



Optimize the cost of cultivation with using low-tillage in the wheat fields of Tehran province

Hossein KAMALI¹, Mohammad Mahdi PARHIZGAR²

¹PhD student, Agricultural and Natural Resources Research Center of Tehran province, Iran, Varamin

²Associate Professor, Graduate Center of Payam Noor University, Tehran, Iran

Received: 01.02.2015; Accepted: 05.05.2015

Abstract. In appropriate patterns of tillage in wheat, three methods commonly cultivated as a maximum for tillage, planting a multifunctional device as minimum tillage and direct seeding cultivation system as no tillage operations together are comparable. Analysis of variance and mean cost of land preparation and time spent on the three methods of tillage operations shows that maximum conventional tillage and planting allocated to the most and direct seeding without tillage operations allocated to the lowest cost and time. In conclusion, due to lower production costs and the income and reduce soil compaction, Instead, the usual method of planting is recommended to especially in dry lands and farms with irrigation and plant debris and with soil low light or light meal, or the non-tillage direct seeding method used.

Keywords: Commonly cultivated, no tillage, minimum tillage, Cost optimization

1. INTRODUCTION

Wheat is considered as the most rewarding plants because of its obvious role in providing human food especially for its consumption level between our countrymen and also in the world. Wheat is one of the main and strategic products, which its production in the self-reliance level for food security in the country has been one of the important objectives and one of the main duties of the Ministry of Agricultural Jihad. Another important feature of this product which is that can be counted among one of the highest government budget subsidies allocated to it and it was also one of the highest imported commodities of the country in some years. In addition, wheat is considered as most important annual crop, which occupied about 7 million hectares of arable land of country¹. The amount of this arable land, contribute about 3% of the land under wheat cultivation of the world. Over the last decade, the area under wheat cultivation has been almost constant. The area under wheat cultivation in the world was about 217 million hectares and production of wheat was about 675 million tons in 2012. Over the past decade, only 2 million hectares under cultivation has increased. However, increased production has been 85 million tons, resulting from the increase in yield². Meanwhile, the total area under wheat in Iran is included about half of arable lands.

These statistics show the importance of the product and the extent of its cultivation within the country. This also reveals the importance of the optimizing the consumption pattern of different resource. This optimization in wheat production will impact at micro-level on all operational units as well as macro level on national economy. This article aims to look at some

¹ Crops Statistics for crop year 2007-2008. Ministry of Agriculture, 2012

² www.fao.org

*Corresponding author. Email address: hkamali2012@gmail.com

results concluded from conducted researches about wheat production in the farms of Tehran province especially by economical perspective and comparative approach. Required data have been taken from questionnaires filled by 424 farmers throughout Tehran province based on stratified sampling. Also it will take a look at land preparation and planting, its costs and optimization.

2. TYPES OF CULTIVATION AND TILLAGE METHOD

Generally, three methods could be considered in order to investigate different types of suitable tillage patterns in Tehran wheat farms and their impacts on different resources cost. These three methods are including conventional cultivation as maximum tillage operation; planting by multifunctional devices as minimum tillage operation (low tillage), and direct planting known as no tillage operation. This study is comparing all three methods according to their costs and operations. In addition with appropriate planting method -which is proposed in this article- some recommendations have brought in terms of better crops operation according to *Fajaria* as below:

- 1) Provision of suitable land
- 2) Enough and balanced fertilizer and lime
- 3) Applying good quality seeds
- 4) Planting of high production ability and suitable with local climate
- 5) Using enough density and space
- 6) Treating the seeds for disease control
- 7) Applying appropriate fertilizing methods especially non stimulant nutrient such as P, K
- 8) Consuming top dressing nitrogen fertilizer in proper phase of growth
- 9) Controlling diseases, insects and weeds
- 10) Adequate water supply, using drought resistant varieties
- 11) Planting disease resistance varieties
- 12) Applying proper crop rotation
- 13) Maintaining soil organic materials
- 14) Keeping timing compliance of all agricultural operations
- 15) Timely harvesting crop while physiological ripen
- 16) Access to high quality seeds, fertilizers, insecticides and fungicides
- 17) Providing effective extension services for developing new production methods³

Since agricultural production plans such as wheat production are considered as economical plans, the most important purpose of them is maximizing their benefits. Cost benefit analysis is one the most important way for evaluating economical plans as well. One of the advantages of this method is determination of costs and whether they can be decreased or increased in terms of preserving economical attraction for each of those production plans in competitive arena. The crucial point for project evaluation is about costs and efficiencies (values). Such conception is using in financial accounting as well. Cost benefit analysis as a useful tool is applying to assess economical conceivability of every plans or activities. The purpose of such an analysis is costs measurements and economical benefits in case of implementation. In this study evaluate one of the wheat production costs according to a conducted economic research in Tehran. Results of this study also revealed that low tillage was more economic versus conventional tillage.

³ *Fajaria* N.K.. Increasing performance of Crops, p 22-23.

3. PREPARING THE GROUND FOR PLANTING (TILLAGE OPERATION) AND USE OF MACHINERY

The rate of plowing equipments for ground preparing in conventional planting is shown in Table1.

Table 1. Number of plowing.

Number of plowing	Sample of farmers	
	Number	Percent
One time	307	72
Two times	117	28
Total	424	100

As Table1 shows farmers have used tractors in order to plowing the farm at least one time. The rate of using leveler for ground preparing in conventional planting are shown in Table 2.

Table 2. Land leveling.

Using leveler	Farmers (%)
yes	90/7
no	9/3

As Table 2 shows farmers usually have used tractors in order to land leveling at least one time. The rate of grinding disc for ground preparing in conventional planting is shown in Table 3.

Table 3. Number of discs.

Disc number	Farmers	
	Number	Percent
1	29	7
2	250	59
3	99	23
4 or more	46	11
Total	424	100

As Table 3 shows farmers have tractors for disc grinding usually two times and in some cases three or more times.

The costs of conventional planting in 2014 crop year for Tehran province have shown in Table 4. It is obvious that farmers usually spend 350,000 Rials in order preparing the ground and wheat planting in each hectare through conventional method. Meanwhile, expenses of earth damages, more tractor and other equipment using as well as time consuming will be added to that above mentioned cost. Cost of planting with no tillage operation machine (seeding device with chisel) in each hectare is 120,000 Rials while the cost of planting with multifunctional devices (as minimum tillage operation) will be about 150,000 Rials. These amounts are estimated because these two methods are not unfortunately using as usual entire the province and source of this information were some engineers who are working in a public agribusiness company.

Optimize the cost of cultivation with using low-tillage in the wheat fields of Tehran province

Table 4. Number of wheat planting device usage and its related costs in 2013-14 crop year

Applied tools	Number and cost of required tools	
	Number	Cost (in thousands Rials)
Plowing	1	900
Disc	2	900
Land leveling	1	450
Seeding	1	1250
Total	-	3500

Results of variance analysis, comparing means of ground preparing costs and time consuming in all three methods explore that conventional tillage operation and direct planting, respectively, have highest and lowest amounts. Therefore it can be said that conventional method is expensive in terms of higher production cost, lower income, friction, equipment depreciation.

Tractor is usually passing four times for plowing, land leveling and disc gridding according to Tables 1, 2, and 3. In accordance with seeding by drill machine number of tractor passing will be exceed to five times. In contrast, multifunction agricultural machines in low tillage operation just pass one time and do tillage operations along with planting at the same time. Operation time, spent fuel and soil compression decrease by working with these machines. As long as operating these two methods, direct planting is also considered in recent years in order to not rummaging agricultural soil, preventing wind and water erosion, preventing from organic matter decomposition, surface evaporation. Direct planting machine (trailing) has got some stems with chisel at the end of each (for drilling the soil), mechanical planter (driller) and a swivel roller at the back (for covering and consolidating the seeds). Any way tillage operation will be done using direct planting machine just by one time tractor passing. Lightweight is its advantage rather than multifunction agricultural machine. So it definitely needs lower energy. In contrast multifunction agricultural machine will chop all plants remains and other extras and mix them with soil.

4. FUNCTION RATE AND HARVEST

Akbarnia et al studied three different type of planting through same condition using 200 kg seeds for each type of methods. Their result has compared base on wheat yield means by different treatments and planting methods using Duncan's multiple range test at 5 percent level.

Table 5. Comparison of yield mean(Ton in hectare) in different treatment

Treatment	Grouping at 5%	
	1	2
Conventional operation(high tillage)	8/07	
Multifunction machinery operation(low tillage)	7/9	7/9
Direct planting(no tillage)	-	6/5

Moreover, analysis of variance explored that yield for three tillage operation methods were as below:

- Analysis of variance between conventional tillage method and low tillage did not show any significant differences.
- Analysis of variance between conventional tillage method and no tillage operation showed significant difference.

5. CONCLUSION AND RECOMMENDATION

1- Generally, using low tillage operation is recommended in comparing with direct planting machine particularly in homebred land or low extent of plant residuals at the surface.

2- It seems that cost effectiveness of applying low tillage or no tillage methods versus conventional operation is not considerable. In first look it seems so because of ground preparation cost for conventional method is half of ground preparation cost for low tillage and one out of forth in no tillage operation. But low tillage method has got other advantages such as saving in time, tools, equipments, preventing soil compression and degradation. In accordance with high price of energy carriers and widely span of wheat farms in provinces, household saving and national saving will be really considerable and impressive.

REFERENCES

- [1] Crops Statistics for crop year 2007-2008. Ministry of Agriculture, information and statistics department, Tehran, 2012.
- [2] www.fao.org.
- [3] *Fajaria* N.K.. Increasing performance of Crops. Translated by Hashemi abolfazl et al, Mashad university publisher, 1995.
- [4] Sagden R. Analytical foundation of practical cost benefit. Translated by Khalili eraghi Mansour, Tehran university publisher, 1993.
- [5] Kamali, Hossein et al. economic evaluation of different yield results in Tehran farms. Agricultural research and natural recourse center, Tehran, 2005.
- [6] Akbarnia, Abas et al. assessment of appropriate low tillage patterns in wheat farm of Tehran, 2009.