

**PAKISTAN
AGRICULTURAL MACHINERY
CENSUS 2004**

ALL PAKISTAN REPORT



**GOVERNMENT OF PAKISTAN
STATISTICS DIVISION
AGRICULTURAL CENSUS ORGANIZATION**

STATISTICS DIVISION

Secretary

Asad Elahi

AGRICULTURAL CENSUS ORGANIZATION

Agricultural Census Commissioner

Muhammad Younis

Additional Agricultural Census Commissioner

Muhammad Akram Khan

Joint Agricultural Census Commissioner

Noor Muhammad Dharejo

Deputy Agricultural Census Commissioner

Muhammad Saleem

Abdul Latif Iqbal

Muhammad Afzaal

Senior Statistician

Khurshid Ahmad

Livestock Specialist

Abdul Ghaffar

Agricultural Economist

Bashir Ali Bhatti

Gurumangat Road, Gulberg-III, Lahore, Pakistan.
Tele: 042-99263180-82, Fax: 042-99263172
E-mail : agcensus@yahoo.com

Comparative Status of Agricultural Machinery Data in 1994 and 2004

Major Items	1994	2004
All Tractors	252,861	401,663
Private	251,810	400,446
Government	1,051	1,217
Tractors by Make		
Massey Ferguson	109,597	171,943
Ford	25,541	24,968
Fiat	92,720	164,941
IMT	2,575	2,037
Belarus	20,992	31,768
Others	1,438	6,004
Implements		
Cultivators	236,272	369,866
Mould Board Ploughs	28,413	40,050
Disk Ploughs	20,372	29,218
Chisel Ploughs	6,547	8,514
Rotavator	5,594	47,919
Disk Harrow	13,233	23,764
Ridger	10,984	71,338
Sprayer (Tractor Mounted)	20,778	21,756
Reaper	7,972	5,341
Thresher	112,707	137,270
Trolley	176,412	242,655
Tubewells / Lift Pumps	454,257	931,048
Private	442,775	922,207
Government	11,482	8,841
Electric	96,039	97,095
Diesel	358,218	833,953
Private Tubewells	427,690	904,688
Centrifugals	422,852	850,045
Turbines	15,826	25,411
Wells with Pump	-	18,289 *
Submercible Pumps	-	10,944 *
Private Lift Pump	15,085	17,519

- Covered in 2004 for the first time.

P R E F A C E

Agricultural Machinery is an important input positively contributing to increase the production of agriculture sector. Data pertaining to such a valuable variable is of basic need and importance for future agricultural planning. Therefore, the Agricultural Census Organization (ACO) has been assigned to undertake decennial Agricultural Machinery Census on regular basis to meet data requirements of agricultural planners, researchers, administrators and students.

2. Introduction part of this report provides brief description of the census objectives, scope, geographical coverage, reference period, type of census, sampling plan and operational procedures adopted for field operations. This part also contains explanation of terms used in the census and notes on tables. After elaborating the technical details and background, the main findings of the census are furnished.

3. The report consists of a set of eighty tables for each administrative unit. The tabulation part highlights variety of data on Agricultural Machinery i.e. Tractors and Tractor Drawn Implements, Bulldozers, Combine Harvesters, Tubewells, Wells with Pump, Submersible Pumps and Lift Pumps. These tables contain a lot of multidimensional information on a number of variables for the interested readers. This publication also throws light on useful information on availability, status and extent of use of such machinery.

4. The data collected through this census has been published in three Volumes. Volume-I gives detail of country and provincial data. Volume-II has four parts which contain data for each province and districts for the same province. Data pertaining to Northern Areas and Azad Jammu & Kashmir is published in Volume-III.

5. The timely completion of the census field operations and release of the report would have been impossible without active cooperation provided by the officers and staff of the Provincial Agriculture Extension Departments. The staff and supervisory officers of the Agriculture Department deserve special appreciation for their hard work and dedication to complete this gigantic task according to the schedule. The efforts made by the staff of Agricultural Census Organization and Data Processing Centre, (FBS), Lahore, needs special acknowledgement for processing massive data well in time. Mr. Muhammad Ikram-ul-Haq Rishi, incharge DPC Lahore and his team had made tireless efforts to complete this project successfully. ACO is sincerely indebted to the computer centre Lahore for their valuable contribution. Similarly the first level supervisors of ACO M/S Muhammad Nawaz Arshad, Mirza Zahid Mahmood, Amjad Javaid Sandhu, and Muhammad Shafique, Assistant Agricultural Census Commissioners and their staff members also deserve due appreciation for their keen involvement towards completion of this arduous assignment within the schedule time.

(MUHAMMAD YOUNIS)
Agricultural Census Commissioner

Lahore
June 2005

C O N T E N T S

	<u>Page No.</u>
COUNTRY MAP	III
COMPARATIVE STATUS OF AGRICULTURAL MACHINERY DATA IN 1994 AND 2004	IV
PREFACE	V
LIST OF TABLES	IX
INTRODUCTION	XIII
Objectives	XIII
Scope	XIV
Reference Period	XIV
Census Schedule	XV
Geographic Coverage	XV
Sample Design	XV
Sample Size	XV
Questionnaires / Forms	XVI
Field Organization	XVII
Training And Operational Procedure	XVII
Document Control	XVIII
Data Processing And Tabulation	XIX
Quality Control	XIX
Publication Of Census Data	XX
DEFINITIONS AND EXPLANATIONS	XXI
NOTES ON TABLES	XXV
MAIN FINDINGS	XXVII
TABLES	1-107
APPENDIX (Specimen of Census Forms)	109

LIST OF TABLES

Table No.	Title	Page Number
TRACTORS		
1	Tractors by Type of Ownership	1
2	Tractors by Make and by Horse Power	1
3	Privately Owned Massey Ferguson Tractors by Model and by Year of Purchase	4
4	Privately Owned Ford Tractors by Model and by Year of Purchase	5
5	Privately Owned Fiat Tractors by Model and by Year of Purchase	7
6	Privately Owned International Tractors by Model and by Year of Purchase	8
7	Privately Owned Belarus and IMT Tractors by Model and by Year of Purchase	10
8	Privately Owned Zetor and Deutz Tractors by Model and by Year of Purchase	11
9	Privately Owned Zadrugar and Ursus Tractors by Model and by Year of Purchase	13
10	Privately Owned John Deere and Universal Tractors by Model and by Year of Purchase	14
11	Privately Owned Miscellaneous Tractors by Model and by Year of Purchase	16
12	Private Tractors Purchased as New or Used and Their Present Condition by Year of Purchase	17
13	Private Tractor Owners and Tractors by Horse Power and by Type of Household	19
14	Levelling and Cultivating Equipments Owned by Tractor Owners	21
15	Levelling and Cultivating Equipments Rented In by Private Tractor Owners and by Type of Household	22
16	Levelling and Cultivating Equipments Intended to be Purchased by Tractor Owners and by Type of Household	24
17	Sowing, Fertilizing and Spraying Equipments Owned by Tractor Owners	26

Table No.	Title	Page Number
18	Sowing, Fertilizing and Spraying Equipments Rented In by Private Tractor Owners and by Type of Household	27
19	Sowing, Fertilizing and Spraying Equipments Intended to be Purchased by Private Tractor Owners and by Type of Household	29
20	Harvesting, Haulage and Processing Equipments Owned by Tractor Owners	31
21	Harvesting, Haulage and Processing Equipments Rented In by Private Tractor Owners and by Type of Household	32
22	Harvesting, Haulage and Processing Equipments Intended to be Purchased by Private Tractor Owners and by Type of Household	34
23	Miscellaneous Equipments and Machines Owned by Tractor Owners	36
24	Miscellaneous Equipments and Machines Rented In by Private Tractor Owners and by Type of Household	37
25	Miscellaneous Equipments and Machines Intended to be Purchased by Private Tractor Owners and by Type of Household	39
26	Purchase of Tractors and Implements during 2003-04 by Source of Finance and by Type of Household	41
27	Purchase of Tractors and Implements by Source of Finance and by Year of Purchase	43
28	Physical Area Covered by Private Tractors During Last 12 Months by Type of Household	44
29	Use of Private Tractors for Different Operations During Last 12 Months by Type of Household	46
30	Use and Renting Out of Private Tractor Time During Last 12 Months by Type of Household	48
31	Use and Renting Out of Private Tractor Time During Last 12 Months by Horse Power	50
32	Use and Renting Out of Private Tractor Time During Last 12 Months by Yearly Hours Worked	51
33	Average Tractor Hiring Charges for Different Operations by Horse Power	52
34	Average Tractor Hiring Charges for Different Operations by Horse Power	53

Table No.	Title	Page Number
35	Tractor Drivers by Status and by Type of Household	54
36	Private Tractor Owners with Details of Their Operated Area by Size of Holding	55
37	Private Tractor Owners by Tenure and by Type of Household	57
38	Area Added to Farming by Private Tractor Owners After Purchase of Tractor by Size of Holding	59
39	Change in Number of Family Workers on Account of Purchase of Tractor by Type of Household	61
40	Change in Number of Permanent Agricultural Workers on Account of Purchase of Tractor by Type of Household	63
41	Change in Demand for Casual Workers After Purchase of Tractor by Size of Holding	65
42	Change in Number of Work Animals on Account of Purchase of Tractor by Size of Holding	66
43	Tractors Remained Out of Order During Last 12 Months by Number of Days and by Type of Household	68
44	Availability of Various Type of Workshops for Private Tractors by Distance	70
45	Private Tractors Repaired During Last 12 Months by Type of Workshops and by Distance	71
46	Performance of Tractor Workshops and Availability of Spare Parts	71
47	Service Interval of Private Tractors by Make	72
48	Bulldozers and Combine Harvesters by Type of Ownership	74
TUBEWELLS		
49	Tubewells and Lift Pumps by Type of Power	75
50	Private Tubewells and Lift Pumps by Type of Ownership	75
51	Private Centrifugal and Turbine Tubewells by Type of Ownership	75
52	Private Wells With Pump and Submercible Pumps by Type of Ownership	76
53	Tubewells and Lift Pumps by Working Condition	76
54	Number of Private Centrifugals, Turbines, Wells With Pump and Submercible Pumps by Working Condition	76

Table No.	Title	Page Number
55	All Tubewells by Type of Pump	77
56	Electric Tubewells by Type of Pump	77
57	Diesel Tubewells by Type of Pump	77
58	Private Tubewells and Lift Pumps by Year of Installation and by Working Condition	78
59	Private Tubewells and Lift Pumps by Size of Suction / Delivery Pipe	80
60	Private Tubewells by Type of Filter and Length	80
61	Private Tubewells and Lift Pumps by Motive Power and by Type of Diesel Engine	80
62	Private Tubewells by Horse Power of Electric Motor / Diesel Engine / Other Power Source	81
63	Private Lift Pumps by Horse Power of Electric Motor / Diesel Engine / Other Power Source	83
64	Private Tubewells by Depth of Water Table at Present and at the Time of Installation	84
65	Private Tubewells Reporting Difference in Water Table at Present and at the Time of Installation	85
66	Private Tubewells by Boring, Installation Agency and Fitness of Water	85
67	Re-Boring Periodicity of Private Tubewells	85
68	Private Tubewells and Lift Pumps by Tenure and by Type of Household	86
69	Source of Finance for Purchase, Boring and Installation of Private Tubewells and Lift Pumps by Type of Household	88
70	Source of Finance for Purchase, Boring and Installation of Private Tubewells and Lift Pumps by Type and by Year of Purchase	90
71	Area Irrigated by Private Tubewells and Lift Pumps During Kharif 2003 and Rabi 2003-04 by Type of Household	92
72	Area Operated by Owners of Private Tubewells / Lift Pumps by Size of Holding	94
73	Area Operated by Owners of Private Tubewells by Type and by Owners of Private Lift Pumps	96

Table No.	Title	Page Number
74	Area Added to Farming After Installation of Tubewells and Lift Pumps by Size of Holding	97
75	Effect of Tubewell and Lift Pump Irrigation on Productivity of Land by Size of Holding	98
76	Use and Renting Out Time of Private Electric Tubewells and Lift Pumps During Last 12 Months by Type of Household	100
77	Use and Renting Out Time of Private Diesel Tubewells and Lift Pumps During Last 12 Months by Type of Household	102
78	Use and Renting Out Time of Private Tubewells and Lift Pumps During Last 12 Months by Number of Yearly Hours Worked	104
79	Private Tubewells and Lift Pumps by Purpose of Installation	105
80	Tubewell Operators by Status and by Type of Household	106

INTRODUCTION

Since its inception, Pakistan is experiencing rapid growth in human population despite tremendous efforts to check population explosion. Over the years the population density had been increasing, land to man ratio deteriorating, and the food and cloth requirements intensifying.

On the contrary, the scope for increase in cultivated area over the years has always been marginal. Therefore, the expectations of a wide gap between future food requirements and supplies are high which may possibly be reduced by improving average yields by intensive use of agricultural machinery. It is obvious that use of agricultural machinery not only speed up cultivation process but also accelerate harvesting and threshing operations. It is also instrumental to maximization of agricultural production by increasing land use and cropping intensities. Therefore, planning for judicious use of Agricultural Machinery is of utmost importance which, inter alia, depends upon availability of reliable and timely statistics.

The use of Agricultural Machinery is increasing day by day in Pakistan like other agricultural countries of the world which has necessitated periodic stocktaking of Agricultural Machinery as a regular activity. Realizing this fact in Pakistan, the first Agricultural Machinery Census was conducted in 1968, second in 1975, third in 1984 and fourth in 1994.

The current Agricultural Machinery Census is fifth in succession and was conducted in 2004. It has an edge over the previous censuses on account of the fact that it has also attempted to cover bulldozers, combine harvesters, wells with pump, submercible pumps, modern irrigation systems (MISs) and a large number of farm implements for the first time. Salient objectives of this census are as under:

OBJECTIVES

1. To generate estimates of number of tractors, bulldozers, combine harvesters, tractor drawn and other farm implements.
2. To develop statistics on tractors by make, model, power and working condition.
3. To provide the number of tubewells / wells with pump / lift pumps / submercible pumps by type of motive power.
4. To ascertain information on the privately owned tubewells / wells with pump / lift pumps / submercible pumps by type of ownership, year of installation, their suction and delivery capacity.

5. To reckon the households owning tractors and tubewells by type and source of finance.
6. To provide data about the extent and type of use of agricultural machines on own farms and the practice of renting out tractor time and tubewell water.
7. To gauge the number of privately owned modern irrigation systems (MISs) i.e. sprinkler and trickle / drip irrigation systems.

SCOPE

The scope of this census was primarily confined to:

- a) All public and private tractors / bulldozers / combine harvesters used wholly or partly for agricultural purposes. Tractors / bulldozers maintained and used entirely for non-agricultural purposes were not covered in the census.
- b) The farm implements normally pulled by or motivated with tractor and in possession of tractor owners.
- c) All public and private tubewells / wells with pump / lift pumps / submercible pumps used for irrigation purposes. These machines sunk for drinking water fell outside the scope of this census.
- d) Ascertaining the extent and pattern of use of the privately owned farm machinery mentioned above.
- e) All private modern irrigation systems (MISs) installed for agricultural purposes.

REFERENCE PERIOD

The estimates on the number of tractors, farm implements, bulldozers, combine harvesters and tubewells / wells with pump / lift pumps / submercible pumps pertained to the day of enumeration while, the use of these machines pertained to the last one year from the day of enumeration. In most of the areas of Pakistan, the enumeration work was conducted during March & April, 2004. However, at certain places it continued till July, 2004 mainly due to adverse weather conditions.

CENSUS SCHEDULE

The census was conducted as per following schedule:

- | | | |
|------|--|---------------------------|
| i) | Planning and preparatory work | January to December, 2003 |
| i) | Census enumeration | January to June, 2004 |
| iii) | Data processing and preparation of reports | July, 2004 to June, 2005 |

GEOGRAPHICAL COVERAGE

The present census provides coverage to all parts of the provinces of NWFP, Punjab, Sindh and Balochistan.

SAMPLE DESIGN

An inventory of privately owned tractors / bulldozers / combine harvesters and tubewells / wells with pump / lift pumps / submercible pumps with some pertinent information was prepared on hundred per cent count basis. However, the detailed information about tractors / tractor owners and tubewells / wells with pump / lift pumps / submercible pumps was collected on sample basis from the Punjab (except Cholistan and De-Excluded areas of D.G.Khan and Rajanpur districts), Sind (except Tharparkar district) and settled areas of NWFP. A systematic sample of private tractors and tubewells / wells with pump / lift pumps / submercible pumps used for agricultural purposes was selected from each tehsil with random start. Every tenth listed tractor and tubewell / well with pump / lift pump / submercible pump was selected from the inventory prepared for the purpose. Whereas, the census was carried out on complete count basis in unsettled areas of NWFP, Cholistan and De-Excluded areas of D.G.Khan and Rajanpur districts in the Punjab, Tharparkar district of Sindh and whole of Balochistan.

The information on public agricultural machinery was collected through correspondence with all the federal agencies / provincial departments / institutions which make use of such machinery for agricultural purposes whereas, the data on privately owned Agricultural Machinery were collected through specially trained enumerators borrowed from the Provincial Governments.

SAMPLE SIZE

The inventory of tractors / bulldozers / combine harvesters and tubewells / wells with pump / lift pumps / submercible pumps was prepared on Form-1 and Form-3, respectively. The selected tractors and tubewells / wells with pump / lift pumps / submercible pumps in settled areas while all of them in unsettled areas of the country were enumerated on Form-2 and Form-4, respectively. The inventory and actual number of Form-2 and Form-4 completed during census are given as under:

TABLE-1: PROFILE OF THE INVENTORY AND SAMPLE SIZE

Administrative Unit	Tractors / bulldozers / combine harvesters						Tubewells/wells with pump/lift pumps/ submercible pumps					
	Form-1 / Form-1A (Inventory of tractors / bulldozers / combine harvesters)			Form-2 (Tractors only)			Form-3 (Inventory of tubewells / wells with pump / lift pumps / submercible pumps)			Form-4		
	Settled Areas	Un-settled Areas	Total	Settled Areas	Un-settled Areas	Total	Settled Areas	Un-settled Areas	Total	Settled Areas	Un-Settled Areas	Total
Pakistan	394,559	7,104	401,663	46,266	7,104	53,370	916,701	14,347	931,048	103,992	14,347	118,339
NWFP	19,904	4,365	24,269	1,990	4,365	6,355	15,085	6,439	21,524	1,509	6,439	7,948
Punjab	331,203	702	331,905	33,307	702	34,009	837,745	159	837,904	84,109	159	84,268
Sindh	36,245	-	36,245	3,762	-	3,762	50,683	-	50,683	5,186	-	5,186
Balochistan	7,207	2,037	9,244	7,207	2,037	9,244	13,188	7,749	20,937	13,188	7,749	20,937

Note: In De-Excluded areas of D.G.Khan and Rajanpur districts of Punjab, Tharparkar District of Sindh and whole of Balochistan complete enumeration was undertaken like that of unsettled areas of the country.

QUESTIONNAIRES / FORMS

- Form-1 - Used for preparing inventory of privately owned tractors / bulldozers / combine harvesters with details on type of ownership, make, model, year of manufacture, purchase and number & type of tractor drawn implements.
- Form-1 (A) - Used for preparing inventory of government tractors / bulldozers / combine harvesters and implements maintained for agricultural purposes.
- Form-2 - Detailed questionnaire used for ascertaining information about tractors and tractor owners.
- Form-3 - Used for preparing inventory of privately owned tubewells / wells with pump / lift pumps / submercible pumps with details on type of ownership, type of pump, year of installation, delivery & suction capacity, motive power, etc.
- Form-3 (A) - Used for preparing inventory of privately owned modern irrigation systems (MISs) with type of system, year of installation, cultivated area and area irrigated.
- Form-4 - Detailed questionnaire used for ascertaining information about owners as well as tubewells / wells with pump / lift pumps / submercible pumps.

FIELD ORGANIZATION

The staff of agricultural extension department of the provincial governments was hired for enumeration and supervision of the field operation of this census. All the enumerators and supervisors were adequately trained in the census procedures and filling-in of the census questionnaires before assigning the responsibility of carrying out the census enumeration work. The Executive District Officers (Agriculture) / District Officers (Agriculture) / Incharges (Agriculture) of each district were designated as District Census Officers (DCOs) who performed their duties under the overall supervision and guidance of the respective District Coordination Officers / Political Agents. The responsibility of enumeration was assigned to the Field Assistants and other technical staff of their level while the Deputy District Officers (Agriculture) / Extra Assistant Directors of Agriculture and Agricultural Officers acted as the immediate supervisors for the census field operation. The supervisory as well as enumeration staff was engaged normally in their areas of jurisdiction. Deviation to this rule was made only in very odd circumstances and that too with the willingness of the concerned staff to maintain their personal interest in the census work.

All the staff indicated above was paid a suitable amount of honoraria in lieu of the services rendered by them during field operation of the census. The profile of the provincial staff of different categories deployed in the census field operations is as under:

**TABLE-2: PROFILE OF THE PROVINCIAL GOVERNMENT STAFF DEPLOYED
IN THE AGRICULTURAL MACHINERY CENSUS-2004**

Administrative Unit	EDOs (Agri.) / DOs (Agri.) at district level	DDOs (Agri.) / EADAs / Agriculture Officers at tehsil level	Field Assistants / Enumerators
Pakistan	174	946	5,644
NWFP	48	129	810
Punjab	68	415	3,042
Sindh	32	320	1,201
Balochistan	26	82	591

TRAINING AND OPERATIONAL PROCEDURE

A brief description on the training of enumerators and operational procedures adopted for carrying out Agricultural Machinery Census–2004 is given below:

- i. Supervisory and enumeration staff was called at their respective tehsil headquarter offices of Deputy District Officer (Agri.) / Extra Assistant Director of Agriculture, where an officer of Agricultural Census Organization, especially deputed for the purpose, briefed them about the census procedures and filling-in of census questionnaires and other forms. The blank census documents of their respective areas were also handed over to them after completion of the training.
- ii. Immediately after the training, the enumerators were sent for listing of all the tractors / bulldozers / combine harvesters / tubewells / wells with pump / lift pumps / submercible pumps located in their respective jurisdictions.
- iii. Lists of tractors / bulldozers / combine harvesters / tubewells / wells with pump / lift pumps / submercible pumps so prepared were taken to the respective tehsil headquarter for the sample selection only for the districts where sampling was required (settled areas of NWFP, whole of Punjab except Cholistan and De-Excluded areas of D.G.Khan and Rajanpur districts, and Sindh except Tharparkar district) as per sample design. The sample selection was carried out by Deputy District Officer (Agri.) / Extra Assistant Director of Agriculture specially trained for the purpose by the officers of Agricultural Census Organization. Subsequently, the owners / operators of the selected tractors and tubewells / wells with pump / lift pumps / submercible pumps were contacted and enumerated. All the listed tractors and tubewells / wells with pump / lift pumps / submercible pumps were enumerated in unsettled areas of the country i.e. Agencies, FRs and unsettled districts of NWFP, Cholistan and De-Excluded areas of D.G.Khan and Rajanpur districts in the Punjab, Tharparkar district of Sindh, and whole of Balochistan.
- iv. Field Assistants returned the filled-in questionnaires and other forms within five to six weeks time to their respective Agricultural Officers.
- v. Agricultural Officers checked the filled-in documents for completeness and deposited the same at their respective tehsil headquarters as per given schedule.
- vi. Deputy District Officers (Agri.) / EADAs / Tehsil Incharges submitted the same documents after ensuring the completeness to the District Census Officers according to the schedule.
- vii. Finally, the District Census Officers dispatched the filled-in census documents to the Agricultural Census Organization, Lahore. In some areas, the staff of Agricultural Census Organization collected the filled-in documents from the concerned District Officer of the Agriculture (Extension) Department.

DOCUMENT CONTROL

The completed documents of all the four provinces were collected in the control room of Agricultural Census Organization, Lahore. During document control process, first of all it was ensured that the documents for all the union councils / town committees, etc. had been received. The areas from where the documents were not received were identified and special measures were taken to collect the documents from the defaulting administrative units. Subsequently, it was ensured that one Form-2 and one Form-4 for each of the selected tractor and tubewell / well with pump / lift pump / submercible pump has been filled, respectively.

DATA PROCESSING AND TABULATION

The questionnaires were then subjected to manual coding and editing. The doubtful cases were identified and referred back to the field for clarification(s) where necessary. Thereafter, the data were entered at Data Processing Centre (DPC) of Federal Bureau of Statistics located at Lahore. Data were then subjected to computer editing and errors detected during computer edits were removed after verification from the source documents.

The edited data for all the areas were tabulated at the same Computer Centre at Lahore in the form of eighty statistical tables. The format and contents of the tables were finalized in consultation with the Advisory Committee. The provincial reports contain data at district level while data at provincial and country levels is available in the country report.

QUALITY CONTROL

Inspite of the best efforts to execute census as per scientific planning, some errors are always expected to be adhered. In order to safeguard against occurrence of any glaring error, all the tables were checked to ensure quality of the data on the basis of pre-designed quality control checks and comparison with previous data series. The quality of data was also checked through comparison with contemporary data series available from all other sources. The errors that could not be removed during editing or those which might had crept in during coding, editing, data entry, processing and tabulation were identified, examined and then rectified before publication of the reports.

Despite all corrective measures, incidence of under / over enumeration cannot be avoided in huge data collection operations like Census of Agricultural

Machinery. Experience shows that magnitude of response errors is generally minimum in developed areas of the country while it proportionately increases to higher degree in the developing areas of the country due to inadequacy of trained enumerating staff as well as proper supervision.

In addition, the non-response incidence may be assumed on the higher side in the districts where land distribution is erratic and characterized by big land owners. For instance in some districts of Sindh and Balochistan, the big land owners did not allow enumeration of their agricultural machinery and the enumerators could not succeed to get data despite repeated and concerted efforts. In both of these provinces, the cases of irresponsible supervision as well as enumeration were also noticed basically because of low priority accorded to the census work. Similarly, non-reporting of un-registered tractors was also noticed causing under-enumeration of tractors and allied machinery particularly in Balochistan. In view of the above mentioned response tendencies, the estimates of agricultural machinery tended to be on the lower side in Sindh and Balochistan provinces.

PUBLICATION OF CENSUS DATA

The census tabulations are being published in the following reports:

Vol. I. All Pakistan Report:	Contains tabulations at country and province levels.
Vol. II. Provincial Reports: (one report for each province)	Contain tabulations at province and district levels of the concerned province.
Vol.III Northern Areas Report Azad Jammu & Kashmir Report	Contains tabulations at Northern Areas and district levels. Contains tabulations at State and district levels.

DEFINITIONS AND EXPLANATIONS

- 1 **CENSUS:** It refers to Agricultural Machinery Census conducted in 2004, covering all the tractors / bulldozers / combine harvesters primarily used for farming operations and all the tubewells / wells with pump / lift pumps / submercible pumps and MISs used for irrigation purposes and or drainage of water for farming.

- 2 **CENSUS DAY:** The day of enumeration of a household owning agricultural machinery.

- 3 **LAST 12 MONTHS:** The period from the census day to one year back.

- 4 **HOUSEHOLD:** A person or a group of persons usually related to each other, living together and eating from the same kitchen.

- 5 **TRACTOR / BULLDOZER / COMBINE HARVESTER:** Include wheel type tractors, while wheel as well as crawler type bulldozers and combine harvesters.

- 6 **MAKE:** The name by which a tractor / bulldozer / combine harvester is known such as Massey Ferguson, Fiat, Belarus, Jhon Deere, etc.

- 7 **MODEL:** The number which is assigned to a tractor / bulldozer / combine harvester by the manufacturing firm such as Fiat-480, MF-240, Ford-4600, etc.

- 8 **TUBEWELL:** All types of closed surface mechanized water lifting devices such as centrifugal water pumps and deep-well turbines meant for lifting sub-soil water generally for irrigation and drainage.

- 9 **WELL WITH PUMP:** The open wells with mechanized water lifting devices installed for lifting of water for irrigation.

- 10 **LIFT PUMP:** The pumping device installed at the banks of rivers, canals, water courses, ravines, streams, ponds and lakes to lift water for irrigation.

- 11 **SUBMERCIBLE PUMP:** It is basically a tubewell installed for lifting very deep underground water for irrigation. It has a capsule type shape which is submerged deep under the soil surface for lifting of water.

- 12 **MODERN IRRIGATION SYSTEMS (MISs):** This term refers to high efficiency irrigation systems. Mainly two types of MISs are in practice in Pakistan.
- i) **Sprinkler System:** In this system, water is showered over the crop / plants to fulfill their water requirements.
 - ii) **Trickle / Drip System:** In this system, water is supplied to crops / plants in trickling or dripping fashion to fulfill their water requirements.
- 13 **INDIVIDUAL OWNERSHIP:** Agricultural machinery owned by an individual of a household or more than one individuals of the same household.
- 14 **JOINT OWNERSHIP:** Agricultural machinery owned by more than one households.
- 15 **OWNERSHIP BY COOPERATIVE SOCIETY:** Agricultural machinery purchased / installed and operated collectively by the members of a society. It might have been obtained free of cost or at subsidized cost from other individual(s), government / semi-government agency.
- 16 **GOVERNMENT OWNERSHIP:** Agricultural machinery owned by the government or semi-government agency / institution.
- 17 **AREA OWNED:** All the cultivated and un-cultivated area owned by tractor or tubewell / well with pump/ lift pump / submercible pump owner(s) irrespective of its location.
- 18 **AREA OPERATED:** All the cultivated and un-cultivated area which was under the operational control of a tractor or tubewell / well with pump / lift pump / submercible pump owner on the census day without regard to its location, size and title.
- 19 **AREA RENTED OUT:** That part of owned area which is given to other(s) for cultivation on fixed rent to be paid in cash / kind or on share cropping basis.
- 20 **AREA SELF OPERATED:** That part of the area owned by the tractor or tubewell / well with pump / lift pump / submercible pump owner(s) which is under his / their operational control at the time of census.

- 21 **AREA RENTED IN:** That part of the area which is taken by tractor or tubewell / well with pump / lift pump / submercible pump owner(s) from others for cultivation on fixed rent to be paid in cash / kind or on share cropping basis.
- 22 **CULTIVATED AREA:** The area which is sown at least once during the last two years including the year in which the census was taken.
- 23 **UN-CULTIVATED AREA:** The area which remained out of cultivation for the last more than two years including the year in which the census was taken.
- 24 **AREA IRRIGATED BY TUBEWELL / WELL WITH PUMP / LIFT PUMP / SUBMERCIBLE PUMP / MIS:** The cultivated area actually irrigated by tubewell / well with pump / lift pump / submercible pump / MIS at least once during the census year regardless of the fact whether that area is also receiving water through other means of artificial irrigation like canals, wells, karezes, etc. This includes area belonging to both tubewell owners as well as other farmers to whom water is sold on cash or share in the produce. The area is counted once even if it was irrigated more than once during the census year.
- 25 **PHYSICAL AREA COVERED BY TRACTOR :** The area on which tractor is used for any physical farming operation during the last twelve months irrespective of the fact whether that area belongs to the tractor owner(s) or other farmer(s). The area is to be counted once even if the tractor on that area is used more than once at one or more times.
- 26 **ALL HOUSEHOLDS:** The farm households and non-farm households owning tractor and or tubewell / well with pump / lift pump / submercible pump.
- 27 **FARM HOUSEHOLD:** The household reporting operating of any piece / block of land without regard to its ownership.
- 28 **NON-FARM HOUSEHOLD:** The household which does not operate any land. Land owner not operating any land is also included in this category.
- 29 **OWNER HOUSEHOLD:** The household operating a farm of which the entire land is owned by himself.

- 30 **OWNER-CUM-TENANT HOUSEHOLD:** The household operating a farm of which a part of the land is owned by himself and the remaining is taken from other household(s) for cultivation against rent or share in produce.
- 31 **TENANT HOUSEHOLD:** The household operating a farm of which the entire land is taken from other household(s) for cultivation against rent or share in produce.
- 32 **AGRICULTURAL WORK:** The work performed for raising of crops, forest, livestock, poultry, fish and useful insects starting from planning till marketing of the produce.
- 33 **FAMILY WORKER:** Household members of 10 years and above advising / doing any kind of agricultural work on their own farm including operating of their own agricultural machinery such as driving of their own tractor(s), etc.
- 34 **PERMANENT HIRED AGRICULTURAL WORKER:** The person employed on the farm on whole time basis for relatively longer period and getting wage in cash and or kind on fixed period basis i.e. monthly, quarterly, yearly, etc. The paid operator of the agricultural machinery is also included in this category.
- 35 **CASUAL LABOUR:** The labour employed occasionally for specific agricultural work on daily wage basis and paid in terms of cash and or part of the produce.
- 36 **WORK ANIMAL:** All types of livestock used for agricultural purposes. The cow and or buffalo primarily kept for milk but occasionally used for agricultural work is also included in this category.

NOTES ON TABLES

1. Census data have been presented through a set of eighty tables repeated at country, province and district / F.R. / agency levels.
2. All tables except from Table Nos. 1 to 11 in case of tractors, 48 in case of bulldozers / combine harvesters and 49 to 59 in the case of tubewells / wells with pump / lift pumps / submercible pumps are based on sample information. In view of the sampling variability, data contained in the tables, based on sample data may not exactly match with the tables of similar items prepared on the basis of complete count. Similarly, the figures reported against individual size classes, in some cases, may not add up exactly equal to their totals due to rounding effect.
3. The percentages in different columns and rows may not always add up to hundred, as the same have been rounded to whole numbers. A percentage less than 0.05 was dropped and an indication to that effect is given by asterik (*) mark in the relevant data cells.
4. In spite of clear instructions about the area irrigated by tubewell / well with pump / lift pump / submercible pump / modern irrigation system (MIS) and covered by tractor that it should be counted only once even if the irrigation or use of tractor on that area happened to be more than once, multiple reporting in some cases may not be ruled out.
5. The estimates of those implements which may or may not be driven or motivated by tractor be adopted with caution. As these estimates have been developed from the data ascertained from tractor owners only due to methodological constraints.
6. The attempt to generate data on modern irrigation systems (MISs) was made for the first time. The data shows that only 99 MISs are working in Pakistan (NWFP-1, Punjab-24, Sindh-5 and Balochistan-62). In view of their rare occurrence, it was not found feasible to produce detailed tabulation for MISs.
7. To work out use of agricultural machinery, for the cases reporting machinery purchased / installed less than one year the calculations were made on their pro-rata use.

MAIN FINDINGS

TRACTORS

According to Agricultural Machinery Census 2004 the overall number of tractors in Pakistan is 401,663. Their number was 157,310 and 252,861 as per Agricultural Machinery Censuses of 1984 and 1994, respectively. The decennial increase in the number of tractors from 1984 to 1994 was 61 per cent, while it was 59 per cent from 1994 to 2004. The decennial growth in the number of tractors from 1984 to 1994 compares modestly with that from 1994 to 2004 for NWFP, Punjab and Sindh. However, there is relatively steep growth of 106 per cent in the number of tractors for Balochistan during the inter-censal period from 1994 to 2004.

Out of a total of 401,663 tractors in the country, the relative share is 6 per cent (24,269) for NWFP, 83 per cent (331,905) for Punjab, 9 per cent (36,245) for Sindh and 2 per cent (9,244) for Balochistan. This percentage ratio is almost the same as assessed previously through Agricultural Machinery Census 1994, while it is also very close to that enumerated during Agricultural Machinery Census 1984. Similar details for provinces may be seen in Table-1 below:

TABLE-1: NUMBER OF TRACTORS AS PER 1984, 1994 AND 2004 CENSUSES

Administrative Unit	Number of Tractors			Percentage Increase	
	1984	1994	2004	1984 to 1994	1994 to 2004
Pakistan	157,310	252,861	401,663	61	59
NWFP	10,105	14,571	24,269	44	67
Punjab	127,589	210,628	331,905	65	58
Sindh	16,542	23,182	36,245	40	56
Balochistan	3,074	4,480	9,244	46	106

OWNERSHIP OF TRACTORS

Agricultural Machinery Census 2004 brings on record the ownership of tractors as well. Accordingly, the privately owned tractors are counted to 400,446 (99.7 per cent) at the country level, while the remaining 1,217 (0.3 per cent) tractors are owned by the government agencies engaged wholly or partially in agricultural activities. The relative proportion of privately owned tractors is very high in all the provinces, although it varies marginally among provinces. The province-wise distribution of ownership as ascertained through this census is given in Table-2 as under:

TABLE-2: NUMBER OF TRACTORS BY TYPE OF OWNERSHIP

Administrative Unit	Number of Tractors		
	Total	Privately Owned	Owned by Government Agencies
Pakistan	401,663	400,446	1,217
NWFP	24,269	23,967	302
Punjab	331,905	331,273	632
Sindh	36,245	36,082	163
Balochistan	9,244	9,124	120

TRACTOR DRAWN IMPLEMENTS AND OTHER EQUIPMENTS

The state of art in farming has undergone a silent but effective change in Pakistan during the last decade and consequently, a meaningful turn has come in the crop production sector. Agricultural Machinery Census 2004 has taken stock of all such changes by arranging a count of the salient farming implements and equipments.

As per Agricultural Machinery Census 2004, the tractor drawn implements, owned by the tractor owners, like Cultivator counts to 369,866, Mould Board Plough to 40,050, Bar / Disk Harrow to 23,764, Disk Plough to 29,218, Seed Drill / Planter to 70,810 and Ridger to 71,338. Similarly, the count for Trolley and Thresher comes to 242,655 and 137,270, respectively.

The province-wise distribution of the above mentioned implements as well as equipments for 2004 census in comparison with 1984 and 1994 censuses may be viewed in Table-3 given below:

TABLE-3: NUMBER OF TRACTOR DRAWN IMPLEMENTS AND EQUIPMENTS OWNED BY TRACTOR OWNERS

Administrative Unit	Census Year	Implement						Equipment	
		Culti-vator	Mould Board Plough	Bar / Disk Harrow	Disk Plough	Seed Drill / Planter	Ridger	Trolley	Thresher
Pakistan	2004	369,866	40,050	23,764	29,218	70,810	71,338	242,655	137,270
	1994	236,272	28,413	13,233	20,372	64,126	10,984	176,412	112,707
	1984	146,863	7,319	8,140	6,355	11,251	4,711	98,787	78,377
N.W.F.P	2004	21,440	3,004	540	1,371	1,644	658	18,709	9,761
	1994	12,722	1,993	438	879	1,226	46	11,283	5,997
	1984	9,702	377	357	392	299	54	6,808	2,945
Punjab	2004	317,506	27,093	16,032	16,471	66,700	66,806	195,332	112,655
	1994	203,444	17,980	8,302	10,485	60,835	10,872	145,557	96,655
	1984	123,755	2,780	2,734	1,134	10,669	4,030	81,668	71,195
Sindh	2004	26,998	6,357	6,786	9,602	2,147	3,471	21,881	11,626
	1994	17,993	5,908	4,341	8,121	1,237	55	15,681	9,018
	1984	11,244	2,917	4,839	4,644	218	574	8,018	4,166
Balochistan	2004	3,922	3,596	406	1,774	319	403	6,733	3,228
	1994	2,113	2,532	152	887	828	11	3,891	1,037
	1984	2,162	1,245	210	185	65	53	2,293	71

TUBEWELLS AND LIFT PUMPS

Agricultural Machinery Census 2004 has covered all types of tubewells and lift pumps. The number of tubewells and lift pumps meant for irrigation purposes as reported in this census are 931,048 in the country. In 1984, their number was 237,990 which increased to 454,257 in 1994. The decennial count of tubewells and lift pumps increased by 91 per cent from 1984 to 1994 and by 105 per cent from 1994 to 2004. The increase achieved during 1994-2004 in the number of tubewells and lift pumps may be termed as all time record increase since independence and a salient as well as silent causal factor for increased crop production in Pakistan. The province-wise data regarding the number of tubewells and lift pumps for 1984, 1994 and 2004 Censuses are given in Table-4.

**TABLE-4: NUMBER OF TUBEWELLS AND LIFT PUMPS VIDE 1984,
1994 AND 2004 CENSUSES**

Administrative Unit	Number of Tubewells / Lift Pumps Vide Censuses of			Per cent Increase	
	1984	1994	2004	1984 to 1994	1994 to 2004
Pakistan	237,990	454,257	931,048	91	105
NWFP	9,217	14,365	21,524	56	50
Punjab	214,106	414,188	837,904	93	102
Sindh	9,481	16,236	50,683	71	212
Balochistan	5,186	9,468	20,937	83	121

OWNERSHIP OF TUBEWELLS AND LIFT PUMPS

Like tractors, the relative share of the private owners in all types of tubewells and lift pumps at country level works out to be 99 per cent and 95 per cent respectively, while the remaining marginal share is of tubewells and lift pumps owned by government agencies.

The province-wise distribution of tubewells and lift pumps with regard to their ownership is given in Table-5.

TABLE-5: OWNERSHIP OF TUBEWELLS AND LIFT PUMPS

Administrative Unit	Total Number of Tubewells & Lift Pumps	Tubewells			Lift Pumps		
		Total	Government	Private	Total	Government	Private
Pakistan	931,048	912,656	7,968	904,688	18,392	873	17,519
NWFP	21,524	18,958	540	18,418	2,566	98	2,468
Punjab	837,904	831,479	2,674	828,805	6,425	365	6,060
Sindh	50,683	42,392	4,160	38,232	8,291	374	7,917
Balochistan	20,937	19,827	594	19,233	1,110	36	1,074

POWER SOURCE OF TUBEWELLS AND LIFT PUMPS

Agricultural Machinery Census 2004 reveals that 90 per cent of the government and private tubewells as well as lift pumps are operated by diesel, while only 10 per cent of them use electricity as power source. In the case of government tubewells and lift pumps, electricity is the dominant (93 per cent) source of power, whereas for privately owned tubewells and lift pumps, the share of diesel operated tubewells and lift pumps is 90 per cent.

As regards the provinces, the details on power source of tubewells and lift pumps are given in Table-6

TABLE-6: NUMBER OF TUBEWELLS AND LIFT PUMPS BY POWER SOURCE

Administrative Unit	Total Number of Tubewells and Lift Pumps	Government Tubewells and Lift Pumps			Private Tubewells and Lift Pumps		
		Total	Electric	Diesel	Total	Electric	Diesel
Pakistan	931,048	8,841	8,210	631	922,207	88,885	833,322
NWFP	21,524	638	597	41	20,886	10,169	10,717
Punjab	837,904	3,039	2,818	221	834,865	64,394	770,471
Sindh	50,683	4,534	4,340	194	46,149	3,600	42,549
Balochistan	20,937	630	455	175	20,307	10,722	9,585