Tarım Makinaları Bilimi Dergisi (Journal of Agricultural Machinery Science)
2009, 5 (3), 319 - 322

Factors Affecting the Use of Conservation Tillage in the South East Anatolia Region of Turkey

Songül GÜRSOY
South East Anatolia Agricultural Research Institute, P.K.: 72, Diyarbakır/TURKEY;
songulgursoy@hotmail.com

Abstract: The Southeastern Anatolia Region covers 9.7 percent of the lands in Turkey with a surface area of 75.000 km^2. It is the most important region of Turkey in view of growing different plant varieties. With the completion of South East Project which is the largest regional development project in Turkey and also one of the major projects in the world, it is expected that 1.7 million hectares of land will be irrigated. Therefore, an integrated and coordinated program and planning activities are foreseen in the region with regard to agriculture, industry, education, health, infrastructure, transportation and communication. In region, conservation tillage was used at very little level. A number of economic, technical, geographic, and social factors have affected the adsorption of conservation tillage (CT).
This study examines the application of conservation tillage systems in region, the problems faced during application, the suggestions related to solving of those problems.
Key words: conservation tillage, no-tillage, crop production

INTRODUCTION

The south Eastern Anotilia Region is one of the most agricultural production areas in Turkey. It is necessary to apply the new technological packages to increase the yield and conserve the sustainable of the soil because the region has approximately 3 million hectare cultivable agricultural areas and the half of these areas can be irrigated. It is the most important region of Turkey in view of growing different plant varieties. With the completion of South East Project which is the largest regional development project in Turkey and also one of the major projects in the world, it is expected that 1.7 million hectares of land will be irrigated and the ratio of irrigated land to the total GAP area will increase from 2.9 percent to 22.8 percent while rain-fed agriculture will decrease from 34.3 percent to 7 percent. Therefore, an integrated and coordinated program and planning activities are foreseen in the region with regard to agriculture, industry, education, health, infrastructure, transportation and communication (Anonymous, 2006).

Southeastern Anatolia is divided into two sub regions considering altitudes geographical differences. In The Northern zone, the average altitude is around 600 m. from the sea level. Annual precipitation is around 500 mm. The southern zone is characterized by a mild-winter climate, lower rainfall (300-350 mm), and lower elevation (around 300 m). Therefore, agricultural systems are importantly different in those sub regions. Drought and hot stress in agricultural areas is very important problem in region (Anonymous, 2003).

The Monoculture production systems have been usually practiced in both rainfed and irrigated agricultural areas of South East Anatolia Region. Growing without rotation has caused many problems as the increasing of diseases and insect pest. The suitable rotation systems must be practiced in region. The climate is suitable for growing the double crops within same year. Crops such as corn, cotton, soybean, and sunflower have been growth as double crop. After irrigation, the production of double crops increased importantly. But, there are many problems. Farmers don't know the double crop agriculture very well. Residue Management of pre-crop is big problem. Because there isn't enough time when second crop is sown in summer, farmers burn the straw for easy land preparation. Sometimes, after collecting the stalks for livestock, the stubble remained on field is burned. Besides, farmers believe that burning the stubble will make easy of preparing the seed bed and decrease the weeds and pests infestation problems.

Abiotic factors limiting yield in South East Anatolia Region are drought damage, salinity, water logging, late frost damage, hot stress, and cold damage. In addition to this factor, there are many biotic factors limiting yield such as diseases, insect pest and weed. The conservation of soil moisture is very important. Excessive tillage, irrigation and fertilizer have been used in South East Anatolia Region. The common tillage method is deep tillage with a disc or moldboard plow at 20-30 cm. After deep tillage, secondary tillage equipments (generally disc harrow or cultivator) is used to prepare the seed bed. After the cereal harvest, residue of wheat or barley is burnt. This cause environmental pollution, soil erosion and degradation. Planting after harvesting crop such as maize and cotton is very problem because the stalks can not suitability cut into. Therefore, excessive tillage is practiced. In some areas, cotton stalks is collected from field for burning in winter. Seed is sometimes broadcasted on a leveled soil surface and then incorporating it by means of a shallow tillage operation. In this system, excessive seed is used in planting.

It is seen that the physical, chemical and biological properties of soil is rapidly degrading because of the application of wrong production techniques in region which various agricultural products are grown and has the high production potential.

In a study carried out in experimental fields of South East Anatolia Agricultural Research Institute between 2003 and 2006 years, effect of conventional tillage practiced in region, reduced and no-tillage ridge planting methods on soil properties, wheat yield and yield components was researched. Besides, comparing the methods in respect of economic, the suitable method for region conditions was determined. In conclusion of study, no-tillage ridge planting and rototiller tillage methods were determined as best methods according to penetration resistance and bulk density in all of depths. Both yield and yield components were the worst in conventional tillage system practiced in region. In result of comparison of tillage and planting systems according to production costs and net income, the production costs per area were the lowest in no-tillage ridge planting system. Besides, the most profitable method as to net income was determined as no-tillage ridge planting. It was seen that no-tillage ridge planting method in wheat agriculture after cotton harvest would be suitable for region conditions in respect of yield, irrigation management and economic (Gürsoy et al.2006).

MAIN PROBLEMS CONTRACTING the USE of CONSERVATION TILLAGE

Residue Management and Seeding

Due to the rugged soil surface, uneven hardness of soil, and the higher quantity of straw in the field, seeding quality is difficult to control. The depth of seeds varies and seed distribution is uneven. To reduce the disadvantages of CT, it is important to improve the performance of seeding machines. The conditions of the soil should be considered, and suitable quantities of seeds should be used. Residue management is important for the performance of the seeding machines. After the cereal harvest, straw is generally made from stems of wheat or barley, because cereal straw is very important feed for livestock. But, in some areas, residue of wheat or barley is burnt because there isn't enough time to make straw. There isn't suitable machine to chop and distribute the residue after harvest on soil. Planting after harvesting crops such as maize and cotton has many problem because the stalks can not suitability cut into. The suitable residue chopper and planting machines are the necessary premises for the wide application of CT.

Crop Management Techniques

Crop management techniques such as irrigation, seeding, fertilization and control of weeds, diseases, pests used in region aren't not suitable for CT. Thus, it is necessary to develop and build the corresponding technologies for CT. The control of weeds, diseases, and pests is one of the key steps of CT. Agents are often used to control them. It is therefore important that weed growth be closely observed in CT and suitable methods for its control in time we used. Usually, weeds can be controlled with herbicide and hoeing by machine.

Social and economic matters

Farmers in general tend to make production practice changes slowly. Initially, farmers are unaware of a new practice. A variety of economic, demographic, geographic, and policy variables have

been identified that affect the adoption and use of conservation tillage

SUGGESTIONS

Developing the Agricultural Machines Suitable for Conservation Agriculture

Considering the experiences from abroad, it is important to build any technical innovation according to local conditions of regions. Technologies should be developed according to the farming system and conditions, and economic level of region. Residue management is important matter for performance of planting machines. The residues after crop harvest must be suitably cut into and distributed on soil surface. If chopper is mounted on combine, stalks would be suitably cut into and distributed on soil surface. After the cereal harvest, straw is generally made from stems of wheat or barley, because cereal straw is very important feed for livestock. In recent, combine-harvesters, which make straw out from the stems of wheat, barley, oat, and rye and similar plants, was designed. A chopper settled on combine-harvester cut into stems. After then, straw is transmitted to a trailer. These technologies must be developed according to region's conditions. It is important to use the suitable planting machinery for the wide application of conservation tillage methods in region. Pala stated that there was an opportunity for conservation tillage, including no-till direct drilling systems, in dry area cropping systems of cereals-based production systems for resource use efficiency across the the Central and West Asia and North Africa (CWANA) region on the basis of the research results from selected agro-ecosystems and the local industry should be concerned about producing proper no-till direct drill equipment adapted to local soil conditions.

Crop management techniques

The choice of suitable crop rotation, fertilization, weed, disease, pest control method is very important in conservation tillage. Pala et al. (2000) reported that tillage effects on crop performance over 12 years on mean (and most annual) yields of durum wheat showed very little difference between two deep tillage (disk plough and chisel at 20 cm depth) and one shallow tillage (ducks-foot at 10-12 cm depth) systems; but zero-till yields have tended to fall behind the others systems in recent years. They stated that this decline in yield under no-till was due apparently to a gradual increase in grassy weed infestation in zero-till plots. Pala (2007) reported that Suliemenov et al. (2004) tested three tillage methods [mouldboard ploughing, conservation tillage (minimum tillage) and direct seeding] on 12 ha with different farmers in Almaty province of Kazakhstan in 2001 and 2002 cropping years. As in plot experiments the lowest barley yield was obtained on direct seeding because of higher weed infestation. Conservation tillage provided the highest yield: 0.9 t/ha against 0.8 t/ha under mouldboard ploughing. However, in the same region, direct seeding of safflower on 140 ha gave the same yield (0.8 t/ha) as on ploughed land. Thus, conservation tillage was found to be the most economical practice for seedbed preparation. He stated that the effect of conservation tillage might be strengthened under proper weed control and fertilization as obtained at research station trials. Thus, Studies related to the long-term effects of CT are needed according to different crop rotation, fertilization, seeding method, residue, weed, disease and pest management suitable to soil and ecological conditions of region.

Enhancing public understanding of conservation tillage technology

The news media should promote CT and its benefits through various forms. Through training, the farmers can be encouraged to apply CT appropriately. Government should give importance to CT and put in place programmes for sustainable agricultural development with strategies and feasible implementation schemes.

CONCLUSION

Conservation tillage is one of the practices that can be used to reduce soil erosion and maintain productivity of agricultural land. Education and technical assistance are effective mechanisms for increasing the use of conservation tillage by farmers for whom the technology will be profitable. Many factors effect on the success of conservation tillage. Factors such as integrated weed/pest management, role of mulching, residue management, integration of crop and livestock, use of adapted varieties and

external inputs, recuperation of soil fertility need to be monitored. The local industry should be concerned about producing proper no-till direct drill equipment adapted to local soil conditions. Furthermore, still more research is necessary for widespread adoption of conservation tillage including no-till direct drilling systems in different agro-ecosystems of the region with farmers' participatory evaluation of the system to benefit directly and to improve livelihood of rural population.

REFERENCES

Anonymous, 2003. Araştırma Projeleri 2002 Yılı Gelişme Raporu. T.C. Tarım ve Köyişleri Bakanlığı, Tarımsal Araştırmalar Genel Müdürlüğü, Güneydoğu Anadolu Tarımsal Araştırma Enstitüsü, Yayın No:2003/1

Anonymous, 2006. Subject: Gap Bölgesi'nin Sosyo-Ekonomik Özellikleri.http://www.gap.gov.tr/gap.php?sayfa=Turkish/Ggbilgi/gozel.html

Gürsoy, S., H. Kılıç, A. Sessiz, 2006. Güneydoğu Anadolu Bölgesinde Pamuk-Buğday Ekim Nöbeti Sisteminde Pamuk Hasadı Sonrası En Uygun Tohum Yatağı Hazırlığı ve Ekim Şeklinin Belirlenmesi. Araştırma Projesi Sonuç Raporu. T.C. Tarım ve Köyişleri Bakanlığı, Tarımsal Araştırmalar Genel Müdürlüğü, Güneydoğu Anadolu Tarımsal Araştırma Enstitüsü

Pala, M., H.C. Harris, J. Ryan, R. Makboul, S. Dozom, (2000). Tillage systems and stubble management in a Mediterranean-type environment in relation to crop yield and soil moisture. Experimental Agriculture, 36: 223-242.

Pala, M. (2007). Challenges and opportunities for conservation tillage-direct drilling in CWANA region: ICARDA/NARS's experience. Options Méditerranéennes, Série A, Numéro 69.