like fertilizer, water, and cultural practices in crop production. For hybrid maize that are less susceptible to seed-borne diseases, it is of utmost importance that seed be pure, bold, highly vigorous, and pathogen- and disease-free. For such crops, experts recommend replacing seeds on a 5-year cycle and sowing 20 percent of total area annually with improved seed to maintain seed vigor and obtain high yield. Hybrid seeds with superior yield potential have been developed for open-pollinated crops like maize. The adoption of these seeds and related technology package has revolutionized maize production in many countries, including Pakistan. The situation with regard to the requirements for improved seed.

1.1 Assessing social and cultural impacts of agriculture

Social impacts are defined broadly as “the consequences to human populations of any public or private actions,” and social impact assessment (SIA) is defined as “efforts to assess or estimate, in advance, the social consequences that are likely to follow specific policy actions and specific government action” (Interorganizational Committee 1995) The action in question here is the sanctioning and planting of maize that has been transformed by the insertion of genes and gene sequences from outside of the crop’s primary gene pool, the customary source of breeding material. The impacts in question result from changes in agricultural practices, consumption, and markets that might arise because of the introduction of transgenic maize into Mexico. On one side, negative impacts might include declines in income or the availability of food, loss of relative economic or social position, and loss of agricultural assets that are part of cultural identity. On the other side, positive impacts associated with the presently available transgenic maize (with Bt and herbicide tolerance traits) might include reduced costs, health effects, and environmental damage from aerial insecticide spraying and reduced labor costs for weed control.

While the cultural importance of maize to Mexico is discussed in this chapter, its emphasis is on social impacts. The reasons for this emphasis are the lack of standard definitions, units of measurement, and methodology in social science for predicting cultural impact and the lack of information about how transgenic maize is expected to affect different maize populations and characteristics of maize apart from the expression of the specific transgenic trait. Unlike social impact assessment, cultural impact assessment lacks a consistent and accepted set of factors that can be measured for the effect of new technology. Social impact assessment reports regularly on the impact of new technology on specific social groups and categories, such as small-scale farmers, economic class, gender, educational background, ethnicity, as well as on community functions, such as civic participation. Cultural studies start from the assumptions sever culture is distinct and that no standard measurement is appropriate across cultures. The consequence for studying impact of technology is that every culture should be assessed independently. Mexico is well known as a society with numerous cultures. While several studies point out the importance of maize to specific cultures (e.g., Sanderson 1981, González 2001), no study has formally assessed the impact of new maize varieties and technology on the cultural meanings of maize.

Moreover, current theories of culture strongly emphasize the fact that culture is a set of symbols and a knowledge system that is constantly changing and permeable to symbols and knowledge from other cultures. While numerous ways of preparing, consuming, and otherwise using maize are known in Mexico, information is lacking on how transgenic traits, such as Bt expressed in leaves and roots or herbicide tolerance, will affect preparation and use of the grain. Likewise, this chapter documents that maize populations are open systems in Mexico and that new traits are commonly sought after an established in local maize populations. No study to date has related this practice to cultural perception and impact, so that assessing the cultural effect of transgenic traits will be highly speculative.

Although the initial emphasis of SIA researchers was on quantitative assessment of future impacts, practitioners now accept the idea that SIA is a qualitative process whose purpose is to promote public involvement around issues of technological change and to identify the types of social impacts that are likely to be important. A recent compilation (Vanclay 2002) of categories and types of social impact lists seven general categories (e.g., health and social well-being, quality of living environment, and economic and material well-being), and 78 specific types of impact among the general categories.

Many of the social impact categories, such as quality of life, are ambiguous and defined in different ways (e.g. Diener and Suh 1997). The sheer number of possible impacts, the complexity of defining and measuring impacts, the possible roles of many causal variables to any one effect, and the lack of bench-mark data frustrated the goal of determining impact in a quantitative fashion. The number of explanatory variables for a social effect often is greater than the number of cases available to assess impact of a single factor (Meidinger and Schnaiberg 1980). The result of these methodological problems has been to turn SIA toward qualitative approaches that emphasize public involvement in identifying important impacts and information gathering about those impacts (Burdge and Robertson 1990).

SIA (social impact assessment) is usually associated with technologies and projects that have clear social and geographic identity, such as roads, dams, pipelines, and power plants. This type of project allows the SIA analyst to limit the investigation to social groups and locations where impact is likely to be felt. While some agricultural technologies and projects, such as an irrigation project, are limited in geographic and social context, most agricultural technology is relatively broad and unbounded in terms of its potential impact.

These characteristics multiply the difficulty in defining impacts and determining causation, and they increase the likelihood that a technology may be positive for one sector or region and negative for another. The introduction of transgenic maize into Mexico typifies a technology whose impact will not be confined to a specific social group or geographic region. Because of the importance of maize in Mexico, introduction of transgenic maize there will have effects across different social sectors and geographic regions Commercial and non-commercial farms, rural and urban consumers, indigenous and non-indigenous communities.

While technological change has both positive and negative effects, impact assessment has traditionally emphasized the anticipation of negative effects of new technologies (Finsterbusch 1980, Lacy 2001). The evaluation of technological change in agriculture has focused on two broad categories of negative impacts: (1) a bias in the technology that favors specific types of farms (e.g., large vs. small farms) (e.g., Griffin 1974, Qaim 1998), social groups (e.g., male vs. female farmers) (e.g., Gloverman and van Wilsum 1994), and regions (e.g., lowlands vs. highlands) (e.g., Brush et al. 1988), and (2) a decline in the quality of life of rural communities (e.g., Goldschmidt 1978). These two categories of effect have been extensively researched for specific farming systems and technologies. For instance, the issue of bias in new agricultural technology has received attention in Asian rice systems affected by the Green Revolution. Contrasting evaluations have been presented over time by Palmer (1976),Karim (1986), and Evenson and Gollin (2003). The issue of declining quality of life has been studied in the U.S. since Goldschmidt's (1978) landmark study that associated an inferior quality of community with large farms.

Other social scientist have related Goldschmidt's finding to the long term restructuring of the rural sector toward larger farms and the role of technological change in driving this trend. The key analysis of rural restructuring is Cochrane's (1993) of the "technological treadmill" in which acquisition of technology is part of inter-farm economic competition. Luloff and Swanson (1990) provide comparative analyses of the social impact of declining numbers of farmers and increasing farm size in different regions in the U.S.

The evaluation of bias and declining quality of life relating to technological change in agriculture has generated contrasting studies that find evidence of negative and positive social impacts of the same technology. Technological bias has been extensively studied in relation to the diffusion of high yielding rice varieties in Asia during the Green Revolution. Frankel (1971) and Griffin (1974) provide negative assessments citing scale bias, while Hazell and Ramasay (1991) and Hayami and Kikuchi (2000) find no scale bias and give positive assessments. Labao et al. (1993) dispute Goldschmidt's assertion that increasing farm size causes negative impacts on the quality of life in rural towns.

One conclusion from the comparative studies of negative social impact of specific agricultural technologies is that it is all but impossible to confirm cause-and-effect relationships between specific technologies and social conditions. While the potential for negative impacts is present, there is often insufficient evidence about the significance of the impacts, how they weigh against positive impacts, and whether technological change is the most important causal factor. All of these issues are present in assessing the social impact of transgenic maize in Mexico.

Economic effects

The awareness of the importance of maize in Nigeria's food economy is on the increase. Maize is particularly important for its versatility both in growth and uses. It is the most important cereal crop grown in South Western Nigeria where it attains special significance in view of the limited amount of protein-rich cereals in southern diets. The cultivation, processing and marketing of maize provide employment opportunities for several farming and non farming households. The employment opportunities in turn provide important sources of 1070income and livelihood to growers, processors, and the market women who engage in maize marketing activities.

The economic and agricultural policies in Nigeria have further put maize in a prominent position in the country's food economy. The ban placed on the importation of rice and wheat flour further makes maize a very important raw material being sought after by feeds mills, flour mills and breweries in Nigeria. Also, government now compels manufacturers, notably flour mills and breweries to source their materials locally. As a result of the widening maize demand-supply gap, government formulated programmers and policies which place small holder farmers in central focus due to the fact that nations agriculture had always been dominated by small holder farmers who represent a substantial proportion of the total farming population and produce over 70% of total agricultural output.

In addition, several research institutes have been established since independence including the National seed multiplication scheme (NSMS), International Institute of Tropical Agriculture (IITA) and Agricultural development project [ADP] established to undertake research activities that will generate improved production technologies particularly the production and distribution of high yielding varieties (HYVs) of seed so that the present annual maize production of 8 million tons can be raised by 12 million tons annually as predicted by Ogara (2011) .All these notwithstanding, the problem of wide maize demand-supply gap has remained largely unresolved mainly because farmers who are the central focus of technology and who hold the key to agricultural production have been seriously neglected in policy formulation and implementation strategies.

Agricultural production technology may be defined as an art of obtaining farm produce from the synthesis of natural and man-made resources under specific managerial organization (Aken'ova, 1987; Akinyosoye, 1989). Natural resources for agricultural development include land, labour, water and traction of animal origin while man-made resource (capital) include farm equipment, planting devices, fertilizers, herbicides seeds etc The various combination of these resources (natural and capital) give rise to different production technologies. Several technological practices are involved in the production of maize in Nigeria and a number of factors seem to account for the existence of these technologies of production. These factors include differences in resource endowment, level of technical and managerial capacity of the farming population, quality and degree of available scientific information, ecological characteristics of production areas, factor and output prices and the last but obviously not the least are the characteristics of farmers who are the users of Journal of Agricultural Technology 2013, Vol. 9(5): 1069-1080 1071 technologies. The study of farmers and their socio-economic background is very important in the use of maize production technologies.

The characteristics of farmers would determine awareness of the type of technologies to be adopted, conceptualization and perception of the technology, quantities to purchase and when, efficient utilization of purchased inputs, results obtained and their general economic wellbeing. Since farmer's characteristics differ from farmer to farmer, the type of technologies used would also differ significantly.

For instance, education is a strong factor that could improve the quality of labour and the ability to derive, decode and evaluate information on production technologies. Available empirical evidences show that farmer's socio-economic characteristics such as age, level of education, farm size, farming experience etc are important determinants of farmers' technical inefficiency. Oladeebo (2006); Osundare (2008) concluded that farmer's socio-economic characteristics affect their inefficiency in the use of modern technology. Socio-economic characteristics such as age, years of schooling, farming experience, farm size etc were specified in their inefficiency model. They found out that old farmers tend to be more conservative and less receptive to modern and newly introduced agricultural technology. Irrespective of the signs, the socio-economic variables specified in the models were significant determinants of inefficiency (inherent) in the use of production technologies.

From the above, the socio-economic background of farmers can negatively, influence, farmers's level of production if care is not taken. This study therefore intends to describe and compare the socio-economic characteristics of maize farmers using different production technologies in the study area with the aim of coming up with the (best) technology that is suitable with farmers socio-economic characteristics.

Maize, in Pakistan, is the third important cereal after wheat and rice. Yields of maize varieties are disgracefully lower. Without the genetic and other environmental variables, give in losses in maize are caused mainly by competition from weeds. A number of weeds are found to be strictly distressing the yield of maize crop. Many important weed species in maize have widely been studied in the country. On the other hand, *Xanthiumstrumarium*, which has resentfully predisposed maize yields in past in various areas of Pakistan but still disused, needed to be investigated. In order to search out all the available information about the previous studies on the interference of *X. strumarium*in maize, the world's libraries were explored through web browsing, emails and personal contacts. The Ohio State University (USA) library website, which has access to world's many journals, was also employed in this venture. The following pages describe the review of the related research work on different aspects of maize crop, the weed (*X. strumarium*) and their competition studies carried out in Pakistan and to another place in the world.

2.1. Density of Maize

The density of maize in its productivity is an important factor determining the crop yield potential, economics and competition with weeds. Many previous studies on maize competitive ability at various densities in and out of Pakistan had been reviewed. In a study on the response of various plant populations (75,000, 100,000, and 125,000 plants ha-1) on maize varieties, Noor-ul-Akbar (1998) reported that days to tasseling, days to silking, days to maturity and plant height all increased whereas cob length, 1000-grain weight and grain yield ha-1 decreased at a density of 125,000 plants ha-1. They noted maximum grain yield (4428.7kg ha-1) in plots having 75,000 plants ha-1. Akbar *et al.*, (1996) grew maize in Peshawar at plant densities of 50,000, 100,000 and 150,000 plants ha-1 with N applied at the rate of 0, 50, 100 and 150 kg ha-1. They stated that the biomass and grain yield of the crop increased with increasing N rate and crop density, with the highest values at 100,000 plants ha-1. In an estimation study of plant population (65,000 and 130,000 plants ha-1) and row spacing on the morphology and yield of maize hybrid (Pioneer-3902), Mudarres*et al.*, 7 (1998) suggested that increased population density increased the grain yield but single plant grain yield was decreased at higher plant density.

The days to tasseling and silking were also greater at higher density. Using three levels of plant densities (83,000, 110,000, and 145,000 plants ha-1) and five N levels (0, 60, 120, 180, and 240 kg ha-1) in a field experiment, Sanjeev *et al.*, (1997) noted the best grain and Stover yield at 110,000 plants ha-1, whereas the best N rate was 180 kg ha-1 for the number of grains ear-1, 1000-seed weight and grain yield ear-1. Studying densities of 47,600, 57,120 and 71,400 plants ha-1 for eight maize hybrids, Hassan (2000) exposed that plant height, ear height and grain yield increased with increasing plant density, whereas mean ear leaf area, ear length, ear diameter, number of grains row-1 and 1000-grain weight decreased with increasing plant density. Ear length, number of grains row-and 1000-grain weight collectively contributed 84.96, 95.07 and 82.16% of the total grain yield variation at 47,600, 57,120 and 71,400 plants ha-1, respectively. Using densities of 5.56, 6.67, 8.33, and 11.33 plants m-2, the optimum plant population density which resulted in the maximum grain yield was 11.33 plants m-2. Grain number ear-1 and grain number row-1 were the most important grain components responding to changes in plant density in the hybrids. Weight grain-1 and ear number plant-1 had an insignificant effect on the yield adjustment (Dastfal*et al*., 1999).

Ahmad and Khan (2002) studied the effect of three plant densities (6, 8 and 10 plants m-of two maize varieties (Azam and Pahari) and two hybrids (N7989 and Babar). They reported that increase in plant density extensively increased days to maturity, fresh biomass at tasseling, plant height and number of grains ear-1, Stover yield, ear yield, grain yield, 1000-grain weight, harvest index and shelling percentage. They also mentioned that high plant density, up to 10 plants m-2, decreased number of ears plant-1, number of rows ear-1, number of grains ear-1 and 1000-grain weight. Maximum dry matter yield at tasseling (3670 kg ha-1), number of grains ear-1 (313), ear yield (4602 kg ha-1), grain yield (4222 kg ha-1), thousand grain weight (249g), and harvest index (37.1%) were obtained at density of 8 plants m-2. The plant height, grains cob-1 and 1000 grain weight were maximum at 1.5 feet spacing followed by 1.0 and 0.5 feet spaced treatments whereas days to 50% tasseling and silking protracted with increasing plant density, in a study on the effects of plant spacing on the growth behavior of maize (Hamayun, 2003). Hashemi*et al*., (2005) revealed that plants 8 grown at noncompetitive densities (isolated plants) can be used to relate competitive pressure on yield and yield components at high plant densities. He quantified the sensitivity of grain yield and its components to manipulation of crowding stress in corn (*Zea mays* L.) by planting single-ear corn hybrids at six densities (0.25, 3, 4.5, 6, 9, and 12 plants m–2), the lowest density being considered an secluded density. He quantified intensity of competition by comparing grain yield and its components of plants in these densities with those of secluded plants.

Thus he obtained the highest grain yield from 9 plants m–2 and highest biological yield from 9 and 12 plants m–2. Core yield per plant and all other yield components decreased linearly as plant density intensified. The decrease in core yield was attributed most to the reduction in number of kernels per row. There are a couple of reasons of increase in maize (*Zea mays* L.) production in USA; firstly as a replacement for nematode invasion in cotton (*Gossypiumhirsutum*L.) and soybean (*Glycine max* L.) fields and secondly due to the improved yield potentials of maize hybrids. According to Michael *et al*., (2006) the full season hybrids are traditionally grown using 76-cm row spacing at population densities of 6 to 8 plants m-2. They further added that the yield potentials of short-season hybrids are similar to those of full-season hybrids, but they require significantly narrower rows (50 cm) and increased populations of about 10 to 12 plants m-2. Monneveux*et al*., (2005) worked on lenience of maize to high population density and low N because maize is commonly exposed to low N conditions worldwide. They proposed lenience to high plant population density as another breeding strategy to improve stress lenience in maize. They reported that under low N stress, grain yield was significantly negatively associated with abortion rate and under high plant population density, a positive association was noted between ovule number and abortion rate.

The effect of stress on yield constituents varied greatly according to germplasm type. Tollenaar*et al*., (1994) grew maize at densities (4, 7, and 10 plants m–2) under three weed pressures i.e. all season (weed free), planting to 5-7 leaf stage (medium weed pressure) and planting to 3-4 leaf stage (high weed pressure) and found up to 50% decrease in weed biomass by increasing maize plant density from 4 to 10 plants m–2. The impact of high weed density treatments on maize dry matter accumulation remained in a narrow range of 18 to 21% throughout the growing season. The grain yield reductions attributable to high weed 9 pressures were 26, 17, and 13% for the maize plant densities of 4, 7, and 10 plants m–2, correspondingly. Results of this study show that the competitiveness of maize with weeds can he enhanced by increasing plant density. Therefore, it is clear from the earlier research activities that the crop population density is an important factor that can play a key role in improvement of the competitive ability of maize crop for achieving the required crop stands and desirable yields. Generally a population density of 5 to 15 maize plants m-2 has been used; the density that is affirmed the best in performance was in the range of 7 to 10 plants m-2.

Weeds of Maize

Weed rivalry in maize (*Zea mays* L.) is a serious challenge to the crop production at huge scale. In Pakistan, the estimated percent yield losses in maize due to weeds and weeds plus insects are 18 and 31%, correspondingly (Khaliq and Hussain, 1987). Maize has got a long range of broadleaf and grassy weeds including the *X. strumarium*. A few credentials concerning weed species and their created problems in maize crops in the country and outside the borders are hereby provided to validate the research. In a survey regarding enveloping weeds conducted by Hashim and Marwat (2002) in District Abbottabad, North-West Frontier Province, Pakistan during 2001-02, a total of 16 weeds reported as enveloping species were, *Xanthium strumarium, Ipomoea eriocarpa,Alternantherapungens, Trianthemaportulacastrum, Tagetesminuta, Imperatacylindrica,Amaranthushybridus, Robiniapseudoacacia, Broussonetiapapyrifera, Ailanthus altissima,Pistia stratiotes, Phragmitesaustralis, Partheniumhysterophorus, Cannabis sativa, Galiumaparine*and *Emexspinosus*. A total of 60 weed species, belonging to 50 genera and 23 families were recorded by Afzal *et al*., (1994) in Abbottabad and Haripur in maize fields during 1987-88. They added that out of these 60 weed species, 33 species (55%) were of large distribution and 45 % were very little distribution among which *X. strumarium*was found as the most plentiful.

Shah and Khan (2006) enlisted a total of 63 weed species belonging to 32 families that were common in four major crops via; wheat, maize, rice, tobacco and vegetables in District Mansehra, North-West Frontier Province, Pakistan. Their checklist of harmful weeds indicated *X.strumarium*as a problematic weed in maize crop in the area. The weeds reported by Shah *et* 10 *al*., (2006) in maize fields were *Achyranthusaspera*, *Amaranthushybridus, A. viridis*, *Convolvulus arvensis*, *Cynodondactylon*, *Cyperusrotundus*, *Datura alba, Sorghumhalepense*, *Trianthemaportulacastrum*, and *Tribulusterrestris*. Studying the therapeutic values of important weeds infesting wheat and maize fields in Peshawar, the two major crops of Pakistan, Shah *et al*., (2006) reported a total of 19 weeds of different families. They found most of the weeds highly effective against many of the diseases, for instance, *Galiumaparine*used against skin diseases such as seborrhea, flavonoids and tannins, *Tribulusterresetris*used as sex stimulant, *Cichoriumintybus*excellent tonic for liver and digestive tract, *Convolvulus arvensis*useful against joints pain.

Besides the therapeutic importance, most of the weeds are used as vessel herbs and green fodders, they added. In a survey in District Abbottabad, Ibrar *et al*., (2003) reported a total of 35 weeds in various crops (11 in maize) that had medicinal and some other uses. Most of these weeds, including *X. strumarium,* were locally used for common diseases like cough, fever, diarrhea, pain, worms and skin diseases. Some of these weeds were locally used as vessel herbs and some as fuel, while a good number was a source of fodder for cattle. 11 Whereas studies on maize weeds in the rest of the world also point out a large number of weeds inflicting considerable damage to the crop research. In Romania, Sarpeand Mihalcea (1999) reported the following weeds as plentiful in maize crop; Abutelontheophrasti, Xanthium strumarium,Chenopodium album, Solanum nigrum, Cirsiumarvense ,Echinochloacrusgalliand Setariaglauca. The problematic weeds in maize, *Abutelontheophrasti*, *Xanthium* strumarium, Polygonumpensylvanicum, Amaranthus*hybridus*, *Amaranthusrudis*, and *Ambrosia artemisiifolia*were reported by Young *et al*., (1999).

In Spain, from the results of a weed survey in different irrigated maize fields, Lopez Garcia and Zaragoza (1995) reported a group of maize weeds with high incidence, (*Setariaverticillata*, Cynodondactylon, Echinochloa crus-galli, Amaranthusblitoides, A. retroflexusand Convolvulus arvensis), most species showing reduced frequency, (Cirsiumarvense, Malvasylvestrisand Polygonumaviculare), and some showing increased frequency, (Sorghum halepense, Xanthium strumariumand Cyperusrotundus), and a few species that were newly found, (Abutilon theophrastiand Panicumdichotomiflorum).

In United States, Galatowitsch*et al*., (1996) compared 10 restored freshwater grassland swamp to 10 contiguous natural swamp regarding the floristic composition of their vegetation and seed banks, to test the hypothesis that communities rapidly develop through natural decolonization. All 10 swamp had been cultivated for maize production for the previous 25-75 years. Ten species were found only in restored swamp including Cyprus esculentus, Panicumvirgatum, Xanthium strumarium, Amaranthusrudisand 6 inundated aquatics; whereas Sium suave, Glyceriagrandis, Iris virginica, Carexlacustrisand Phragmitesaustraliswere common emergent species in natural wetlands but were not found in restored wetlands. Thus, maize crop is strangled by immeasurable weeds round the globe in terms of yield loss and weaker stands. Competitive studies have been conducted on almost all the important weeds of maize in Pakistan, yet *X*. strumariumis still a secrecy which triggered a need to investigate its possible evils in maize crop at various densities in irrigated conditions.

The *Xanthium strumarium*

*Xanthium strumarium*or common cocklebur is an invasive species (Hashim and Marwat, 2002). Invasive plant species have harmfully affected habitats the whole time the world and continue to raid previously un-infested lands at a frightening rate. Earlier efforts have focused on obliteration and control; however, recent efforts have recognized that preventing invasive plant species from infesting new areas is more cost-effective and proficient than trying to restore the system after it is infested. One of the major components of prevention is limiting the introduction of the invasive plant to un-infested areas. Davies and Shelley (2006) stated that in order to limit the dispersal of invasive plants, land managers need a framework that assists them in identifying major spatial dispersal vectors and management strategies based on those vectors. The framework they proposed identifies major potential vectors by incorporating invasive plant seed adaptations for dispersal through space and infestation locations relative to vector pathways. The framework then proposes management strategies designed to limit dispersal by those specific vectors.

The framework also identifies areas where investigate could improve the effectiveness of dispersal-prevention strategies by providing additional management tools. Species of the genus *Xanthium* (family Composite) are troublesome herbaceous yearly weeds during most of the world (Holm *et al*., 1977). Common cocklebur can also be found on beaches, along watercourse and in leisure areas (Weaver and Lechowicz, 1983). Common cocklebur contains varieties that vary in their growth and progress and is an adaptable species found in diverse environments (Wassom*et al*., 2002). The mechanisms underlying the ability of *X. strumarium*to spread from its natural waterside habitats and establish weedy populations in urban waste areas were discussed by Bales and Lechowicz (1989). A unique biotype, called multiple seeded cocklebur, was discovered by Abbas *et al*., (1999) in United States in 1994, which has up to 25 seeds bur-1 instead of the usual two, and it frequently produces up to nine seedlings bur-1 whereas normal common cocklebur has two seeds bur-1 which usually produce only one seedling.

The multiple seeded cockleburs MSC burs are large, round, covered with hairy spines or prickles, and firmed one end with each seed terminated by a bill Leaf morphology differs among the biotypes, and stems of MSC are straighter and smoother than normal common cocklebur NCC. Both biotypes have potential dormancy with13 germination occurring in the second growing season. MSC produces increased numbers of seedlings which increases the difficulty in controlling common cocklebur. Monitoring the reproductive success of sibling *X strumarium*plants after growth at different levels of availability of water and nutrient resources, Lechowicz and Blais (1988) related the variation in reproductive success among individual plants to physiological, structural, and phonological characteristics and concluded that reproductive success increased with increased availability of resources, but the relative contribution of particular characters to reproductive success varied with resource availability. They further added that the allocation of biomass to different vegetative tissues, time to seedling emergence, degree of branching, transpiration rates, water use efficiency, the rate of decline in height growth after seedling emergence and final plant size all varied significantly with resource availability.

Denali *et al*., (2003) examined the genetic variation at 12 isozyme loci in three species of Xanthium (italicum, strumarium, and orientale) forming a X. strumarium intricate. They found very little variation within species at the loci studied in contrast to the considerable interspecies genetic differentiation at several loci and avowed that the gene differentiation between species was ranged from 61 to 91%. Methyl jasmonate (JA-Me) at concentration 1000 mu M inhibits cocklebur seeds germination by preventing the conversion of aminocyclopropane carboxylic acid to ethylene in the tissues. The inhibition of ethylene production by JA- Me resulted in retardation of the germination of cocklebur seeds (Nojavan and Ishizawa, 1998). In contrary, cocklebur is harmful weed in a number of crops in Hungary due to theallelopathic effects that were examined in several studies (David *et al*., 2005).

The toxicoses of *X*. strumariumare usually associated with the consumption of the seedlings in the cotyledon stage, which contain a high concentration of the toxic principle, carboxy-atractyloside. Witte (1990) analyzed plant and tissue samples for carboxyatractyloside with various results. Frolov (1991) studied the survival of the larvae of Ostrinianubilalis, O. nubilalis, O.narynensisand O. scapulalison leaves of maize and cocklebur (X. strumarium) and observed significant differences in the behavior of 1st-instar larvae of populations adapted to dicotyledonous food-plants, but not in their mortality, when forced to feed on 'own' and 14 'alien' food-plants.

The growth of individual *X*. strumariumplants was studied at four naturally occurring densities: isolated plants, pairs of plants 1 cm apart, four plants within 4 cm of each other, and discrete thick clumps of 10–39 plants. A large individual variation in growth and resultant size within the population and within all densities was found (Weiner *et al*., 1998). They added that there were significant differences in final size among all densities except pairs and quadruples, which were almost identical. Plants growing at higher densities were more variable in growth and final size than plants growing at lower densities, but this was due to increased variation among groups (greater variation in local density and/or greater environmental heterogeneity), not to increased variation within groups.

In a mono-specific stand of cocklebur, the interaction between individual plants competing for light was evaluated by Hikosaka*et al*., (2001) who stated that light intercepted by a leaf of the target individual is influenced by its own leaves and those of neighbors higher in the awning. To determine the degree of interaction, they established experimental stands of cocklebur and measured light interception directly with light-sensitive films attached to leaves. They calculated the interaction using light amalgamation of individuals within the stand and of those isolated from the stand and concluded that light interception of an individual was influenced more by its neighbors' leaves than by its own. They further added that the degree of interaction was greater in the stand of higher density. The method they presented is useful in studying the role of architectural characteristics in light competition in relation to evolutionarily stable strategies of individuals in mono-specific stands. Intra-specific variations among five common cocklebur biotypes were examined by Lee and Owen (2003). They recorded plant heights, an thesis dates, and day of bur set; excised all plants at the soil surface at the end of the growing season; and then weighed them. Common cocklebur biotypes did not differ significantly in height; flowering date was linked strongly with photoperiod and varied little between years within a biotype but flowering date and bur set date differed among biotypes, and the highest dry matter yields occurred in later flowering biotypes, they concluded. Common cocklebur is an adaptable and competitive weed with variable morphology.

In order to learn how the rate of net photosynthesis by cocklebur relates to traits that influence competitiveness Wassom*et al*., (2003) compared photosynthesis, accumulation of biomass (shoot mass, root mass, and total plant mass), and total leaf area among six accessions of common cocklebur grown in a greenhouse. They found highly significant differences among the accessions for all measured traits. Correlations of each measure of biomass with total leaf area were positive and highly significant, but correlations of photosynthesis with each biomass measure and with total leaf area were negative. They concluded that the relative photosynthesis rates among common cocklebur accessions grown in the greenhouse might be used to predict their relative photosynthesis rates in the field, but relationships of photosynthesis with biomass or leaf area observed in the greenhouse might not be a reliable indicator of relationships in the field.

For the influence of elevated CO2 on energetic properties as a mechanism of growth responses in *X. strumarium*, Nagel *et al*., (2005) grew individuals of *X. strumarium*at ambient or elevated CO2 and then harvested them. They exposed that *X. strumarium*individuals produced more leaf and root biomass at eminent CO2 without increasing total energy investment. Therefore, as a physiological mechanism affecting growth, altered energetic properties could positively influence productivity of *X. strumarium*at elevated CO2. The above mentioned terrifying amount of previous research work on *X. strumarium*elucidates that this weed has all the competitive, invasive, aggressive, adaptive, and proliferative capabilities; can flourish rigorously in any environmental and ecological regimes. It has been studied very inconsequentially in maize crop particularly in Pakistan.

Social impact

Social impact assessment (SIA) is usually associated with technologies and projects that have obvious social and geographic identity, such as roads, dams, pipelines, and power plants. This type of project allows the SIA analyst to limit the investigation to social groups and locations where impact is likely to be felt. While some agricultural technologies and projects, such as an irrigation project, are limited in geographic and social background, most agricultural technology is relatively broad and limitless in terms of its potential impact. These characteristics multiply the difficulty in defining impacts and determining causation, and they increase the likelihood that a technology may be positive for one sector or region and negative for another. The introduction of transgenic maize into Mexico typifies a technology whose impact will not be restricted to a specific social group or geographic region. Because of the importance of maize in Mexico, introduction of transgenic maize there will have effects across different social sectors and geographic regions – 3 commercial and non-commercial farms, rural and urban consumers, native and no native communities.

Farm size in different region in the U.S. The appraisal of bias and declining quality of life relating to technological change in agriculture has generated different studies that find evidence of negative and positive social impacts of the same technology. Technological bias has been expansively studied in relation to the diffusion of high yielding rice varieties in Asia during the Green Revolution. Frankel (1971) and Griffin (1974) provide negative assessments citing scale bias, while Hazel and Ramsey (1991) and Hayami and Kikuchi (2000) find no scale bias and give positive assessments. Leboa et al. (1993) argument Goldschmidt's assertion that increasing farm size causes negative impacts on the quality of life in rural towns. One conclusion from the comparative studies of negative social impact of specific agricultural technologies is that it is all but impossible to confirm cause-and-effect relationships between specific technologies and social conditions. While the potential for negative impacts is present, there is often inadequate evidence about the significance of the impacts, how they weigh against positive impacts, and whether technological change is the most important causal factor. All of these issues are present in assessing the social impact of transgenic maize in Mexico.

Increasing agricultural yield and hence production using enhanced agricultural technologies has been identified as a precondition for achieving food security (Langyintuo et al. 2000). As long as farmers continue to use traditional or low yielding crop varieties, agricultural productivity will remain low. Small-scale farmers depending especially on subsistence agriculture have the potential to increase their welfare and food security situation if they adopt improved production technologies. This is especially true for staple food crops such as maize cultivated by the majority of farmers in Kenya.

Economic effect

Agricultural production technology may be defined as an art of obtaining farm produce from the amalgamation of natural and man-made resources under specific managerial organization (Aken'ova, 1987; Akinyosoye, 1989). Natural resources for agricultural development include land, labor, water and traction of animal origin while man-made resource (capital) include farm equipment, planting devices, fertilizers, herbicides seeds etc. The various combination of these resources (natural and capital) give rise to different production technologies. Several technological practices are involved in the production of maize in Nigeria and a number of factors seem to account for the existence of these technologies of production. These factors include differences in resource endowment, level of technical and management capacity of the farming population, quality and degree of available scientific information, ecological characteristics of production areas, factor and output prices and the last but evidently not the least are the characteristics of farmers who are the users of Journal of Agricultural Technology 2013, Vol. 9(5): 1069-1080 1071 technologies. The study of farmers and their socio-economic background is very important in the use of maize production technologies.

The characteristics of farmers would determine awareness of the type of technologies to be adopted, conceptualization and perception of the technology, quantities to purchase and when, efficient utilization of purchased inputs, results obtained and their general economic wellbeing. Since farmer's characteristics differ from farmer to farmer, the type of technologies used would also differ significantly.
For instance, education is a strong cause that could improve the quality of labor and the ability to get, decipher and evaluate information on production technologies. Available empirical evidences show that farmer's socio-economic characteristics such as age, level of education, farm size, farming experience etc. are important determinants of farmers' technical inefficiency

Conclusion

Hybrids can have up to 25 percent higher yield. Hybrid plants are physically uniform. This is advantageous for farmers who harvest with machines, but it's usually not a big deal for small-greenhouse gardeners. Hybrids often show greater vigor and faster growth. Hybrids cost up to five times more because they take longer to develop and are more trouble to produce.

They often require a more exacting horticulture. When things aren't optimum, they may suffer more than plants grown from non-hybrid, open-pollinated seeds. If you save and grow seeds from a hybrid plant, don't expect a similar plant in the next generation. The resulting plants in the second generation are usually much lower yielding, have less vigor, and are quite variable in their physical characteristics. You don't know what you are going to get, and usually you'll lose all the advantages you had in growing the original hybrid.

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