

## Traditional Plow Compared with Moldboard Plow Increased Productivity Study

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### ABSTRACT

Traditional plow use compared with Moldboard plow will enhances the productivity of rainfed crops such as wheat and barley especially in mountainous and impassable and lands in extent of low. The purpose of this study is to achieve traditional plow improved efficiency compared to moldboard plow that has been written documentary in two different spots of Govaver County in Gilane Gharb, and mostly as field studies based on interviews and visual perception and Photography.

By conventional plow tillage in addition to reducing costs, reduces environmental pollution, maintain soil structure and in other words, protective agriculture, and also observe proper planting depth, and most importantly, maintaining and restoring the old tradition and heritage, and increase in the average value of production per hectare that Based on studies conducted in the mentioned two regions, increased production is about 200 kg compared to moldboard that Increases from 1.5 ton per hectare to 1.7 ton.

**KEYWORDS:** Traditional plow, Moldboard plow, Efficiency, Planting depth, increased production

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### INTRODUCTION

Agriculture, in fact, is art, craft or livestock and crops production science in organized units and it is one of the human oriented activities which began about 10,000 years ago and is the basis of human civilization (koochaki & Khajehusseini 1387, p591). Iran history shows that settlement in parts of this land; humans first, began agricultural activities through the domestication of plants such as wheat. So we can say that our ancestors role in the development of agricultural science and technology throughout history is clear, and in this regard domestication of plants and animals is the evidence for this claim. Farmer humans, in the distant past, applied various tools such as plows (Traditional plows) to agricultural fields for tillage and due to the small size of farms it was appropriate instrument in ancient and the use of traditional plow and domestic animals had suitable efficiency for them. Due to the fuel and new spare parts for agricultural implements high prices, and generally too expensive tillage costs for farmers, requires the use of traditional plow. Reduce costs, reduce environmental pollution, conservative agriculture, cultivation depth observation and preserve and restore the old tradition are important reasons for selecting the subject. No specific research has been done in this regard and this study carried out at two points in Govaver County from Gilane Gharb with the same weather and with the aid and assistance of two villages' residents mainly as field studies to became a mechanism to increase agricultural efficiency in the region.

#### Geographic and economic characteristics of the Lata Choqa and Toolak villages

Lata Choqa village Known as Askar Abad is located at a distance of 11 kilometers from the center of Govaver County (Sarmast City) has 157 households and a population of 837 people that their main occupation is agriculture and animal husbandry. It has 1,200 acres of agricultural land that are often integral parts and there is a 20-hectare part. The village's name derives from an ancient half hill and the half hill overlooks river and it has a beautiful landscape. "Lata" means half and "Choqa" means hill, in the local language, in based on studies, artifacts on the hill is dating back more than 4,000 years ago(Figures 1 and 2).

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*Figure1: Lata Choqa ancient half hill*



*Figure2: View of Lata Choqa Askare Abad village*

Toolak village is located about 34 kilometers from the center of Govaver County (Sarmast City) on the hillside and overlooking the river that has beautiful scenery and landscape. It has 22 families that their main occupation is farming and agriculture and have approximately 40 acres of agricultural land. Their land plots average is about one-hectare that this does entail the need to use traditional plow. The village's name comes from the old oak tree in the local language, is refers to as "Toolk"



*Figure3: The old oak tree that the name of the village (Toolak) is derived from*



*Figure4: A general view of the Toolak village that is located in the mountain range*

### **Traditional plow**

In past periods, traditional plow has been used for plowing farmlands that its motion agent has been one or two cows. Unfortunately, in most areas, new agricultural equipment and implements were replaced traditional plow and this traditional way has been eliminated. Lata Choqa Askar Abad village can be mentioned as these regions where the use of traditional plow has been obsolete since about thirty years ago. While Toolak village is about 23 km away from Lata Choqa Askar Abad village still used the traditional tillage in the village, but, in some cases, donkeys and mules are used instead of one or two cows. Expensive and the cost of keeping cattle is the reason of using ass.

The wood of existing trees is used to build a traditional plow and is made artistically in the region that this method of construction has been transferred from the past to the future, generation to generation, currently, however, the beauty and artistry of the plow do not much attention in village. In making the plow besides the wood a piece of iron is used for its plow. Iron Miner size and dimensions vary according to the type of animal so that the size of Miner for cattle is larger than mule and ass and the size of Miner for ass smaller than a mule's.

### **Traditional plow consists of the following components:**

**Arrowy:** In tow asses is long and about 2/5 m and in one ass is short and about 1/10 m which its role is the connection between the ass and plow parts.

**Vertical handle:** With a height of about a meter, which is placed in the direction of men waist and its role is control of plowing depth by the farmer.

**Handle:** Its size is about 25 cm and its role in regulating plowing depth.

**Heel:** Iron blade attached to it and its role motion factor of in land plowing. Its length is 70 cm and width 20 cm.

**Blade (Miner):** Blades made of iron and is sharp and its role digging and plowing the land.

**Sword (Wedge):** Piece of wood that is used for connecting the heel and the arrowy.

**The yoke:** Consists of two main parts connected by four thinner parts and is attached on the neck and chest donkeys in the two donkey plow.

**Arrowy holder:** A piece of wood with a diameter of 5/3 cm and length of 60 cm that is in the form of 5 digit {in Persian}.

**Wood Piece holding the chains:** This piece is used as retaining chains attached to the ass neck in the plow that is stretched with an ass.

**Fatal Chain:** Is composed of two chains on the one side is attached to two heads of wood piece and on the other side to the ass neck. This chain, of course, only is used in the plow that is stretched with an ass (Figs. 7 and 8).

**Rope (bridle):** bridle is used for control the movement of Ass, which one end is attached to the vertical handle, and the other on Ass head.



*Fig. 7: Traditional plow with an ass and its compon Fig. 8: Traditional plow with two ass and its components*

### Depth and level of cultivation

Grabbing traditional plow handles, and pressing proper pressure to it, and commanding and controlling fatal animals move, farmer begins plowing of the land, and would end it(Figs. 9 and 10). Plowing is suitable In terms of the cultivation depth and level, is much more favorable compared with moldboard so that planting depth is about 8 to 10 cm and the planting surface is smooth and lump-free (Figures 11 and 12). Planting Optimal coverage and density are respected in the tradition plow compared to moldboard. In table (1) depth and level of cultivation and its coverage and density are briefly compared in two different ways.



*Fig. 9: Tillage by an Ass Fig*

*Fig. 10: Tillage by two Asses*



Figure 11: tillage with traditional plow in the Toolak village



Figure 12: Tillage with moldboard plow in the Lata Choqa Askar Abad village



Figure 13: Having lump by moldboard plow



Figure 14: Tillage by traditional plow without the lump and smooth

Table (1): Comparison o the depth of planting, Cultivation levels and seed density and coverage in the traditional and moldboard plow

Moldboard plow	Traditional plow
Plowing depth is more than 30 cm	Plowing depth is less than 15 cm
Seed depth are more than 10 cm	Seed depth are less than 4 cm
Soil moisture evaporation from the soil surface in the farm level inappropriate coverage which placed in the sun	Decreasing soil moisture evaporation from farm due to better coverage of farm level
Due to the plowing depth of 30 to 40 cm, in the tillage with moldboard, Surface layer of soil that is rich In terms of organic matter combined with a lower layer of soil that is poor In terms of organic matter and soil quality lowers. Also, soil texture and structure is destroyed	Protective agricultural in tillage with traditional plow due to observing of plowing depth (less than 15 cm), and will not cause degradation of soil texture and structure
Tillage with moldboard makes the arm surface lump and unsmooth and resulting in increased costs due to the need to disk	In the Traditional plow tillage soil is free lump and smoothly and has not need to disk and thus leads to reducing of costs
Traffic heavy machinery caused soil compression, thus leading to a lack of water penetration in the soil (needs to the crusher)	Lack of soil compaction, resulting in water penetration into the soil easily (no need subsoiler)
Non desirable cover and density and growth of weeds in the creation of negative competing among plants due to high density of seed and non-optimal use of farm level	Farm level better cover and better compete with weeds
	Lack of negative competition between plants and optimal use of farm level

### Growth Comparison

Seed depth has a great impact on the plant growth. The seed which is placed at more depth more time is needed to reach the surface and all the seed reserves is used for germination and the seedlings coming out of soil; Resulting in poor plant growth or seedlings can be destroyed, at some cases. But at Traditional planting due to proper seed depth only a small amount of material inside the seed will used for germination and seedling coming out; so at the same time of planting date, at traditional planting, seedling is at trifoliate stage, while seedling, at planting with moldboard, is at one leaf stage or the emergence. Meanwhile, traditional planting tillering stage is covered with a uniform green(Figs.15-18).



**Figure 15:** seedling at one leaf stage at planting with **Figure 16:** Traditional planting full tillering and four-leaf at moldboard moldboard and at trifoliolate stage at traditional planting



**Figure 17:** High deep, seeds choking, lack of coverage and desired density, weed growth in the use of the moldboard Toolak village Figures

**Figure 18:** Proper depth, desired coverage and density, non growth of weeds in the traditional plow in Toolak

In moldboard, due to the greater depth of seed, the root is located at a lower depth and because of amount of nutrients available in the soil is low in the bottom layers and the soil is poor in terms of food and the root does not have access to adequate food; thus plant has so weak and thin stem. But, plant root was in appropriate depth at traditional planting, and the soil was rich in terms of food, and as a result, plant root have access to sufficient food, plant enjoy a satisfactory growth, and stem diameter increased.

Number of spikes per square meter is depending on the number of tillers per square meter. In the moldboard, number of tillers is less and so the number of spikes per square meter is less. But in the traditional plow, due to optimal plant growth, the more number of tillers the more number of spikes

Due to food shortages around the roots, in the moldboard, nutrient absorption has decreased, and so Storage of photosynthetic, and can interfere with pollination which reduces the number of grains per spike and spike length. But In the traditional plow, there was plenty of food around the roots, and increasing nutrient uptake, the photosynthesis material storage rate is increased, and better pollination increases the number of grains per spike and spike length (Figure 19).



**Figure 19:** Compare the number of grains per spike and spike length in the traditional plow, and in moldboard

In moldboard planting, stored photosynthetic materials which are transmitted via the remobilization for seed supply is low Seed, and had wrinkled and thin mode which resulting in thousand grain weights reduced. But, in the traditional plow, stored photosynthetic materials which are transmitted via the remobilization for seed supply, is enough which resulting in thousand grain weights increased.

### Comparison of tillage costs

Due to the high prices of agricultural machinery and spare parts and expensive forms of energy such as Gas oil which resulting in increasing manifold of Tillage costs, farmers will have to use the traditional plow that does not cost to them. Traditional plow is made easily in the region, and they use of donkeys that farmers have to do other things like shipping and ..., Because Toolak farmers have to care ass for their works, and the animal in most seasons eats grass in natural resources and the farm sides without any cost to the farmer. Thus, according to Table (2), moldboard application cost is very high, while the cost of hay and barley for ass is about 40,000 rials in traditional plow tillage that it is minimal and can be ignored.

*Table (2): The cost of using moldboard tillage in the Toolak village*

Rows	Description	Unit	Amount to Rls
1	The cost of tillage	Hectar	750.000
2	Tractor driver tipper	1 Man	100.000
3	Food cost of driver	1 Man	70.000
	Total Sum		920.000

Considering the Amount of 40,000 riyals in the use of traditional plow, compared with 920000 RLS in moldboard, the traditional plow cost is minimal and negligible. Then applying the conventional plow tillage In the Toolak village is very effective. Seedbed preparation cost shall be doubled.

### The comparison of production rates

Average production is about 1.5 ton per hectare in different parts of agricultural land in Toolak and Lata choqa vilages which have used a moldboard plow in the past two crop years and the years ago. While average production agricultural different parts in the last two years and according to the farmers in the Toolak village which have used a traditional plow was about 1.5 ton per hectare and its production increased about 200 kg per hectare.

### Conclusion

Using traditional plow in the studied area, which access to its devices and tools is easy Besides reducing costs, Has many advantages such as: Maintaining and restoring the old tradition, Maintaining soil structure, Used on steep slopes and impassable routes, Flat and uniform level of cultivation, Lack of big lumps at plowing, Proper cultivation depth is less than 10 cm, Seed depth is less than 4 cm, Water storage in the cultivation surface, desired coverage and density (due to lack of tillage and seed displacement on the ground surface), Reduce weed due to favorable density, Non-compacted layer of soil structure due to heavy traffic, Farmer skill and freshness, Prevent environmental pollution and .... Of course, using of traditional plow has disadvantages, too, such as: Compared to The tractor, increasing the tillage time (about half an acre At 8 hour), and also a lack of productivity for some cultivation such as sugar beet varieties and....

Proper planting depth may impact on plant growth stages as: Germination, emergence, tillering and increasing o stem diameter, and reproductive growth stages as Heading, increasing the number of spikes per square meter, number of grains per spike, spike length and thousand seed weight which result in increasing the performance value is about 200 kg per hectare; That is its performance increased from the 105ton to 1.7 ton per hectare.

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