

Farm Mechanization in Punjab: Social, Economic and Environmental Implications

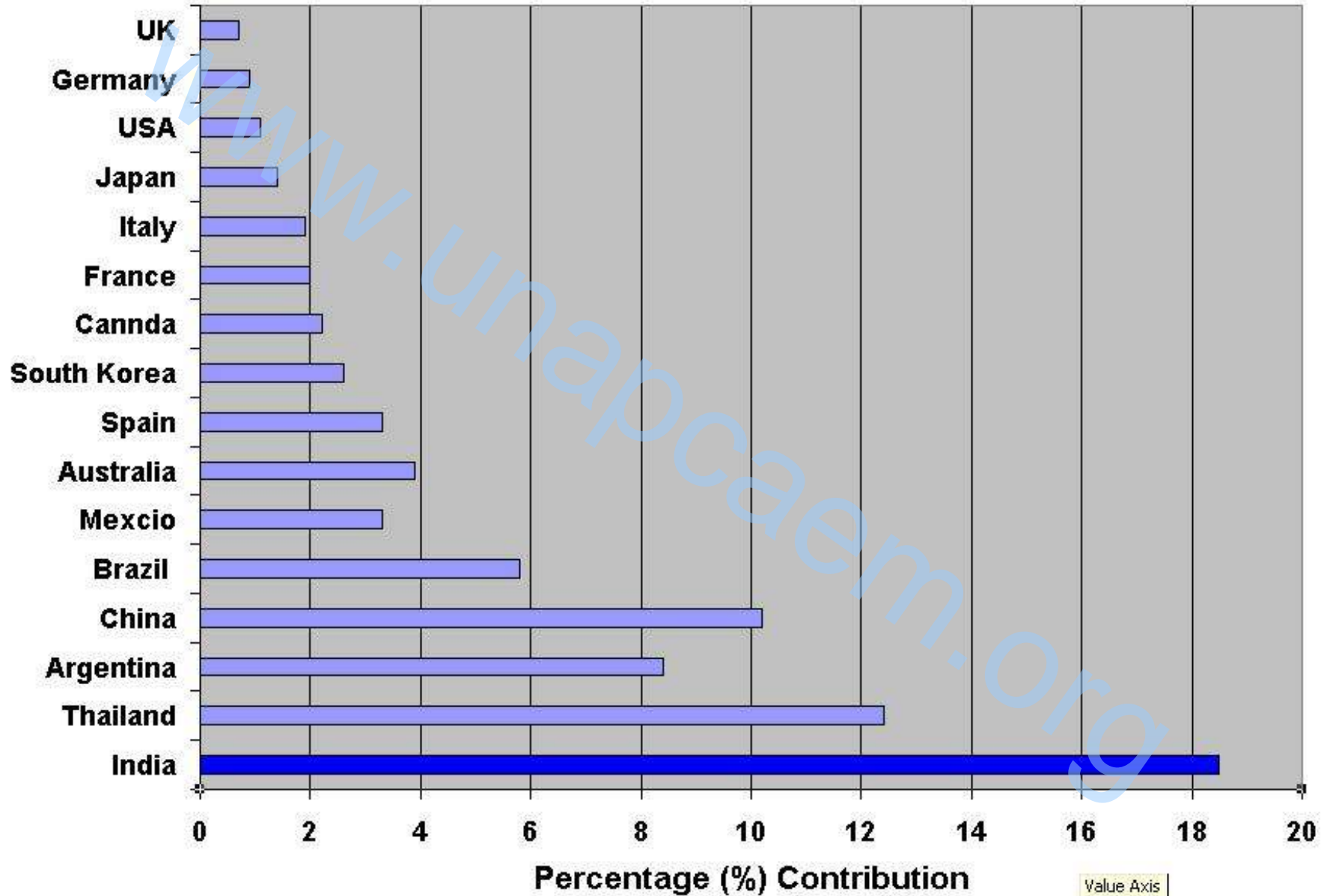
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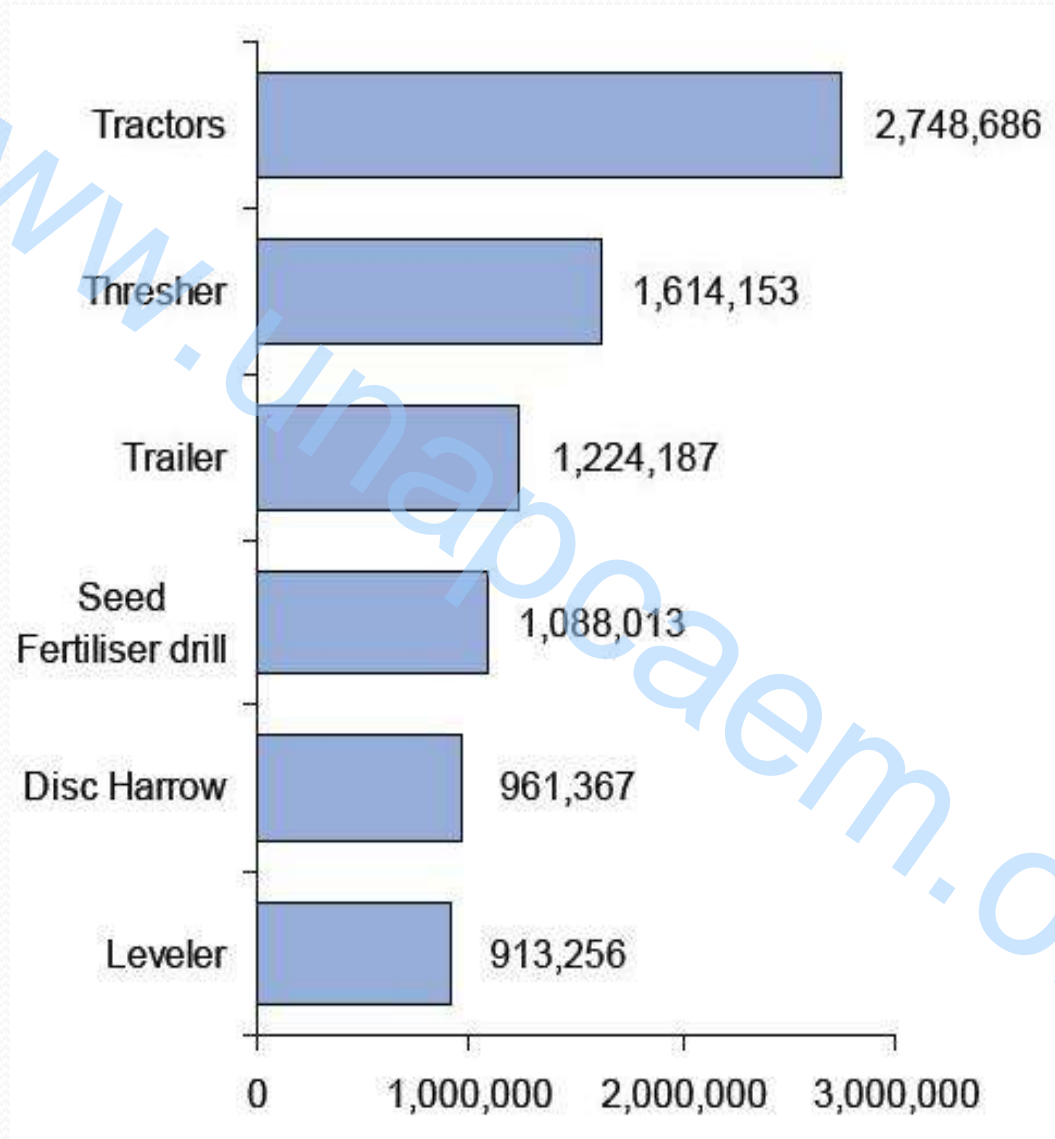
Shift from Traditional Farming Practices to Mechanized Farming in India

PROCESSES	Traditional Practices	Current Practices
Land Development, Tillage and Seedbed Preparation	Plough and Blade harrow were used to break soil without inverting or disturbing crop residue	Tractors, Mould board plough and disc plough are advanced implements for breaking soil.
Sowing and Planting	Dibblers were used to make hole in soil and seeds were dropped in funnel attached to country plough	Modern seed drill and planters are used to distribute seeds uniformly at the desired application rates.
Weeding and Inter-cultivation	Hand hoes and animal driven weeding tool were generally used for removing weeds between plants in a row.	Tractor operated implements are used presently for inter cultivation and weeding purpose of wider rows.
Plant Protection	Dusters and hand sprayers have been used traditionally for plant protection. It was suitable for low volume spraying.	Blower and Power sprayer can regulate volume of pesticides and size of drops to be sprayed.
Harvesting and Threshing	Harvesting of major crops was done manually using sickle. After harvesting, crops were trampled and beaten for threshing.	Tractor mounted as well as self propelled harvester and thresher are used nowadays for doing these processes efficiently.

Agriculture Contribution as % of GDP (WEF, 2010)

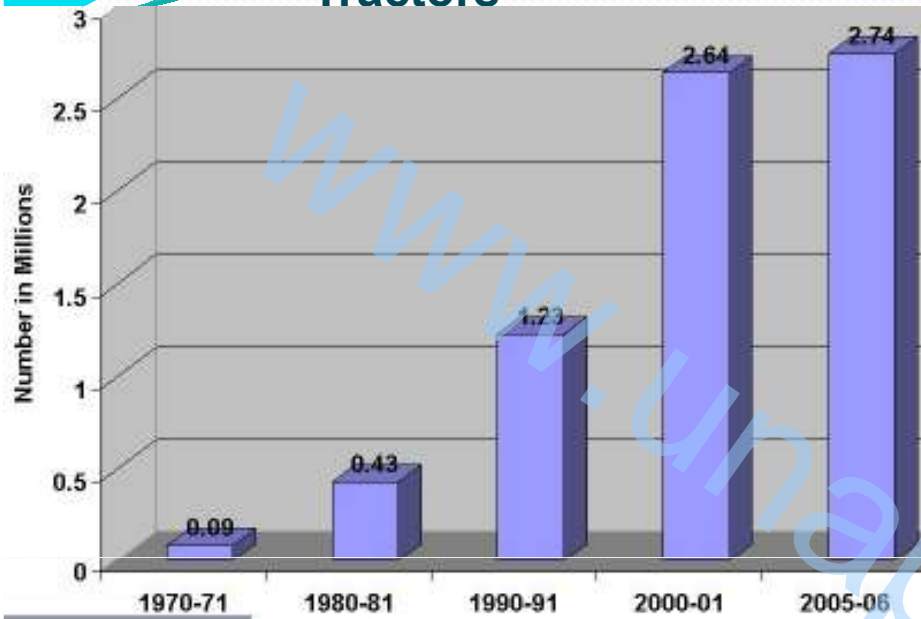


Major Agriculture Machinery in India

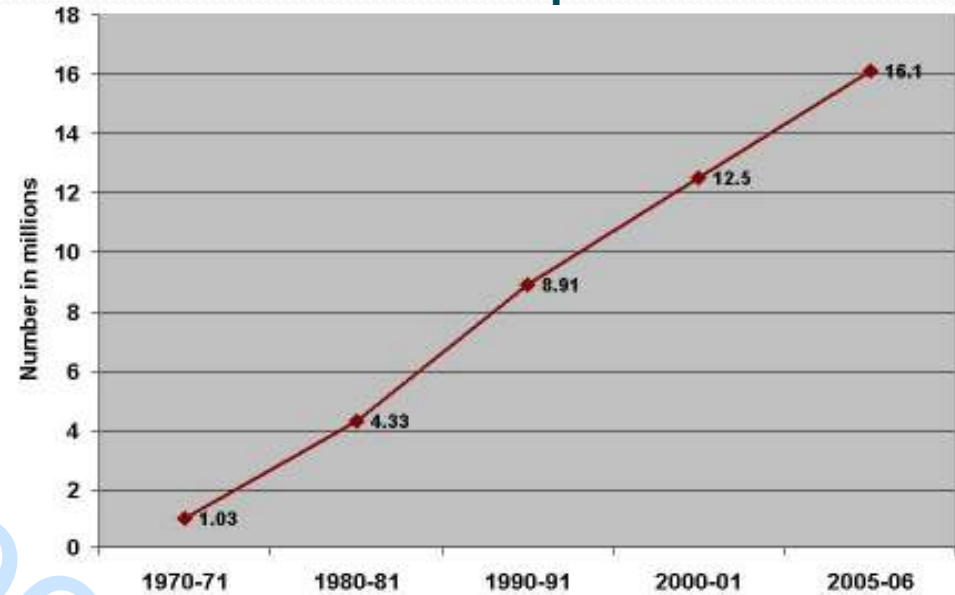


Trends in Farm Mechanization in India

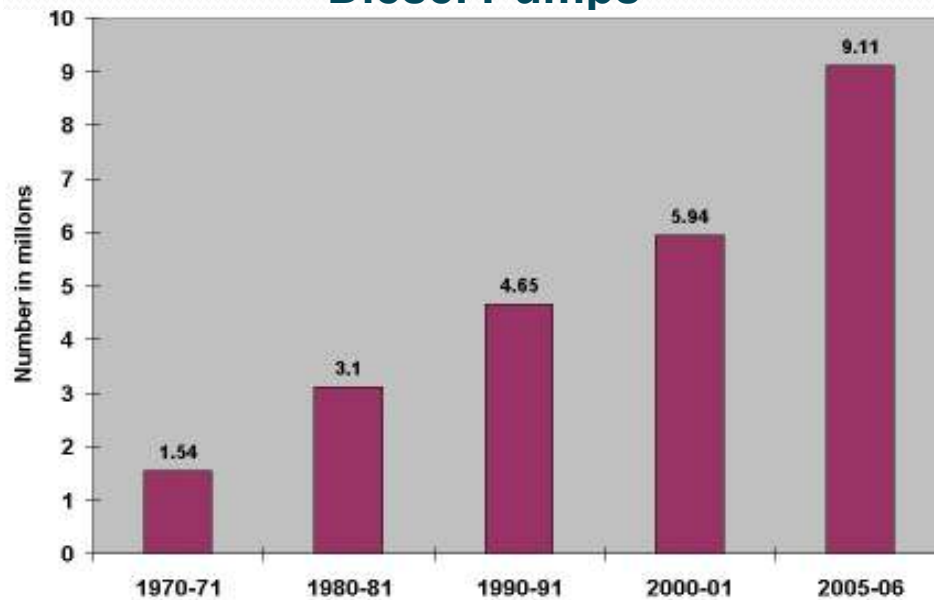
Tractors



Electric Pumps



Diesel Pumps

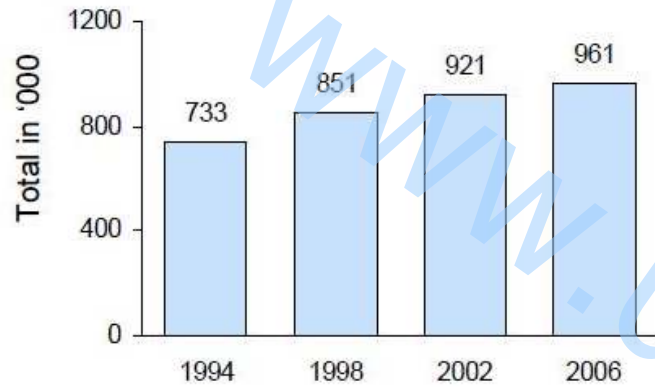


Threshers

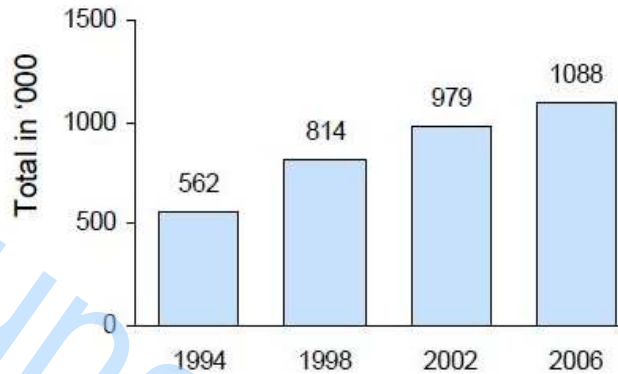


Trends in Farm Mechanization in India contd...

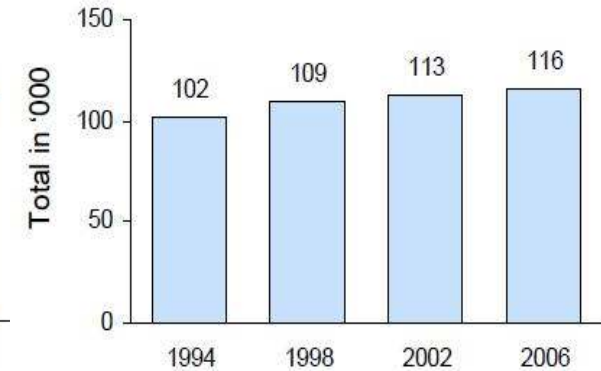
Disc Harrow



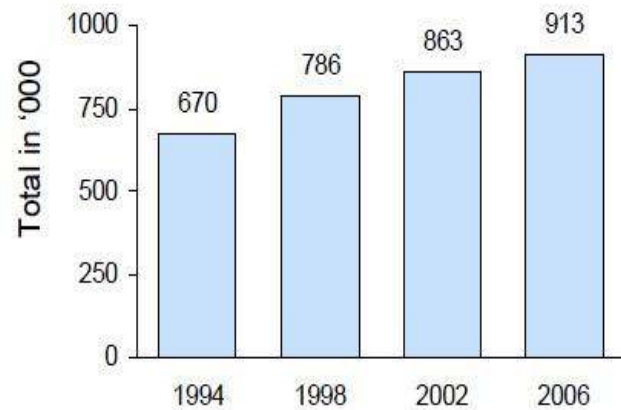
Seed F. Drill



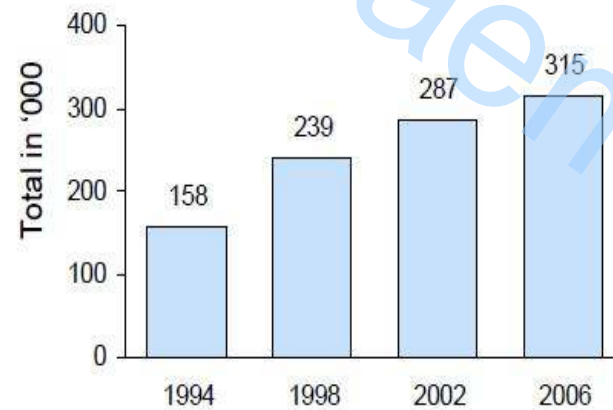
Planter



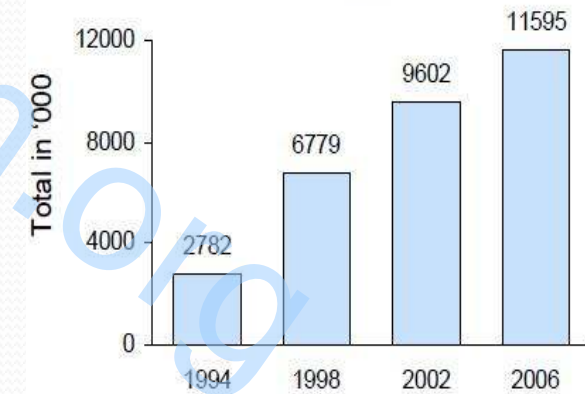
Leveler



Potato Digger



Reaper



Status of Farm Mechanization in India

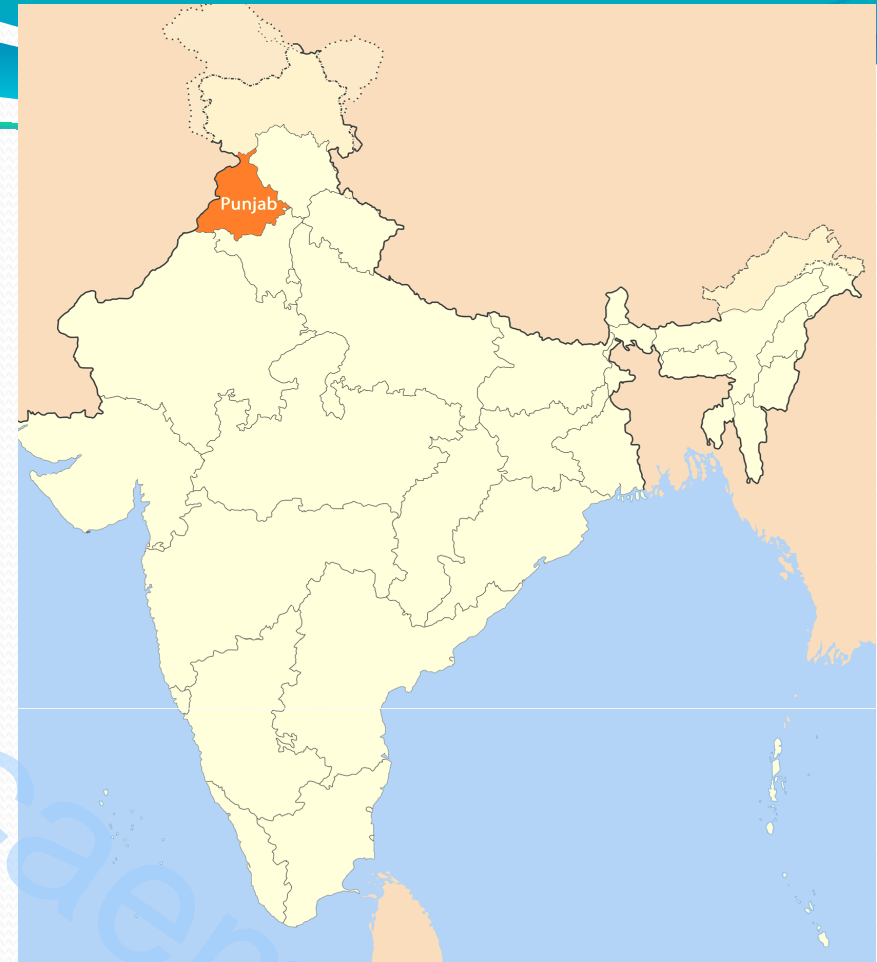
- ❑ Northern States such as Punjab, Haryana, Uttar Pradesh (particularly Western and Tarai belt) achieved a faster growth in mechanization
- ❑ The pace of mechanization in North-Eastern States slow due to constraints like as hilly topography, socio-economic conditions, high cost of transport, lack of institutional financing and lack of farm machinery manufacturing industries
- ❑ Mechanization in Western and Southern states of the country viz., Gujarat, Maharashtra, Rajasthan and certain areas of Tamil Nadu, Andhra Pradesh etc increased with the increase in area under irrigation and also with the growing awareness among farmers
- ❑ 30-40 hp tractors primarily used in southern and western regions due to hard soil conditions
- ❑ 21-30 hp tractors popular in soft soil conditions and well irrigated northern states
- ❑ Use of tractors has witnessed an increase of more than 78% since 1994
- ❑ There are more 13500 tractors per millions hectares at present in India
- ❑ The sale of other implements and machines like combine harvesters, threshers and other power-operated equipment increasing almost throughout the country

Constraints in Farm Mechanization in India

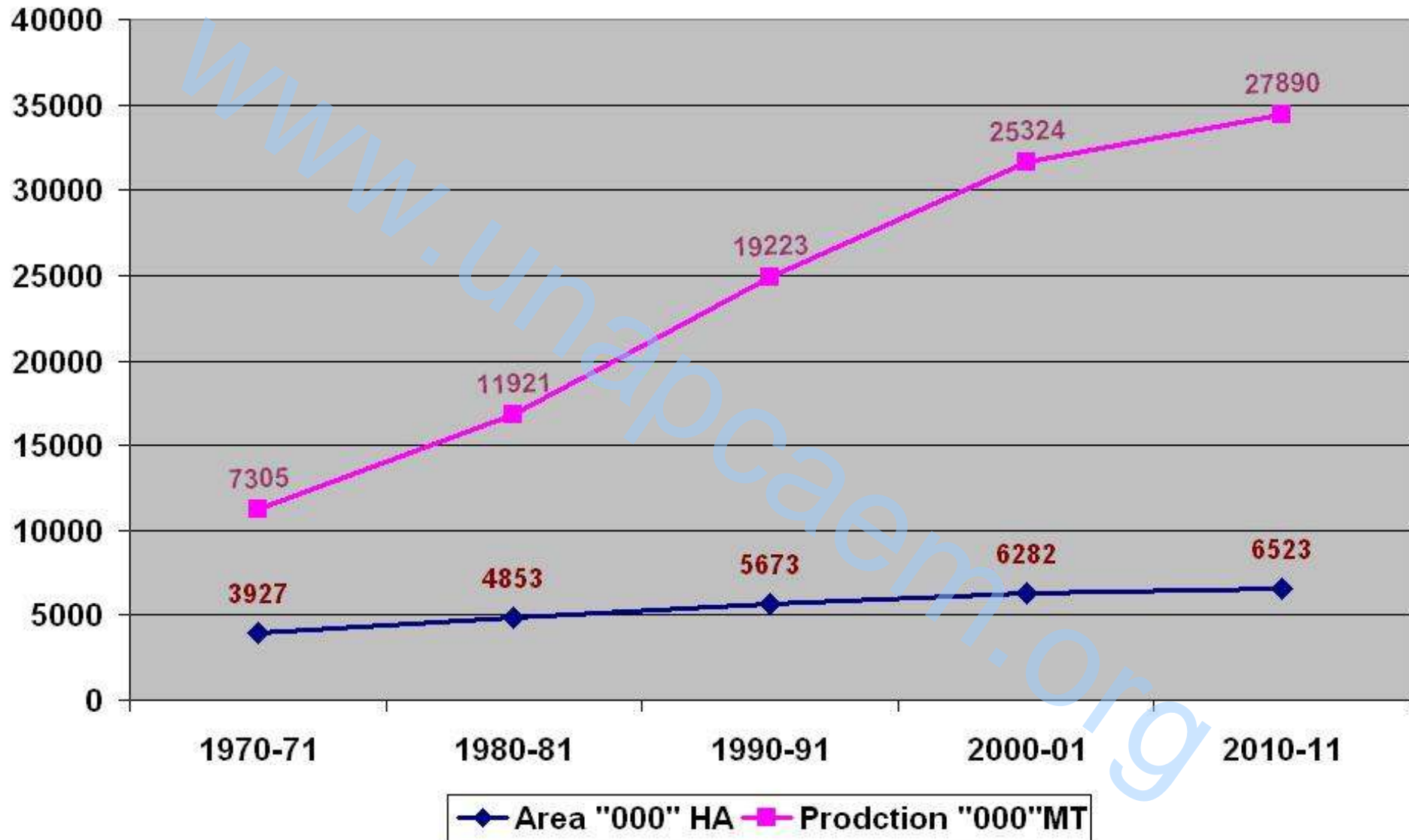
- ❑ Small size and scattered holdings of the farmers stand in the way of mechanization and farm machinery generally remains underutilized.
- ❑ Majority of small cultivators are poor and cannot purchase the costly machinery like tractors, combine harvesters etc
- ❑ Lack of proper knowledge of farmer to purchase, operate and maintain farm machinery leads to wrong choice and makes it uneconomical and risky too.
- ❑ Due to the seasonal nature of agriculture, the farm machinery remains idle for much of the time causing high depreciation cost (unless proper alternate use of such machinery in the off-season is made)
- ❑ Lack of service centre near rural areas
- ❑ Quality and reliability of farm machinery being manufactured and supplied by various agencies and scale of manufacturers yet to gain confidence of common farmer.
- ❑ Ever increasing prices of diesel and shortage of electricity

ABOUT PUNJAB

- ❑ Area (geographical) : 5.04 m ha
- ❑ Net sown area: 4.2 m ha (84%)
- ❑ Irrigated area: 4.04 m ha (96%)
 - Canals : 1.10 m ha (27%)
 - Tubewells : 2.92 m ha (73%)
through 1.3 million tubewells
- ❑ Total cropped area: 7.9 m ha
- ❑ Cropping intensity: 189%
- ❑ Cropping Systems : Rice-Wheat; Cotton-Wheat; and Maize-Wheat
- ❑ Food-grains production about 11-12% of the country
- ❑ **Highest farm power availability (3.5 kw/ha) in India (1.5 kw/ha)**
- ❑ **Highest foodgrain productivity (4032Kg/ha) in India (1921 kg/ha)**



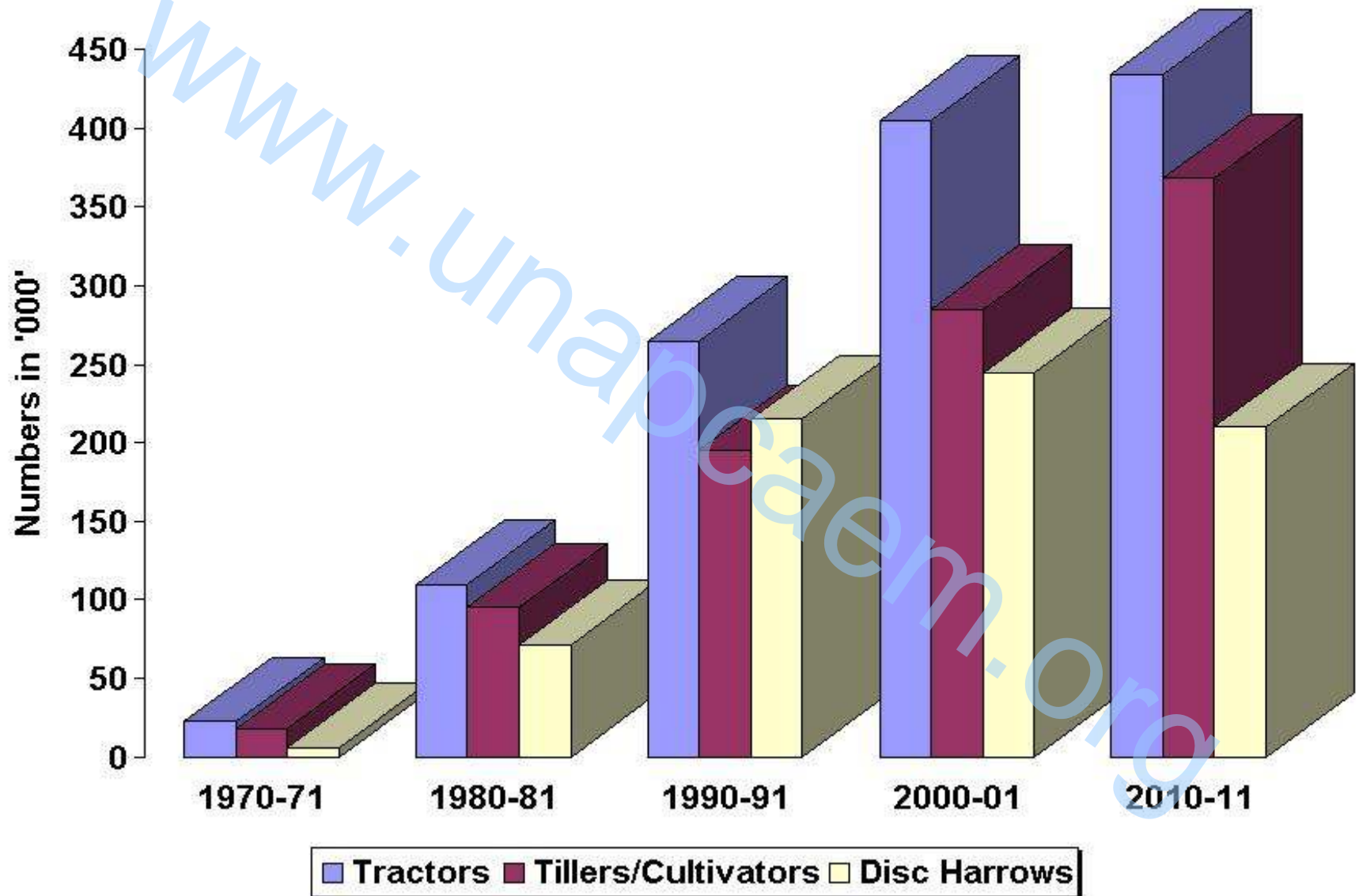
Four Decades of Foodgrain Production in Punjab





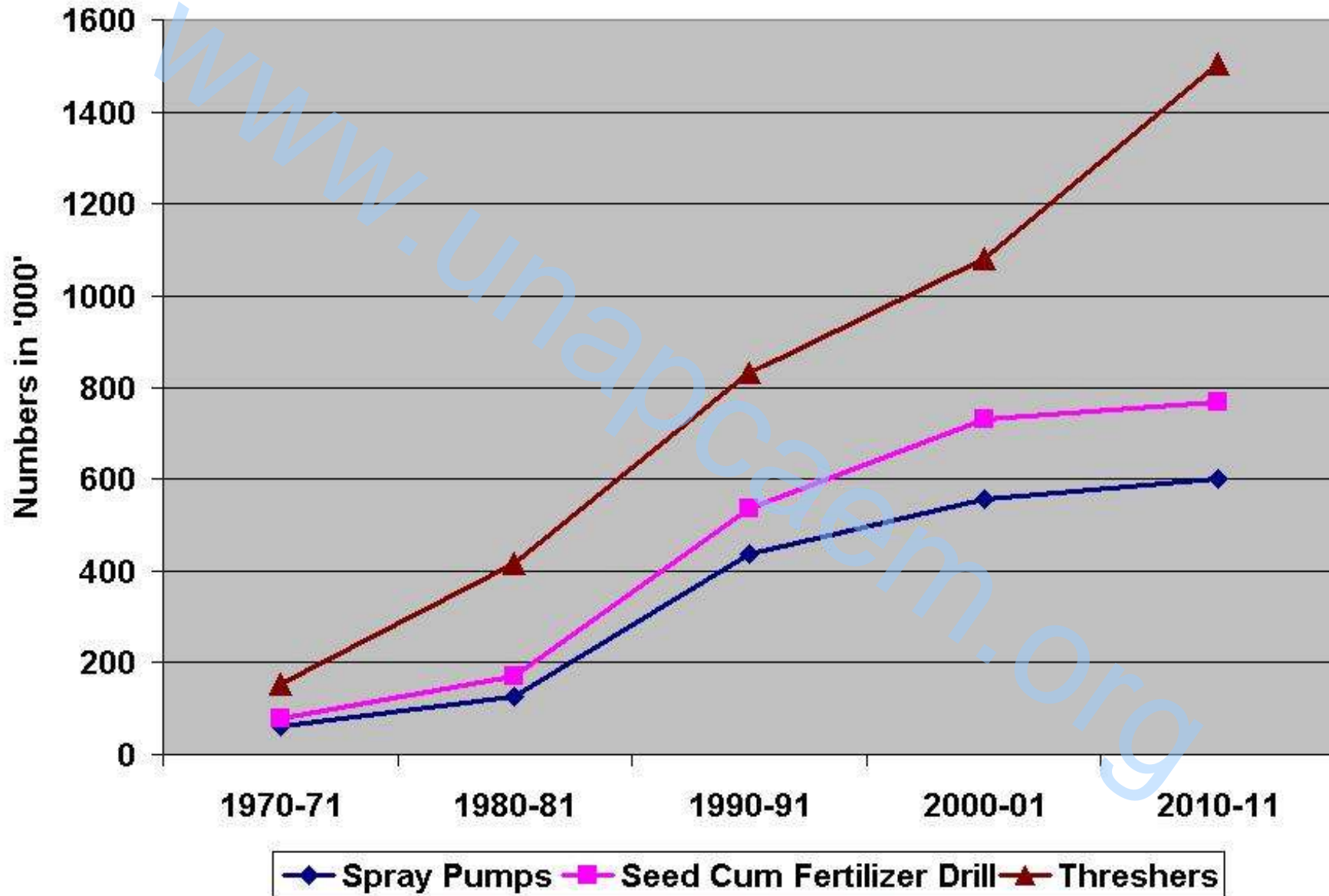
Growth of Farm Machinery in Punjab

Tractors, Tillers/Cultivators, Disc Harrows



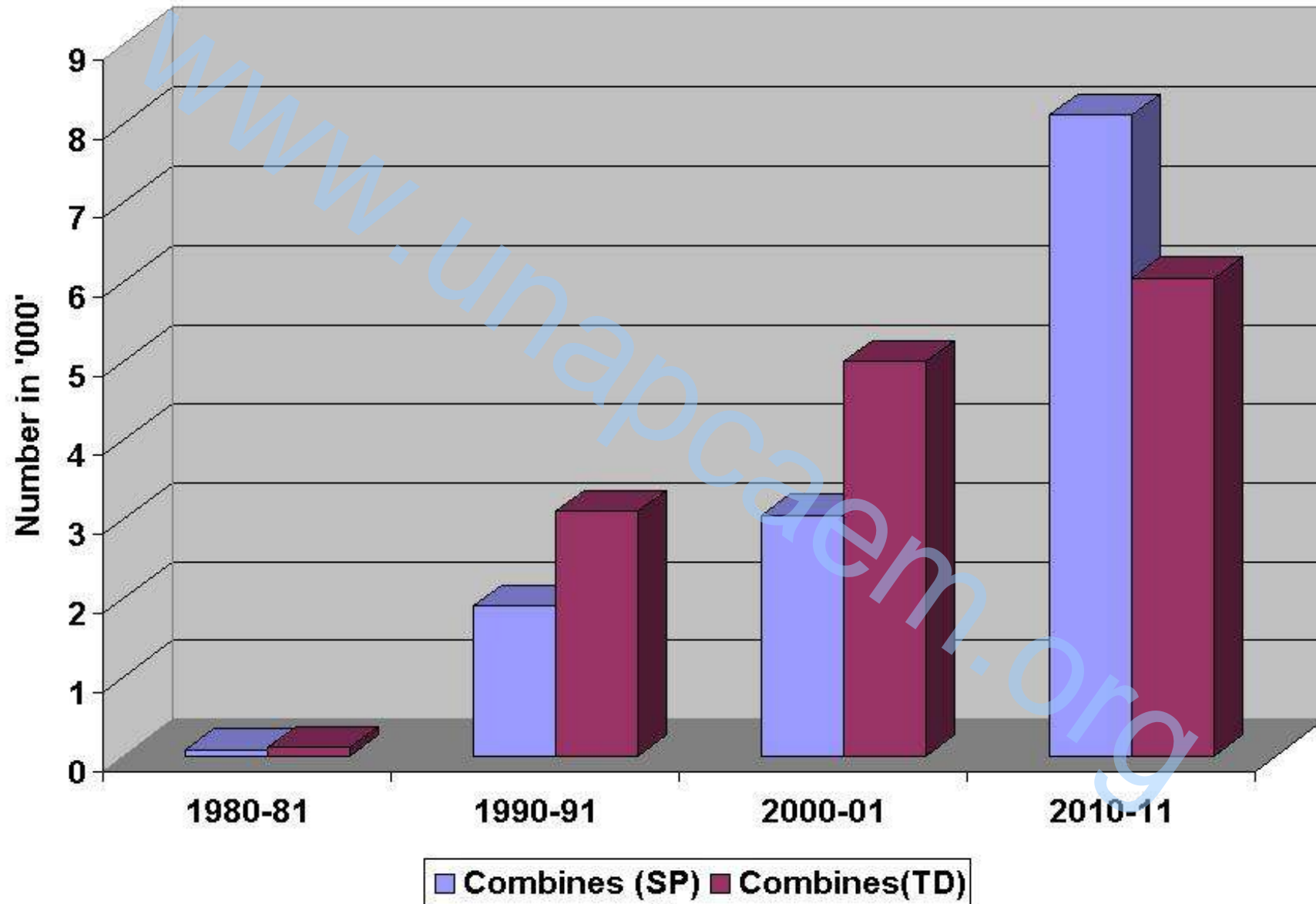
Growth of Farm Machinery in Punjab contd...

Spray pumps, Seed cum Fertilizer Drills and Threshers



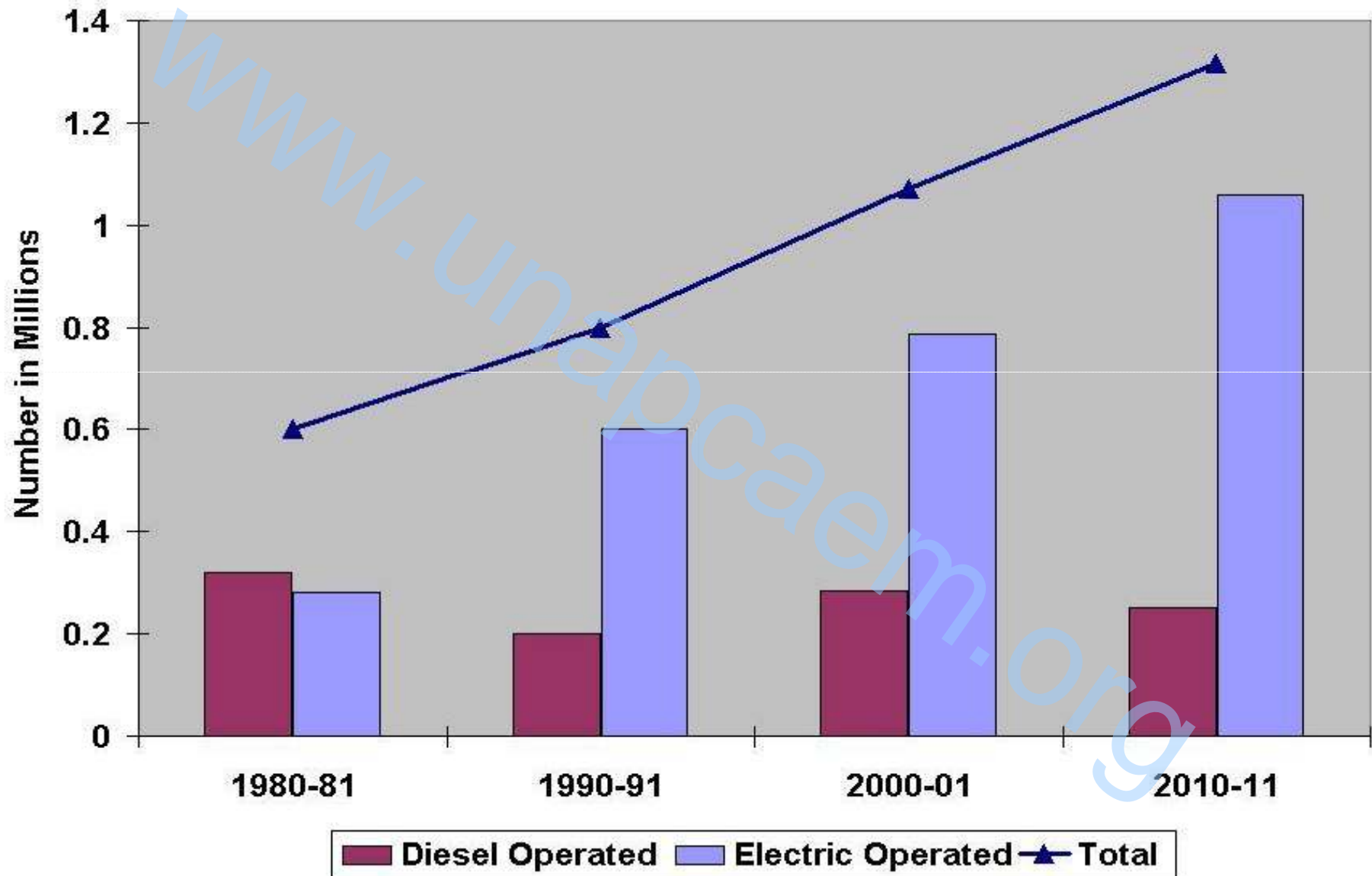
Growth of Farm Machinery in Punjab contd...

Combines (Self propelled and Tractor Driven)



Growth of Farm Machinery in Punjab contd...

Tubewells



Tractors

Overcapitalization, underutilization and environmental concerns

- ❑ Presently, one tractor for every 9 ha of net cultivated land of state (62 ha National Avg,)
- ❑ 169, 37, 16 and 11 ha area per tractor in 1971, 1981, 1991 & 2001, respectively
- ❑ Twice the number of tractors required w.r.t area
- ❑ 16% of total tractor of India operating in state
- ❑ Per annum avg. use of 450 hrs much lower than minimum 1000 hrs productive use
- ❑ Overcapitalization in farm mechanization and its under utilization due to decrease in farm size (Avg. Size 3.8 ha, 62% farmers below 1.5 ha)
- ❑ Higher cost of production and lower net income making tractors economically unviable to small and marginal farmers
- ❑ Once a symbol of the Punjab farmer's prosperity, tractors now become a debt trap
- ❑ Massive increasing use of diesel generate gaseous emissions (735.8116 TMT of HSD consumed by Agri Sect in 2010-11)
- ❑ Excessive use leads to soil compaction and causes damage to physico –chemical characteristics of soils especially during puddling



Combines environmental and social concern concerns

- ❑ More than 14 thousands combines operating in state
- ❑ Number of threshers decreased from 300 thousand in 1995 to 92 thousand in 2005.
- ❑ Popularity and number of combines increased manifold between 1995 and 2005
- ❑ More than 20 MT of uncut straw and stubble left in fields often burnt causing air pollution and declining soil fertility
- ❑ Carbon loss due to straw burning in state equivalent to a carbon dioxide load of more than 1.83 MT per year
- ❑ NPK loss from the soil about 0.824 MT equivalent to 50% of total fertilizer consumption of state
- ❑ Recycling potential equivalent to 0.56 MT of nutrients worth Rs. 4 billion
- ❑ Health impacts on population in the region due to trapping of pollutants in atmosphere.
- ❑ Reduced the peak earning season of local agricultural labourers by two weeks (upto 2005)



Tubewells

Environmental and economic concerns

- ❑ 1.3 million tubewells operational in state
- ❑ Excessive exploitation of groundwater necessitating heavy investments deepening the tubewells every fifth year and thereafter with the installation of submersible tubewells replacing centrifugal pumps
- ❑ 45680 submersible tubewells (47%) in state out of 968007 electric driven tubewells as on March 31, 2008
- ❑ Led to huge investments in installation and higher energy consumption
- ❑ A submersible pump installation costs more than 1600 USD than 600 USD incurred on installation of a centrifugal pump
- ❑ A whopping amount of Rs. 0.8 Million USD spent by farmers on replacing centrifugal pumps with submersible pumps in state till 2010 due to depletion of underground water.
- ❑ Farmers compelled to borrow, while their repaying capacity suffering and debt burden accumulating



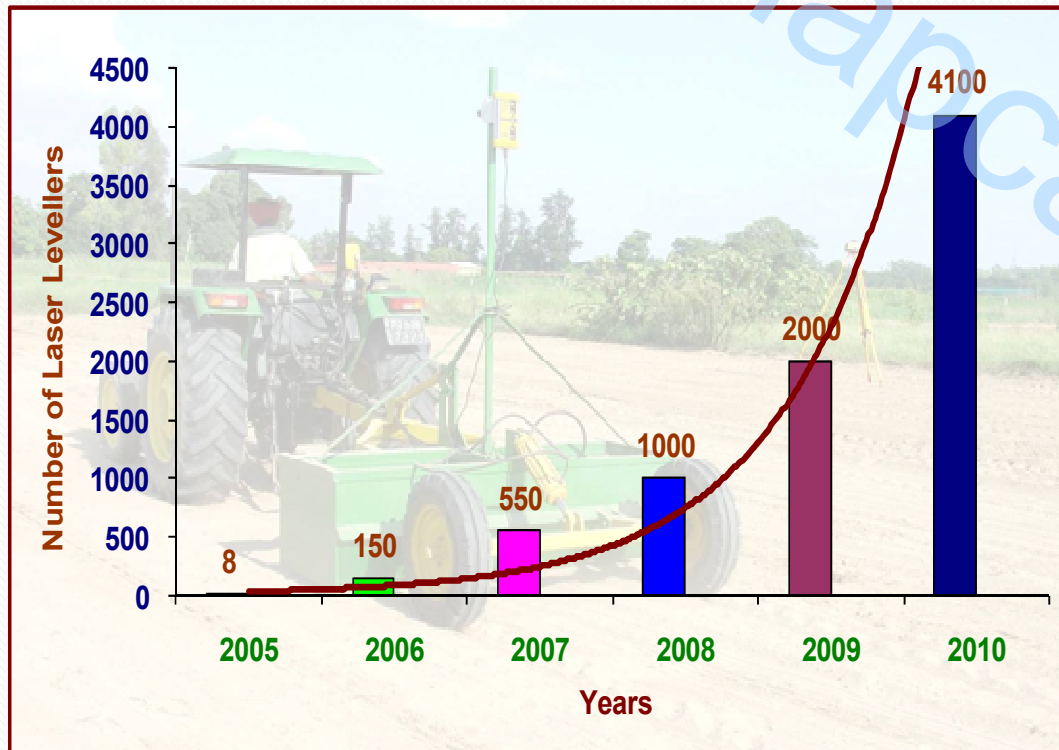
Farmers Debt

- ❑ Agriculture Growth rate in state slowed down from 5.0% in 1980s to 2.4% in 1990s and to 1.9% in 2000s
- ❑ Declining trend in farm income in state pushing small and marginal farmers into vicious cycle of debt
- ❑ Agriculture debt grown from 114 Million USD in 1997 to 607 Million USD in 2008 with a five-fold jump in a decade.
- ❑ Debt amount as a % of net income increased from 68 % in 1997 to 84 % in 2008
- ❑ The rate of growth of farm debt in the last 10 years for Punjab faster than farm incomes
- ❑ 72 % of farm households are heavily indebted, and 17% unable to even pay out interest payments from their current farm income.
- ❑ **Increasing amounts of debt money spent on farm machinery and it increased from 15% in 1997 to 53% in 2008 (IDC Report, 2009)**
- ❑ Punjab farmers having the maximum avg. indebtedness of 900 USD in India (NSSO, 2005)

2nd Generation Farm Mechanization (RCTs)

CONSERVATION OF IRRIGATION WATER THROUGH LASER LAND LEVELING

- ❑ Larger plot size and better water use efficiency
- ❑ Better crop stand and lesser weeds
- ❑ Better nutrient use efficiency
- ❑ Uniform water application

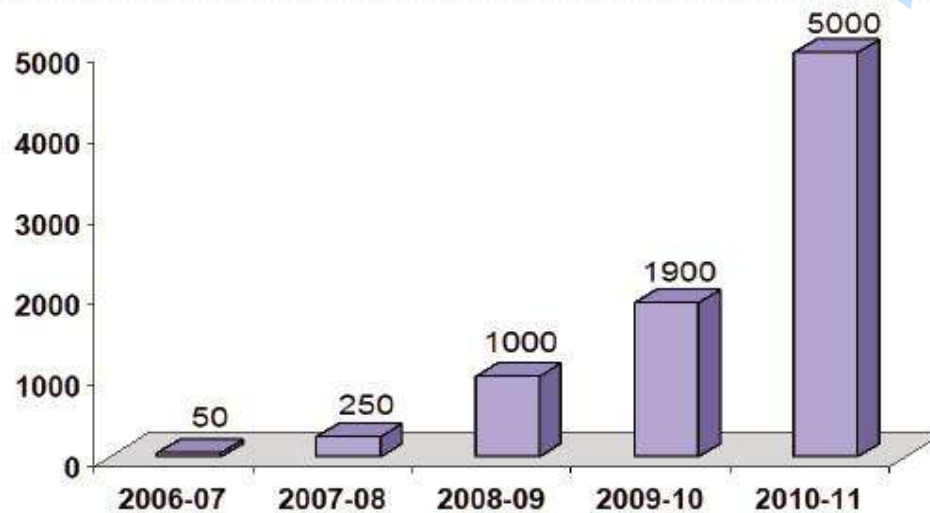


Year	Cumulative Area Covered (ha)
2005-06	1312
2006-07	25900
2007-08	116150
2008-09	280172
2009-10	608165
2010-11	1264112

Happy Seeder

- Improve soil fertility by incorporation of organic matter in the soil
- Enhanced water use efficiency
- Weed suppression due to mulching
- Reduced time lag between harvesting and sowing of next crop
- 160 machines introduced in 2010 in Punjab by State Govt

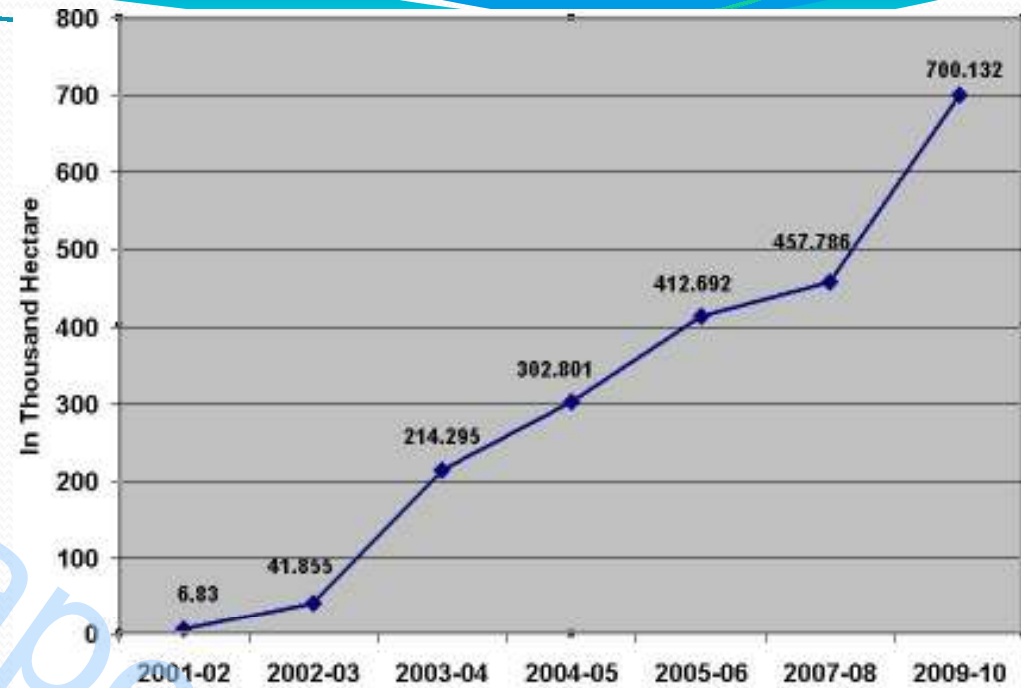
Area covered Happy seeder in Punjab



Area under Zero Tillage in Punjab



Zero Till drill (10,465 in 2010-11)



Straw Combine



Combine Straw Baler

AGRICULTURAL MACHINERY SERVICE CENTRES

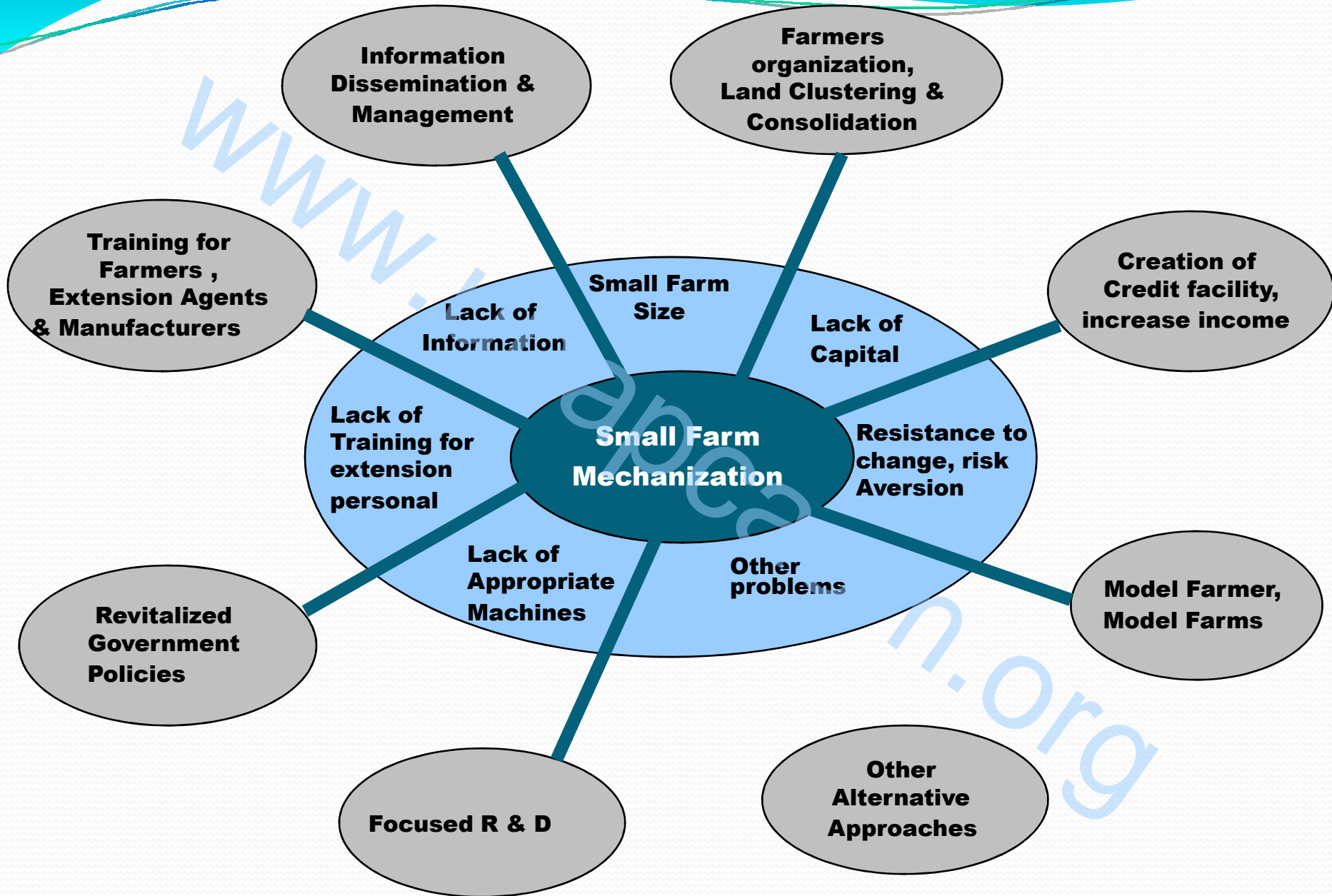
- ❑ Propagation of New Technologies
- ❑ Reduced investment due to availability on custom hiring basis
- ❑ Generation of employment in rural areas

1167 AMSC Set up in State

- Each AMSC equipped with:
 - i) Laser Land Leveler;
 - ii) Happy Seeder;
 - iii) Rotavator;
 - iv) Raised Bed Planter;
 - v) Zero-till-drill; and
 - vi) Other implements including tractors



Approaches to promote of Sustainable Mechanization



**Thank you
for your kind attention**

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Influence of Govt. Policies on Farming in Punjab

