Chapter – V

Farm Implement Technology

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Farm Implement Technology

5.0 Introduction –

The proper utilization of basic inputs like water, seeds and fertilizers will be possible only when proper farm implements are used. The present chapter deals with the spatio-temporal variations in various improved implements, in Indapur Tahasil. ‘The food crises of the mid-1960’s were the prime movers for the Indian Government of an overall economy’ (Rajpati Ram, 1989). Agricultural productivity during the last four decades has increased by about four times. The spectacular rise in the agricultural production was closely associated with the increased use of high yielding variety of seeds, chemical fertilizers, irrigation and mechanization (Anwar Alam, 2000). In the face of growing population, agricultural development has posed a serious problem for policy makers both of to feed the growing population and to stabilize our economy so that agriculture starts playing a significant role in the development of an overall economy, (Rajpati Ram, 1989).

It leads to the invention of new methods, techniques and input to raise the agriculture production. Adoption of this innovations leads to the transformation of traditional agriculture into modern farming. The main characteristic of modern agriculture is the widespread use of these yields raising technologies. Among the improved seeds, fertilizers, pesticides and machinery are worth mentioning (Tiwari P. D. and Jain C.K, 1989) farm mechanization is a term used in a very wide sense. It not only includes the use of machines, wherever mobile or immobile, small or large, run by power and used for tillage, harvesting and thrashing but also includes power crushing sugarcane, spraying implements against pests and against pests and diseases (Memoria C.B and Tripathi B.B, 1978).
‘Mechanization has also led to the proper utilization input, like fertilizers, pesticides, water and high yielding varieties of seeds which can be achieved in field operation only through mechanization’ (Randhawa, M.S. 1974). The mechanization of agriculture is the labour saving input. It further refers to use of improved implements. With the application of new farm technology (mechanization) agricultural productivity has shown marked improvements. This has becomes common phenomenon in irrigated areas of western Maharashtra. In irrigated area, farming is generally carried out scientifically and with commercial attitude. The period during seventies and nineties has witnessed considerable increase in the quantity and quality of improved implements run by mechanical power. The heavy iron ploughs drawn by five or four pairs of bullocks were gradually replaced by multifunctional implement like tractor. Favorable Government policies have led to the availability of financial facilities through government agencies, banks or co-operatives. Besides many agro-based industries were established on co-operative basis which encouraged their member farmers for high production. The farmers were supplied tractors and other improved implements on long term loan basis. Besides these, the role of regional agricultural universities is worth mentioning, which devised new improved implements of agriculture and suitable to local environments. All these efforts were resulted into overall increase in agricultural productivity in IndapurTahasil.

Farm technology or mechanization may be defined as the use of improved types of iron-based land tools, drought driven implements and power driven equipment. The nature and intensity of agriculture, mainly in irrigated areas, has been determined by improved implements. However, there is regional disparity in the distribution of these implements. There are many implements which require heavy investment. This cannot be afforded by small farmers and farmers in dry farming areas where income level of farmers is insignificant. It is observed that there has been awareness among the farmers regarding the merits of improved implements. Even small farmers prefer to hire modern implements particularly for plugging land preparation, winnowing and harvesting etc.
In view of this, the study of the spatio-temporal developments of different components of mechanization has been also considered. This main focus of this chapter is on tractorisation in agriculture which has been developed during the last decades in order to achieve timely field operations of satisfactory quality. In the present study also incorporates to assess the use of inanimate energy in agriculture. Beside these, an attempt has been made here to understand the spatio temporal variation in the level of mechanization in the Tahasil.

The present study is based on primary as well as secondary data. Nearly 10 percent sample villages were selected for primary data. Besides this, the secondary data was obtained from the records of PanchayatSamiti, livestock census, and R.T.O. office and agriculture department of Tahasil.

**Implement –**

In IndapurTahasil, the modern implements have been popularized through. Intensive Agricultural district programmed and the use of these in the last decades in study region so the reference period of the study is selected for 10 years i.e. from 2001 to 2011, various types of implements are used for the agricultural operations in which some of them are discussed here and broadly classified under the two categories in which one is Power operated implements and second is Tractor operated implements.

However, certain limitations of data have restricted the scope of temporal study certain data like plant protection equipments, harvesters and rotavator etc. are recently introduced in Tahasil i.e. after 2001. So information pertaining to those aspects has been spatially analyzed here.

### 5.1 Power operated Implements:

With the introduction of high yielding varieties and multiple cropping in general have a more critical time schedule for harvesting and threshing becomes exceedingly difficult on too early a harvest. As a result, the farmers have been using the power operated implements for the agricultural operations (Desai, D. K., 1966).
a) Oil Engines –

Oil engines are one of the important technological aids to agriculture. The development of agricultural cultivation is largely influenced by the introduction of oil engines particularly after independence. The number of oil engines has considerably decreased during last 10 years i.e. from 1239 in 2001 to 288 in 2011 as most of the
Indapur Tahsil
Spatial Distribution of Oil Engine (2011)

Legend
Per 1000 Hect. of Cultivated Area
- Above 4
- 2 - 4
- Below 2

Fig. 5.1
farmers use electric pumps. When farmers are face the problem of load shading oil engines are used for lifting water either from rivers and back water of dam but in very low proportion.

The distribution of oil engine however, varies from Revenue circle to Revenue circle. The high and moderate concentration (above 4 and between 2 to 4 oil engines per 1000 hectare) is observed in the North, South east and West part of the Tahasil where the available water for irrigation is more but these area face the problem of load shading mostly the rich farmers use the oil engine in summer period. The low concentration below 2 oil engines is found in the central part of the Tahasil where the electric pumps is limited and the water for irrigation is limited.

a) Electric Pumps –

Particularly for irrigation purpose the use of electric pumps is a significant component of physical infrastructure of agriculture in the region under study. Electric pumps are used for lifting the water either from wells or rivers, with increasing rural electrification the number of electric pumps in the Tahasil has increased from 8891 in 2001 to 32269 in 2011. However, they are varying in their horse power capacity ranging from 3 H.P. to 300 H.P. The distribution of electric pumps varies from North to South and East to West.

The high density of electric pumps (above 340 pumps per 1000 hectares of cultivated area (fig.5.2 A) is confined mainly Revenue circle of Sansar and Kati due to the wide spread well, canal and lift irrigations. The moderate density (between 170-340 pumps per 1000 hectares of cultivated land) is observed to the area of along the river courses, back water of Ujani dam and the high and moderate density of wells. Low density of electric pumps i.e. below 170 pumps per 1000 hectares of cultivated land is observed in Bhigwan and Revenue circle due to lack of irrigation
facilities, hilly nature rugged topography in the South east part of this Revenue circle. (Fig 5.2 B) shows the temporal change in electric pumps in the Tahasil keeping an
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Fig 5.2
upward trend. The high change (above 150 pumps per 1000 hectares of cultivated land) is observed in Indapur, Bawda and Kati, LoniDeokar Revenue circle due to assured water supply from rivers and Back water of Ujani dam. The Moderate change (between 100 to 150 pumps per 1000 hectares) is confined to the Revenue circle of Sansar, Anthurne, and NimgaonKetki. These Revenue circles are endowed with the development in irrigation mainly from wells and tube well. The low change (below 100 pumps per 1000 hectares of cultivated area) is observed in Bhigwan Revenue circle due to the lack of irrigation facilities in south-east part of the Revenue circle.

a) **Power operated Thresher:**

Mr. Toe Richardson, an Agricultural Engineer attached to the University of Tennessee, which is co-operating with the college of Agriculture in Coimbatore, Tamil Nadu, has designed a thresher which is quite light and easy to operate. Removal of grain is complete and without any damage. The thresher is effective for High yielding varieties. It needs only 3 H.P. oil engine or electric motor (Mirchandani, G.G., 1973).

**Spatial pattern:**

Its distribution varies from Revenue circle to Revenue circle. High density i.e. above 6 threshers per 1000 hectares of cultivated land are confined mainly to the area along the river banks as this tract is endowed with multiple cropping system and has assured irrigation facilities. Moderate density i.e. 3 to 6 threshers per 1000 hectares of cultivated area is observed in Bhigwan, Anthurne and Sansar Revenue circle due to the development of irrigation mainly from wells, tube wells and canal. Besides, in this part the agro-based industries are also playing vital role in promoting the modern technology. The low intensity of threshers i.e. below 3 per 1000 hectares of cultivated area is found in LoniDeokar and NimgaonKetki Revenue circles (fig.5.3 A). Some part of these Revenue circles has lack of irrigation facilities and adverse environmental conditions have retarded the development of modern agricultural technology.

(Fig.5.3 B) reveals that there is a temporal change in the number of threshers in the study region. The high change i.e. above 4 threshers per 1000 hectares of cultivated
Fig. 5.3
land is observed in the marginal lands of sugarcane belt along the river Bhima, Nira and Back water of Ujani dam. Where multiple cropping systems is practiced. The moderate change between 2 to 4 threshers per 1000 hectares of the cultivated land area confined to the Revenue circle of Anthurne, Sansar, and Kati. These blocks are endowed with the development in irrigation mainly from well and canal and also co-operative movements has played an important role for providing the loan facilities. The low change below 2 is observed in NimgaonKetki Revenue circle due to poor income level of the farmers where the lack of irrigation facilities and adverse environmental conditions are exit.

d) Power operated plant Protection Equipments –

The power operated plant protection equipment has been mainly used for vegetables and horticultural crops. There distribution varies from Revenue circle to Revenue circle. The high density i.e. (above 15 equipments) per 1000 hectares of cultivated area is confined to the Revenue circles of Anthurne, NimgaonKetki, Bawda and LoniDeokar. Where the horticultural crops are being cultivated, the farmers have used different varieties of chemicals. Beside this, the environmental conditions are suitable for horticultural crops in these Revenue circles. The moderate density i.e., between 10 to 15 equipment per 1000 hectares of cultivated land are observed in Revenue circle of Indapur and Sansar where these equipments are used for crops like groundnuts, pulses and unnecessary weed. The low density i.e. below 10 equipments per 1000 hectares of cultivated area are found in North east part of Bhigwan Revenue circle and Kati Revenue circle where the horticultural and vegetable crops area is less than other Revenue circles and some part of these Revenue circles affected by irrigation facilities. (Fig. 5.4)

5.2 Tractor operated Implements –

With the help of improved implements, different agricultural operations have been performed and which were operated by inanimate power like tractor. This change has proved to be efficient and result oriented causing into an increase in agricultural
efficiency. Tractor is an important machine used for farm mechanization. About 10% area of the country are covered by tractor operated implements. These tractors operated
Fig. 5. Implements are used for plugging and tillage operations like harrowing, leveling.
seedling and harvesting.

A) Tractor operated ploughs –

The plough or plow is a tool used in farming for initial cultivation of soil in preparation for sowing seed or planting to loosen or turn the soil. Plough are drawn either by bullocks or other animals such as horses or camels or through a tractor. A plough may be made of wood or iron. It has been a basic instrument for most of recorded history, and represents one of the major advances in agriculture.

The primary purpose of ploughing is to turn over the upper layer of the soil, bringing fresh nutrients to the surface, while burying weeds, the remains of previous crops and both crop and weed. Seeds allowing them to break down it also aeration the soil allowing it to hold moisture better and provides a seed free medium for planting an alternate crop in modern use a ploughed field is typically left to dry out and is then harrowed before planting.

Ploughs were initially human powered but the process became considerably more efficient once animals were pressed into service. The first animal powered ploughs were undoubtedly pulled by oxen and later in many areas by horses and mules, although various other animals have been used for this purpose. In industrialized countries, the first mechanical means of pulling a plough were steam. Powered but these were gradually superseded by internal combustion powered tractors.

Locally tractor operated plough are called as Nangar. The tractor operated plough facilitated deep plugging. They are of two types one is mould bold plough and another is disc plough. The use of these ploughs is depending on crop and the type of the soils to be tilled.

There are about 3326 tractor operated plough in the study area in 2011. However its distribution varies from Revenue circle to Revenue circle. Based on the regional imbalance in the number of plough, three zones can be identified.
Fig.5.5
Spatial Pattern –

**High Proportion zone –**

It is as high as above 30 tractor operated plough per 1000 hectares of cultivated land confined mainly in the Revenue circle of Indapur and Sansar due to the assured irrigation facilities by back water of Ujani dam in Indapur Revenue circle and Nira left canal in Sansar Revenue circle and also substantial income from sugarcane farming. Beside this the role of co-operative sugarcane factories is boosting up the spread of implement technology.

**Moderate proportion zone –**

Between 15 to 30 plough per 1000 hectares of cultivated area are observed in Bawda, Lonideokar, Kati, Anthurne Revenue circle due to the innovative nature of farmers and availability of financial aids endowed with the development in irrigation facilities mainly from river courses canal, well and tub wells etc.

**Low proportion zone –**

This zone covers relatively low irrigated area below 15 plough per 1000 hectares of cultivated area. They are found in NimgaonKetki and Bhigwan Revenue circles. The physiographic impediments and high fluctuations of water table have retarded the development of modern technology. In fact these part of Tahasil are virtually dry parts and depending on uncertain monsoon rainfall. This has resulted into low purchasing power of farmers (fig.5.5 A)

Fig. 5.5 B reveals the temporal change in tractor operated plough in the region. The high change ( above 20 plough per 1000 hectares of cultivated area ) is observed in Indapur, and Sansar Revenue circle located along irrigated part and monoculture of sugarcane, rich alluvial tract, high purchasing power of farmers and their forward attitude. The moderate change ( between 10 to 20 plough per 1000 hectares of cultivated land ) is found in Bhigwan, Lonideokar, Kati Revenue circle due to development of irrigation technology like canal, wells, tub-wells, lift irrigation etc. The low change i.e. below 10 is confined in NimgaonKetki
Revenue circle due to the adverse environmental conditions and lack of irrigation facilities. Thus spatio temporal variations in the number of these implement has been determined by the physio - socio- economic set of the region.

B) **Rotavator** –

Rotavator has been recently introduced tractor operated implements which is used for pulversing soils. The rear portion of the tiller has 20 rotary blades which cut and pulversing soil to a depth of 150 mm and cover a cutting width of 600 mm. Eight different speeds of the rotavator and six forward moving speeds enable the machine to maneuvers in all kinds of soils effectively ( G.G. Mirchandani, 1973 ).

The distribution of rotavator varies from Revenue circle to Revenue circle. The high density (above 12 rotavator per 1000 hectares of cultivated land) prevails in the Revenue circle of Sansar due to the substantial income from sugarcane and forward looking attitude of farmers to adopt modern implements. However, within such area some Revenue circles namely Indapur, Lonideokar, Bawda, Anthurne and Bhigwan have recorded moderate density i.e. between 6 to 12 rotavator per 1000 hectares of cultivated land. These Revenue circles are endowed with the development in irrigation facilities mainly from wells and tub wells. Beside this, role of co-operative are also playing vital role regarding financial assistance and subsidies to farmers. The low i.e. below 6 rotavator per 1000 hectare of cultivated land observed that in NimgaonKetki and Kati Revenue circles. This is mainly due to the fact that the farmers in such area unable to allocated more land under cash crops which can fetch them higher income. (Fig.5.6)
Fig. 5.6
C) **Cultivators** –

These are another tractor operated implements is used for intercrop culture activity. The low concentration (below 15 cultivators per 1000 hectares of cultivated area) prevails in the central part of the Tahasil i.e. NimgaonKetki Revenue circle etc. as the income level of the farmer have remained low as compared to other some Revenue circles namely Bhigwan, Lonideokar, Kati, Bawda, Anthurne have recoded moderate i.e. 15 to 30 cultivators per 1000 hectares of cultivated area. This might be attributed to recent establishment of agro-based industries which are playing vital role for promoting the new machinery. Moreover, high density (above 30 cultivators per 1000 hectares of cultivated land) can be observed in Indapur and Sansar Revenue circles. This is mainly due to assured water supply from different irrigation sources. (Fig.5.7 A)

There are some temporal changes in the distribution of cultivators. Fig. 5.7 B reveals the fact that the high (above 6 cultivators per 1000 hectares of cultivated land) changes are recorded in Sansar Revenue circle due to assured water supply from different irrigation sources, monoculture of the sugarcane, role of sugarcane factories, positive role of co-operative regarding financial assistance, conversant nature of farmers to new implements etc. The moderate change (between 3 to 6) has taken place in Indapur Revenue circle due to role of sugar factory and assured supply of water from back water of Ujani dam. The low changes i.e. below 3 cultivators per 1000 hectares of cultivated land are observed in remaining Revenue circles due to lack of irrigation facilities, and fluctuation in income level of farmers because agriculture is depends upon uneven rainfall.

D) **Tractor Operated Threshers** –

A tractor operated threshers have been designed by the University of Agricultural Sciences, Hebbal, Mysore state with the guidance and advice of the Agricultural Engineering Adviser of the USAID, has given satisfactory performance in tests, but is claimed to be especially suitable to thresh high yielding varieties. Such tractor operated threshers are recently introduced in Indapur Tahasil. There are about 49 threshers in the Tahasil and out of which (7)
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Fig. 5.7

INDAPUR TAHSIL
SPATIAL DISTRIBUTION OF CULTIVATORS (2011)

Legend
Per 1000 Hect. of Cultivated Area
- Above 30
- 15 - 30
- Below 15

INDAPUR TAHSIL
TEMPORAL CHANGE OF CULTIVATORS (2001 - 11)

Legend
Per 1000 Hect. of Cultivated Area
- Above 6
- 3 - 6
- Below 3

Fig. 5.7
in Sansar Revenue circle, (8) each in Indapur, Bawda and Anthurne Revenue circles, (5) each in Bhigwan, LoniDeokar, Kati Revenue circles and (3) reapers have in NimgaonKetki Revenue circle. In IndapurTahasil tractor operated threshers are found in less number because of the farmers cannot take advantages of this technology and most of the farmers purchase power operator threshing for the seeds. (Fig. 5.8)

E) **Tractor operated Harvesters –**

The Punjab Agricultural University has developed tractor operated reaper and it was successfully tested. The harvester carries 1.5 meters cutter-bar and raking mechanism is powered through power take off shaft of the tractor. These tractor operated reapers have been recently introduced in the Tahasil. There are about 43 reapers in Tahasil and they are concentrated is an extensive tract of sugarcane cultivation. Many agro-based industries mainly sugar industries have introduced such type of reapers for harvesting wheat and paddy. Tractor operated harvesters are distributed unevenly in all Revenue circles. There are 10 reapers concentrated in Sansar Revenue circle, 7 reapers are observed in AnthurneRevenue circle, in Indapur, Bhigwan and NimgaonKetki Revenue circles observed 5 reapers each 4 reapers LoniDeokar Revenue circle.

However, the application of such reapers is limited as it requires extensive track under the same crop, but small holding have become major constraint for its application.

F) **Tractor operated plant protection Equipments –**

The plant protection Equipments have been used for the protection of crops from pest’s diseases and weeds with the help of spraying chemicals from sprayers and dusters. The tractor operated plant protection equipments have been used mainly in grape and pomegranate gardens for spraying the chemicals in time. This has saved time and human labour at a considerable extent. The high and moderate concentration i.e. above 6 and 3 to 6 equipments per 1000 hectors of
INDAPUR TAHSIL

DISTRIBUTION OF TRACTOR OPERATED
THRESHERS (2011)

Legend
1 Dot = 1 Thresher
- Thresher

Fig. 5.8
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Tractor operated plant protection Equipment

Photo Plate No.5.1
INDAPUR TAHSIL

SPATIAL DISTRIBUTION OF TRACTOR OPERATED PLANT PROTECTION EQUIPMENTS (2011)

Legend
Per 1000 Hect. of Cultivated Area
- Above 6
- 3 - 6
- Below 3

Fig. 5.9
cultivated land is observed in horticultural belts viz- Anthurne, NimgaonKetki and Sansar Revenue circles due to different chemicals are used in this horticultural belt mainly to control diseases and pests in grapevine and pomegranate cultivations. Low concentration below 3 is observed in rest of the Revenue circles due to less concentration of horticultural crops and more area under sugarcane cultivation. It is observed that for the rest of crops, they have not been used largely by farmers due to their non suitability to other crops. (Fig.5.9)

5.3 Tractor

The word Tractor is derived prior to 1900, the machines were known as traction motor (pulling- machine). After the year 1900 both words are joined by taking “Tract” from Traction and “Tor” from motor calling it a Tractor. In our country tractors were started manufacturing in real sense after independence and at present we are self-sufficient in meeting demand of country’s requirement for tractors. The production of indigenous tractors started in India in 1961 M/S Eicher Ltd., is the first tractor manufacturer in India. 39 models of tractors are being produced in India in different H.P. ranges. Our country is basically an agriculture country where 75 percent of our population is directly or indirectly connected with agriculture. This cannot be produced with our conventional bullock pulled agricultural implements. Tractor is one of the basic agricultural machines used for speeding up agriculture production. (Sri. ShaliHbibulla, 2005).

The technological breakthrough in agriculture in recent years has led to major changes in agriculture operations. This has led to a greater mechanization and development of modern scientific techniques. Most of the progressive farmers have taken up mechanization in agricultural operation with a view to increase the crop intensity associated with it which finally accelerates agricultural production. Only through mechanization the main thrust of agricultural development through high yielding variety of seeds, improved irrigation facilities, high doses of fertilizers, pesticides, introduction of new crops and multiple cropping programs me could be feasible. So, tractors play an
important role in modern farming. The popularity of tractor is mainly due to its veracity to perform various agricultural operations speedily. Efficiency helps in reducing the operational cost. Where intensive cultivation goes on, the period between harvesting of one crop and sowing of the next crop is so short that only tractor can ensure 2 to 3 crops in an irrigated area. [Narula R.K., 1984]

Tractor is multipurpose agricultural equipment which aims at reducing the drudgery of certain operations which have to be performed either by human labour or combined efforts of human beings and animals such as ploughing and tillage operations with harrowing leveling, harvesting, etc. causing into an increase in agricultural efficiency.

Tractor has been considered as the best technology enhancing agricultural production. The fertility status of soils is improved with deep ploughing by tractors. Besides, its importance lies in the fact that transportation of various inputs to the fields and agricultural produce either to home or market is made. A tractor is not only a superior means to operate a farm; it is also a status symbol in agricultural society. The farmers both small as well as large are well aware of the importance of tractors in the region. The ploughing operations are usually done by tractors as tractors are generally hired by non owners. Mechanization of agriculture is taking its roots where sugarcane cash crop, is grown. The farmers in Sugarcane areas are able to invest more in such improved implements due to their increased incomes from this crop. It is stated by Daniel (1976) that;” Increased application of modern inputs leads to higher level of agricultural production”. Thus, tractor has been considered as the best technology enhancing agricultural production. In the study region the number of tractors is increased during the last ten years. It represents regional disparity in Indapur Tahasil

A) Regional Distribution Of Tractors:

Fig 5.10 shows the regional distribution of tractors in Indapur Tahasil in 2011. Generally the region can be divided into three broad zones based on the tractors per 1000 hectares of cultivated land.

1] Low Density Zone [less than 20 Tractors per 1000 hectare of cultivated land]
The low density of tractors is observed in Revenue circle of Nimgaon-Ketki which could be attributed to the lack of irrigation facilities and poor purchasing power. Apart from this Revenue circle, the farmer, in such areas is unable to allocate more land under cash crops, which can fetch them higher income.

2] Moderate Density Zone-[Between 20 to 40 Tractors per 1000 hectar of cultivated land]

Moderate concentration, between 20 to 40 densities is observed in Bhigwan, Indapur, Loni-Deokar, Kati and Anturne-Bawda Revenue circles. In real sense, the mechanization of agriculture has taken its roots where cash crops like sugarcane, pomegranate and grapes, Banana etc are grown. Assured income from such irrigated crops, reliable markets, financial assistance from co-operative banks, agro-based industries are promoting the farmers to using mechanical power on farms, all these factors are responsible for high tractorisation in the cash crop area in the study region.

3) High Density Zone-(More than 40 Tractors per 1000 Hectar of Cultivated Land)

The High concentration i.e. more than 40 tractors per 1000 hectares of cultivated land is found in Sansar Revenue circles. This has assured water supply from different sources especially from Nira Rivers and canal irrigation. Beside the role of sugar factory to promoting the purchasing of tractors more numbers and also the cash crops of sugarcane have strengthened purchasing power of farmers.

b) Growth of Tractorisation:

Agricultural development is depends upon the growth of agricultural technology (KanawadeM.C.1984). The growth may help to understand future possible trends based on past studies. Agricultural development is expending on the growing agricultural technology. The study of growth of tractor is therefore, made here to assess the trends in growth of tractors in Indapur Tahasil.
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INADPUR TAHSIL
SPATIAL DISTRIBUTION OF TRACTORS (2011)

Legend
Per 1000 Hect. of Cultivated Area
- Above 40
- 20 - 40
- Below 20

Fig. 5.9
Table 5.1
Revenue circlewise growth of Tractors in Indapur Tahsil (2001-2011)

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Revenue circles</th>
<th>2001</th>
<th>2006</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bhigwan</td>
<td>15</td>
<td>47</td>
<td>410</td>
</tr>
<tr>
<td>2</td>
<td>Indapur</td>
<td>81</td>
<td>113</td>
<td>643</td>
</tr>
<tr>
<td>3</td>
<td>Loni-Deokar</td>
<td>36</td>
<td>85</td>
<td>394</td>
</tr>
<tr>
<td>4</td>
<td>Nimgaon-Ketki</td>
<td>14</td>
<td>34</td>
<td>258</td>
</tr>
<tr>
<td>5</td>
<td>Kati</td>
<td>17</td>
<td>50</td>
<td>388</td>
</tr>
<tr>
<td>6</td>
<td>Bawda</td>
<td>28</td>
<td>90</td>
<td>615</td>
</tr>
<tr>
<td>7</td>
<td>Anturne</td>
<td>30</td>
<td>101</td>
<td>582</td>
</tr>
<tr>
<td>8</td>
<td>Sansar</td>
<td>62</td>
<td>159</td>
<td>680</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>283</td>
<td>679</td>
<td>3970</td>
</tr>
</tbody>
</table>

Source: R.T.O office, Baramati and Authorized dealers of different Tractors companies (2012)

1) Position in 2001-

In the year 2001, there were 283 tractors in the tahsil, which increased to 3970 in 2011. In general, there are two broad zones where tractors are concentrated. The Indapur Revenue circle has attained first position with 81 tractors. The second position has been occupied by Sansar Revenue circle with 62 tractors in 2001. This has been emerged out as the 'core zone' for tractor. Such high concentration could be attributed to innovative nature of farmers, assured water supply from different sources. Moreover, the sugarcane and Banana growers have sound income and they have also established contacts to funding agencies. The second zone consists of three Revenue circles i.e.
LoniDeokar(36), Bawda (28), and Anturne (30), which have adverse climatic and physiographic conditions. However, some of the rich and forward looking farmers have adopted such technology. The rest of the Revenue circles viz. Kati (17), Bhigwan (15) and NimgaonKetki (14) have shown poor response to the adoption of such technology. This may be considered as third zone. The main constraint poor stage of economy leading to discouragement to peasants for undertaking costlier ventures.

2] Position in 2006-

In the succeeding half decades i.e. 2006, the growth of tractor has been increased from 283 in 2001 to 679 in 2006 in the Tahasil. The core zone has maintained its first position particularly in Sansar (159) and Indapur (113). This may be due to positive role of co-operative industry, increasing financial facilities from co-operative banks and innovative attitude of farmers. The earlier second zone has also retained its same position especially Anturne (101), Bawda (90) and Loni-Deokar (85). The remaining Revenue circles of Kati (50), Bhigwan (47), and Nimgaon-Ketki comprises the third position. Generally there is increasing number of tractors in the region.

3] Position in 2011-

In the year 2011 the growth in the numbers of tractors has been accelerated from 679 in 2006 to 3970 in 2011. Such considerable increase, in the number of tractors, is due to substantial development of agro-based industries and favorable government policies and positive role of co-operative regarding financial assistance to farmers. The farmers have adopted new cultivation techniques by using tractor technology. All these have led to high growth in number of tractors.

d) Season wise and Operation wise use of Tractors-

Tractor is used for various farm operations like land preparation, sowing, harvesting and transportation of agricultural goods. Their efficiency is increasing resulting into greater economies in operation and saving of money in comparison to manual labour.
Here an attempt has been made to analyze season wise and operation wise use of tractor in Indapur Tahasil. Therefore, two villages have been selected from each Revenue circle of the Tahasil (Appendix 5.1). Further 10 percent farmers were selected from these villages according to random sampling technique.

### Table 5.2

**Operationwise use of tractors in Indapur Tahasil**

(Tractor used in hours / annum)

<table>
<thead>
<tr>
<th>Sr. no</th>
<th>Revenue circles</th>
<th>land preparation</th>
<th>Sowing</th>
<th>Other farm operation</th>
<th>Transportation</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bhigwan</td>
<td>123</td>
<td>127</td>
<td>205</td>
<td>117</td>
<td>61</td>
<td>572</td>
</tr>
<tr>
<td>2</td>
<td>Indapur</td>
<td>136</td>
<td>107</td>
<td>311</td>
<td>151</td>
<td>81</td>
<td>786</td>
</tr>
<tr>
<td>3</td>
<td>Loni-Deokar</td>
<td>139</td>
<td>97</td>
<td>243</td>
<td>125</td>
<td>19</td>
<td>623</td>
</tr>
<tr>
<td>4</td>
<td>Nimgaon-Ketki</td>
<td>152</td>
<td>86</td>
<td>96</td>
<td>173</td>
<td>13</td>
<td>520</td>
</tr>
<tr>
<td>5</td>
<td>Kati</td>
<td>135</td>
<td>127</td>
<td>169</td>
<td>127</td>
<td>27</td>
<td>558</td>
</tr>
<tr>
<td>6</td>
<td>Bawda</td>
<td>140</td>
<td>112</td>
<td>290</td>
<td>125</td>
<td>54</td>
<td>621</td>
</tr>
<tr>
<td>7</td>
<td>Anthurne</td>
<td>130</td>
<td>102</td>
<td>180</td>
<td>132</td>
<td>40</td>
<td>721</td>
</tr>
<tr>
<td>8</td>
<td>Sansar</td>
<td>130</td>
<td>110</td>
<td>250</td>
<td>160</td>
<td>58</td>
<td>708</td>
</tr>
</tbody>
</table>

Sources-compiled by Author, based on field work 2012

The information on operation wise use of tractor in hours is given in table 5.2. The highest hours of tractor are used (786Hrs) in Indapur Revenue circle per year where a variety of improved implements are being used for agricultural operations. Indapur Revenue circle has higher proportion of lift irrigated area, than as a result of this except sugarcane areas the farmers can take two or three crops from the same irrigated land. Therefore the numbers of hours required for the tractor use are always high. The lowest tractor is used in Nimgaon Ketki Revenue circle (520hrs) due to the lack of
irrigation facilities. This is so because farmers in this Revenue circle are unable to allocate more land under crops.

Table-5.3

<table>
<thead>
<tr>
<th>sr. no</th>
<th>Revenue circle</th>
<th>Kharif</th>
<th></th>
<th></th>
<th></th>
<th>Rabbi</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Land preparation and sowing</td>
<td>Transportation</td>
<td>Other farm operations</td>
<td>Other</td>
<td>Land preparation and sowing</td>
<td>Transportation</td>
<td>Other farm operations</td>
<td>Other</td>
</tr>
<tr>
<td>1</td>
<td>Bhigwan</td>
<td>57</td>
<td>40</td>
<td>61</td>
<td>51</td>
<td>43</td>
<td>60</td>
<td>33</td>
<td>49</td>
</tr>
<tr>
<td>2</td>
<td>Indapur</td>
<td>53</td>
<td>43</td>
<td>71</td>
<td>54</td>
<td>47</td>
<td>57</td>
<td>29</td>
<td>46</td>
</tr>
<tr>
<td>3</td>
<td>LoniDeokar</td>
<td>50</td>
<td>37</td>
<td>67</td>
<td>47</td>
<td>49</td>
<td>51</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Nimgaon Ketki</td>
<td>48</td>
<td>30</td>
<td>48</td>
<td>40</td>
<td>40</td>
<td>48</td>
<td>34</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Kati</td>
<td>38</td>
<td>48</td>
<td>68</td>
<td>47</td>
<td>37</td>
<td>56</td>
<td>48</td>
<td>51</td>
</tr>
<tr>
<td>6</td>
<td>Bawda</td>
<td>57</td>
<td>48</td>
<td>58</td>
<td>52</td>
<td>43</td>
<td>60</td>
<td>33</td>
<td>49</td>
</tr>
<tr>
<td>7</td>
<td>Anthurne</td>
<td>51</td>
<td>44</td>
<td>58</td>
<td>42</td>
<td>38</td>
<td>53</td>
<td>51</td>
<td>52</td>
</tr>
<tr>
<td>8</td>
<td>Sansar</td>
<td>65</td>
<td>40</td>
<td>65</td>
<td>42</td>
<td>35</td>
<td>60</td>
<td>35</td>
<td>58</td>
</tr>
</tbody>
</table>

Source-Compiled by researcher based on field on field work, 2012

Table-5.3 shows that Indapur, Bawda, Sansar, Bhigwan Revenue circles have nearly equal weightage given to Rabbi and kharif season due to the assured water supply from the river Bhima and Nira, other perennial sources like wells and tube wells and back water of Ujani dam. The remaining Revenue circles of the Tahasil have restricted use of tractors during Rabi season due to lack of irrigation facilities. Most of farmers from these Revenue circles are unable to take Rabi crops.
e) Tractorisation and Crop Yields: Micro Level studies

The assessment of impact of tractorisation on crop is essential to understand its influence on agricultural efficiency. Presently, in this region, most of the cultivated land has been ploughed by tractor. As mentioned earlier, tractor is multifunctional implement, which facilitates deep plugging resulting into an improvement in fertility status of soils. Besides, loosing of soils has been practiced with tractor operated implements. In fact, it is observed that all the farmers cannot own tractors due to income disparity and impact of other social cultural factors. As a result of this, most of farmers may hire the tractors (Rs.4500 per hectares) and try to increase the yields of different crops from the land available with them.

<table>
<thead>
<tr>
<th>sr. no</th>
<th>crops</th>
<th>pre tractorisation</th>
<th>Post Tractorisation</th>
<th>Difference in yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Case I</td>
<td>Case II</td>
<td>Case I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crop yield</td>
<td>Crop yield</td>
<td>Crop yield</td>
</tr>
<tr>
<td>1)</td>
<td>Jowar</td>
<td>4700</td>
<td>--</td>
<td>4900</td>
</tr>
<tr>
<td>2)</td>
<td>Wheat</td>
<td>4900</td>
<td>5300</td>
<td>5450</td>
</tr>
<tr>
<td>3)</td>
<td>Maize</td>
<td>3650</td>
<td>3100</td>
<td>3850</td>
</tr>
<tr>
<td>4)</td>
<td>Sugarcane</td>
<td>--</td>
<td>117000</td>
<td>--</td>
</tr>
</tbody>
</table>

Figure in bracket indicate difference in percentage.

Source: compiled by the Researcher, based on field work, 2012.
In the present analysis, an attempt has been made to assess the impact of tractorisation of crop yields. Since tractor has been commonly used by farmers for different operations of land, it has considered in the present analysis.

This has been presented by undertaking a case study of two farmers namely Mr. V. V. Nimbalkar and Mr. S. T. Nalawade in the village of Sansar and Gotondi in Revenue circle of Sansar and Nimgaon-Ketki respectively. Both farmers have owned their tractor recently and use them in their own farms for different agricultural operations. In order to study the impact of tractorisation on crop yields, two points of time have been chosen i.e. pre and post period of tractorisation. The data was collected through frequent visits and the interviews conducted from time to time by the researchers with farmers. Based on the data collected above tables is prepared for two cases of farmers.

Table 5.4 reveals that for both the sample studies, there has been difference between yields from the same crops for the period between pre and post tractorisation per unit area. About 5 percent increase in crops yield is observed in sample first (Sansar) and sample second (Gotondi) it of about 3 percent, because timely operations with satisfactory quality is possible after the tractorisation.

The above two sample studies have revealed the fact that there has been considerable increase in the yields of crops per unit area by the applying tractor. This facility has deep ploughing, resulting into an improvement in fertility status of soils. Besides loosing of soils has practiced with tractors operated implements.

5.4 Level of Mechanization of Agriculture –

Farm mechanization is the application of engineering and technology in agricultural operations to do a job in better way to improve productivity. This includes development, application and management of all mechanical aids for field production, water control, material handling, storing and processing. Mechanical aid include hand tool, animal drawn equipment’s power tillers, tractors, oil engines, electric motors processing and hauling equipments. Farm mechanization does not mean the use of big machines and tractors for farming work only. Mechanization is a need based process,
which provides sufficient time gap for self adjustment of various inputs without causing sudden impact of change (Sri ShaliHbibulla, 2005).

Farmers in such area prefer the modern technology to maximize agricultural production. Modern farm technology or mechanization of agriculture refers here to modern farm machinery use for different farm operations. Among the agro inputs, improved farm machinery has made remarkable changes in the nature and intensity of agriculture. Farm machinery here refers to the available numbers of modern implements. Thus mechanization indicates the use of inanimate power in agriculture.

The study pertaining to the levels of mechanization is essential to understand regional imbalance in agricultural productivity and to mark problematic area. This may further help to identify the problems related to regional disparities. Such kinds of studies have acquired important place in regional planning. Modernization takes place only when the farmer can afford themselves to invest in the process of development of agriculture. The ability of farmers to invest in agricultural sector has been determined by the irrigation therefore easy way for mechanization.

In the succeeding analysis, an attempt has been made to examine the spatio-temporal pattern of the levels of mechanization in Indapur Tahasil, which is considered as agriculturally progressing part in Pune district of western Maharashtra.

**Methodology –**

For the computation of the levels of mechanization the equation evolved by Dutt and Sen Gupta (1969) which has been further modified by Jasbir Singh (2005) is employed here and composite index values have been derived. The equation is as under-

\[
Ima = \frac{Te}{Tr} + \frac{ToPe}{ToPr} + \frac{ToCe}{ToCr} + \frac{Tore}{Torr} + \frac{Ppe}{Ppr} + \frac{Pothr}{Pothr} + \frac{Oee}{Oer} + \frac{Epe}{Epr} + \frac{De}{Dr}
\]

Where,

Ima = Implies the composite Index of the level of Mechanization of agriculture.
T = Tractors per 1000 hect. of cultivated area.
Top = Tractors operated plough per 1000 hect. of cultivated area.
Toc = Tractor operated cultivators per 1000 hect. of cultivated area.
Tor = Tractor operated rotavator per 1000 hect. of cultivated area.
Pp = Power operated plant protected equipment per 1000 hect. of cultivated area.
Poth = Power operated threshers per 1000 hect. of cultivated area.
Oe = Oil engines per 1000 hect. of cultivated area.
Ep = Electric Pumps per 1000 hect. of cultivated area.
D = Drip irrigation per 1000 hect. of Cultivated area.
e = Revenue circle
r = Entire region or Tahasil

The above procedure is adopted to compute index value of each Revenue circle.
The summed up index values of all parameters then multiplied by 100 to derive the
degree of mechanization. i.e. –

\[
\text{Degree of Mechanization} = \frac{\sum Q_s}{n} \times 100
\]

Here, n specifies the number of parameters of modern farm machinery used in this study.

Different improved implements have been considered here as parameters and their
composite impact is assessed to determine the levels of mechanization. The improved
implements used by the farmers for different operations may be listed as above.

1) Spatial Variation in the levels of Mechanization.
After the calculation of index value for each block the entire region can conveniently be
divided into following regions.

1) Zone of High Level of Mechanization –
The Revenue circles of Sansar (Fig.5.10A) have recorded high level of Mechanization
(over 50 percent) as this tract is parallel to the river course of Nira and canal facilities,
substantial development of agro industries forward looking attitude of farmers, substantial income from sugarcane and Horticultural farms and positive role of co-operative regarding financial assistance to farmers. The farmers have adopted new Cultivation techniques. Generally the nature of farmers in this region is highly innovative. All these have lead to very high level of mechanization.
Chapter – VFarm Implement Technology

Fig. 5.10

INDAPUR TAHSIL
LEVEL OF MECHANIZATION (2011)

Legend
Composite Index
Above 150
75 - 150
Below 75

B
INDAPUR TAHSIL
CHANGE IN LEVEL OF MECHANIZATION (2001-11)

Legend
Composite Index
Above 50
25 - 50
Below 25

Fig. 5.10
2) **Zone of Moderate Level of Mechanization** :

However, within such area some Revenue circles namely Indapur, LoniDeokar, Bawda, Anthurne, Kati have recorded moderate level of mechanization i.e. between 150 to 75 per cent. These Revenue circles are endowed with the developments in irrigation mainly from wells, tube wells, canal and back water of Ujani dam. Besides in this part, the agro based industries are also playing vital role for promoting and introducing the new machinery. They provide machinery or improved implements at the subsidized rates to farmers. So, farmers are well aware about the new farm technology leading to moderate level of mechanization.

3) **Zone of low level of Mechanization** :

Low level (i.e. below 75%) of mechanization observed in the NimgaonKetki and BhigwanRevenue circles of the Tahasil. This is mainly due to this farmers in such area, are unable to allocate more land under cash crops, which can fetch them higher income. The income level of these farmers has remained low in this tract as compared to other irrigated parts of the Tahasil. (Fig.5.10 A)

II) **Changes In Levels Of Mechanization:**

The period between 2001 to 2011 has been considered here. The low or poor changes in the level of Mechanization are confined mainly to the Kati Revenue circle due to lack of irrigation facilities and adverse environmental conditions (fig. 5.10 B). The moderate changes (between 25 to 50) have taken place in the area along the river course due to the monoculture of the sugarcane. The Revenue circles namely Indapur, Bawda, Sansar, North part of Loni-Deokar&Bhigwan Revenue circle. Anthurne and NimgaonKetki Revenue circle have observed very high level (above 50) of change due to the change in the cropping pattern i.e. pomegranate, grapevine and Banana cultivation. A variety of improved implements are being used in this horticultural belt.
mainly of grapevine cultivation. Because of high income level of the farmers can afforded them selves to purchase different improved machineries.

5.5 Summery

Mechanization of agricultural is one of the most important constituent part of agricultural development, Which in turn reflects the social economic background of the region. Any region moves fast towards modernization with the adoption of mechanization in agricultural. IndapurTahasil is one of the agricultural developed parts of the Pune district of western Maharashtra. However the fertile flood plain offers favorable environmental conditions for technological development.

The IndapurTahasil has used different agricultural implements for agriculture, it has main folding effects an agricultural efficiency various types of implements are used for the agricultural operations of which some have been discussed and divided into two categories i.e. Power operated implements and Tractor operated implements Tahasil. However, they have been divided into three distinctive zones according to their density per 1000 hectares of cultivated area. Irrigated ports of the region have attained sound position in density of implements per 1000 hectares mechanization of agriculture. Moderate density of implements per 1000 hectares of cultivated land is observed in central west and North-West part of the Tahasil. The central North parts of the district have recorded low density of implements due to general backwardness of agriculture resulting from physical and socio economic constrains.

The study on the growth of tractorisation reveals that it has been accelerated form 283 in 2001 to 3970 in 2011. Such this tremendous growth in the number of tractor is due to substantial development of agro based industries and positive role of co-operatives regarding financial assistance to farmers. Almost all the Revenue circles have recorded upward trends in the growth of tractors. The analysis of season wise and operation wise use of tractors reveals that along the river belt, canal track and back water of Ujani dam the sue of tractors in hours per annum is high as compared with draught prone region. It has also revealed that the use of tractor is largely restricted to Rabbi Season due to the
uncertainly of rainfall. There is also favorable impact of tractorisation on the yields of different crops.

The development of irrigation facilities, role of co-operatives, Conversant nature of farmers and overall awareness among the farmers to adopt new technology has all mode greater impact on the levels of mechanization. The last half decodes have witnessed remarkable change in the adoption of agro implements technology especially in emerging horticultural belt of pomegranate and grapevine cultivation in the region. The Tahasil however presents regional disparities in the spatial distributions of improved implement technology.
References


