

ECONOMICAL AND ECOLOGICAL EFFICIENCIES OF ENERGY SAVING TECHNOLOGY IN WHEAT PRODUCTION

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ABSTRACT

Energy saving technologies in wheat production are necessitated by nowadays requirements. Research revealed the minimum tillage is the most economical and ecological efficient technology in wheat production in Mongolia. Therefore, structure of technical park should to be changed through government policy.

KEY WORDS: Soil deterioration, technical renovation, minimum and zero tillage, cost of production

INTRODUCTION

There are two main problems on crop production: increase of cost of production and deterioration of ecological environment.

In current situation to survive the producer has to decrease cost of produce, increase productivity, reproduce soil fertility and preserve the environment. All these problems in crop production can be solved through resource saving minimum and zero tillage technologies.

There are estimations that, in some cases fuel consumption decreases by almost two times, labor use by three times, yield increases due to better conservation of soil moisture, the risk of crop failure in dry years decreases.

Necessary conditions for the use of energy saving technologies in crop production are: safe high quality techniques; seed selection; optimal plant rotation, effective combination of mechanical, chemical and biological methods of weed control;

cheap herbicide access and availability of qualified personnel.

In the history of world, the minimum and zero tillage technologies are considered the most advanced soil cultivation technologies. They give possibilities to diminish mechanical impact on soil, decrease soil compactness by decreased number of driving in crop field.

Due to economical and ecological requirements in crop production, there is need to compare economical efficiencies of traditional, minimum and zero tillage technologies and assess their impact on environment on our country conditions.

In other countries the zero tillage technology in wheat production is considered the most efficient technology. But there is need to consider the specifics and quality of soil for the zero tillage technology. Otherwise, as it said by experts, it might lead to agronomy, economic and ecological negative outcomes.

BACKGROUND

During 50 years of intensive crop husbandry in Mongolia 45.8 % of total arable land have been imposed to wind erosion, damages and removed from rotation. To restore fertility of soil, more additional measures are required for 90 % of total arable land.

Due to soil erosion caused by traditional technology three fourth of “wheat land” has been abandoned and wheat yields have been falling up to 2008.

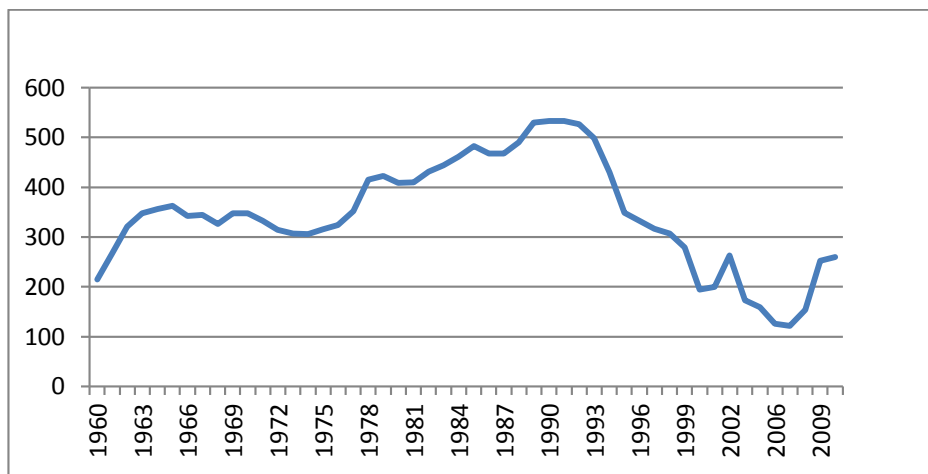


Figure 1. Sown area under crops in Mongolia, thousand hectares

Last year fallow was made on 318 thousand hectares. In addition around 90 thousand hectares of fallow

have been processed by more advanced - minimum tillage technology.

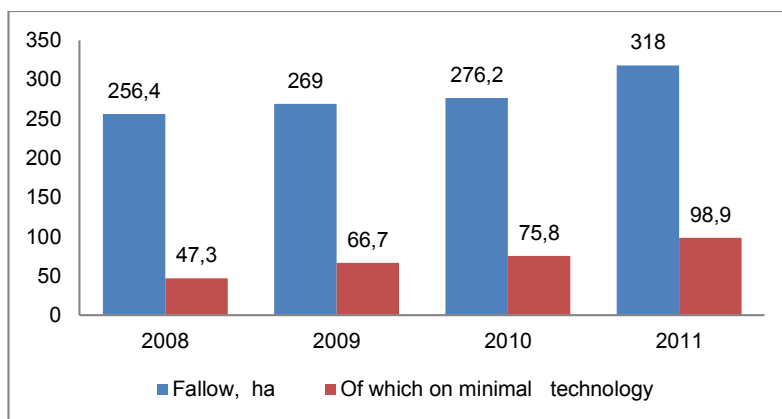


Figure 2. Minimum tillage technology adaptation in Mongolia

Economical and ecological efficiencies

To reach the research objective, the technological cards of wheat production on 160 hectares by using traditional, minimal and zero tillage technologies

have been developed and results of estimations have been summarized in Table 1.

Table 1

		Economic results of different technologies		
		Technologies		
№	Types of cost	Traditional technology	Minimal tillage	Zero tillage
1	Total direct cost	46357.9	43205.5	43759.6
	<i>Comparison, %</i>	-	-6.8	-5.6
	Of which:			
1.1	Fuel	10889.6	8932.2	5931.8
	<i>Comparison, %</i>	-	-17.9	-45.5
1.2	Amortization of fixed assets	3240.0	3023.0	3320.0
	<i>Comparison, %</i>	-	-6.7	-2.5
2	Profits estimated by direct cost	5050.1	8202.5	7648.4

Results of estimations imply that it is economically profitable to grow crops on energy saving technologies.

Compared with traditional technology the fuel consumption is relatively lower for zero tillage than on minimal tillage technology, but due to high

amortization cost the profits are higher for the minimal tillage.

Special interests belong to the cost indicators per hectares. Comparison to traditional technology the fuel consumption and labor use per hectare decreased by 11.8-18.1% on minimal technology and by 22.6-45.5% on zero tillage technology.

Table 2

Wheat production fuel consumption and labor use per hectare			
	Technologies		
	Traditional technology	Minimal technology	Zero tillage
Fuel consumption, kg/ha	37.6	30.8	20.5
<i>Comparison, %</i>	-	-18.1	-45.5
Labor use, labor hour/ha	0.93	0.82	0.72
<i>Comparison, %</i>	-	-11.8	-22.6

Related to direct costs and profits per hectare, the efficiency of wheat production was estimated and compared in Table 3.

Table 3

Wheat production efficiency indicators				
№	Types of costs	Technologies cost		
		Traditional technology	Minimal tillage	Zero tillage
1	Direct cost per 1 hectare	289.7	270.0	273.5
2	Direct costs per 1 ton	315.6	245.5	249.1
3	Profits per 1 hectare	31.6	51.3	47.8
4	Production efficiency, %	10.9	18.9	17.5
5	Cost economy per 1 hectare, thous.tug	-	-19.7	-16.2

From Table 3, the direct cost per hectare, cost economy per hectare, production efficiency are higher for the minimal technology.

From ecological point of view, based on numbers of technological process and driving on field machinery, the zero tillage technology on wheat production is

more rational. This fact implies that in future the zero tillage will play important role in high risky conditions of crop production of Mongolia.

Table 4

Ecological efficiency of wheat production by different technologies			
Indicators	Technologies		
	Traditional technology	Minimal tillage	Zero tillage
1 Number of technical processes	14	13	11
2 Number of driving on field	9	8	7

CONCLUSION

Resource saving technology in crop production is necessitated by current ecological situation in Mongolia. It requires the more sophisticated system of cultivation, special tools machines and measures on plant protection.

Comparison of required economical indicators showed that it is economically profitable to grow crops by energy saving technologies. From current

research, related with high cost of herbicides and special techniques, the minimal technology is economically more efficient in Mongolia.

In addition the ecological efficiency of minimum and zero tillage technologies has been supported by numbers of technological process and driving on field.

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