

Conservation Tillage Equipments in Wheat and Maize Cultivation in Nepal



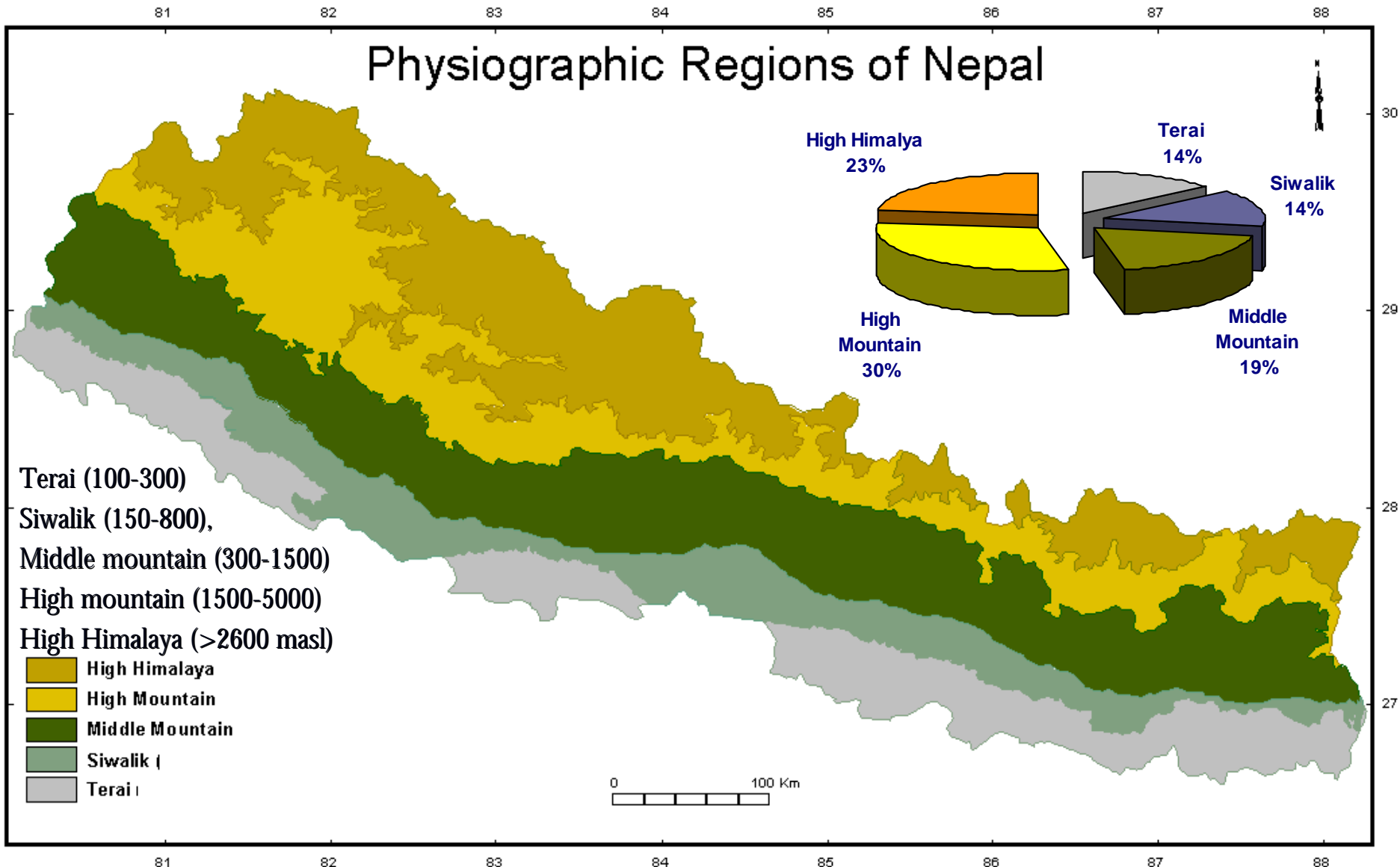
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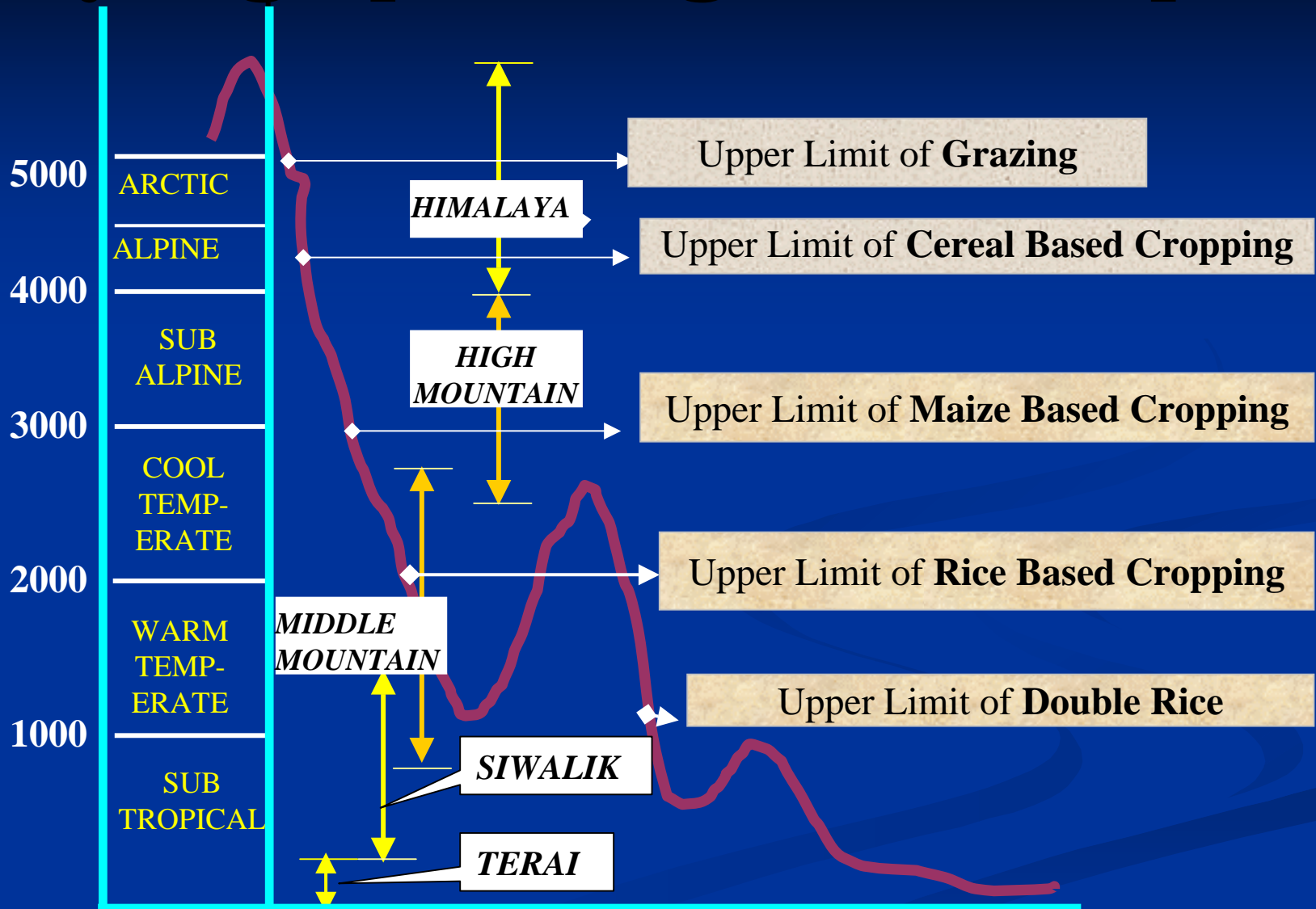
Background

- Nepal small land locked country in between India and China
- Population 25.4 million (2005)
- Population engaged in agriculture: 65.7%
- Total area : 147181 sq. km (21% cultivated area)
- Irrigated area: 32%
- Contribution of Agriculture in GDP: 38%
- Population below poverty line: 30.8%
- Physiographic region : 5

Physiographic Regions



Physiographic Regions in Nepal

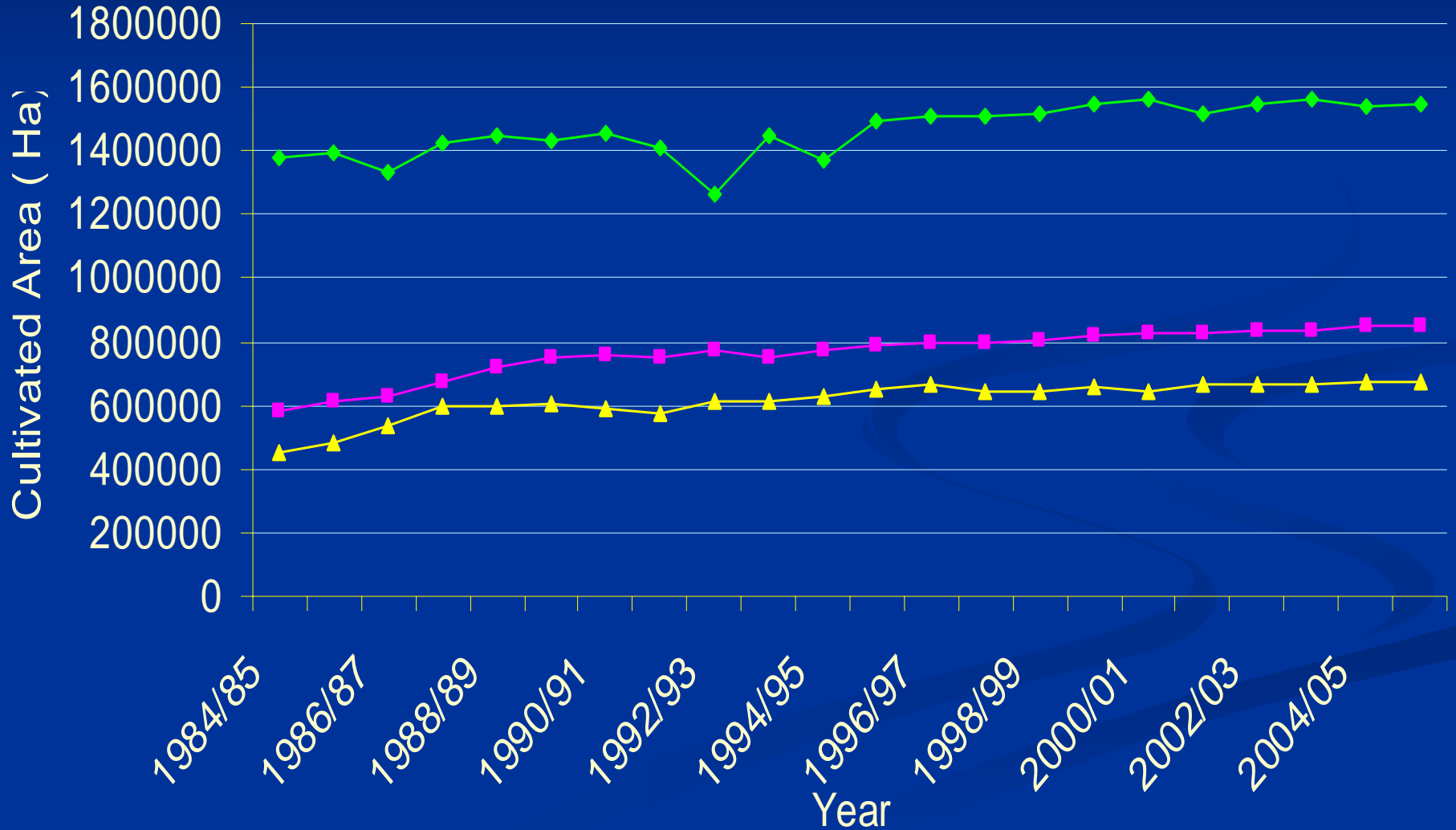


Trend of rice, maize and wheat cultivated area in Nepal

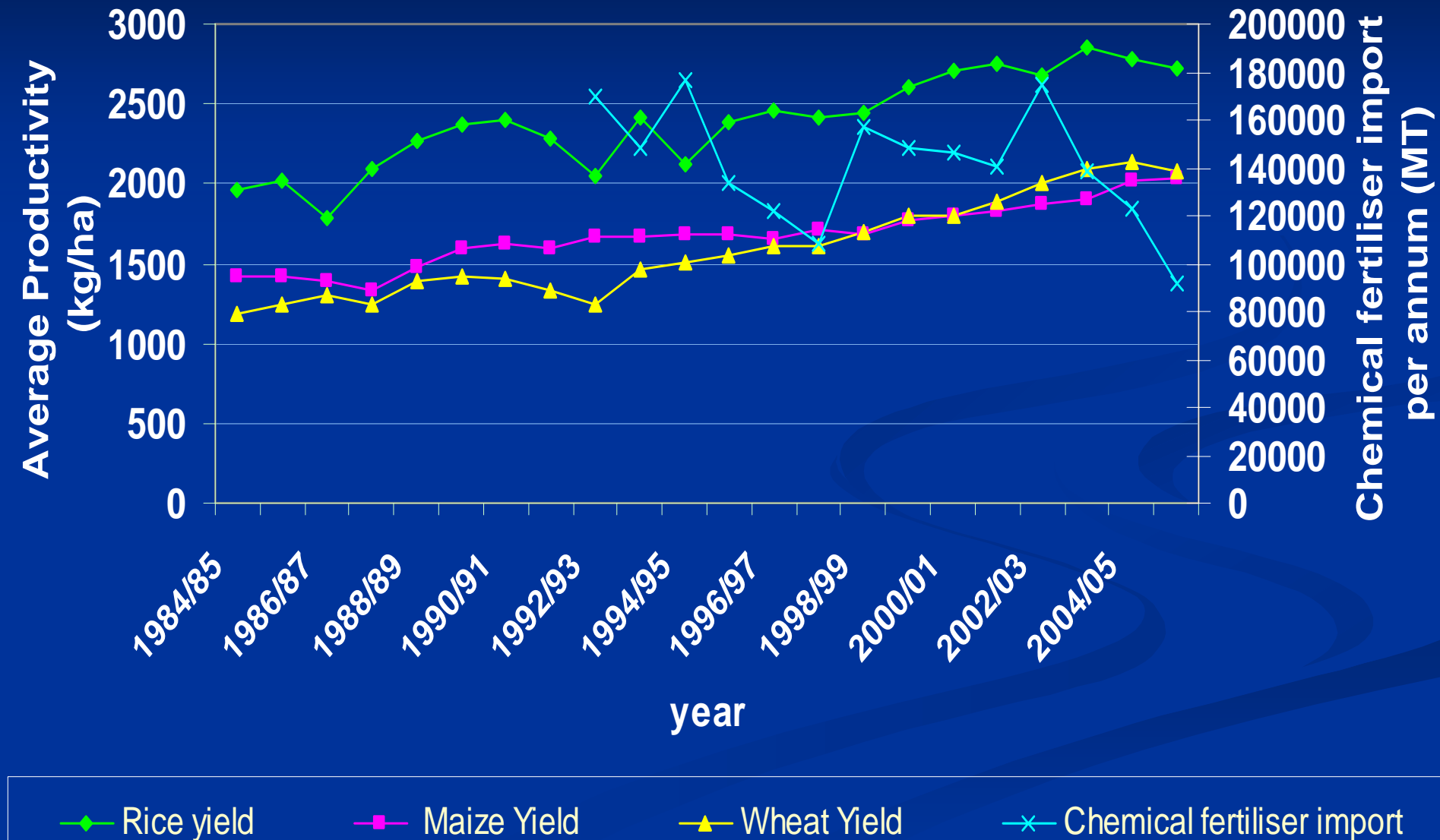
—◆— Rice Area

—■— Maize Area

—▲— Wheat Area



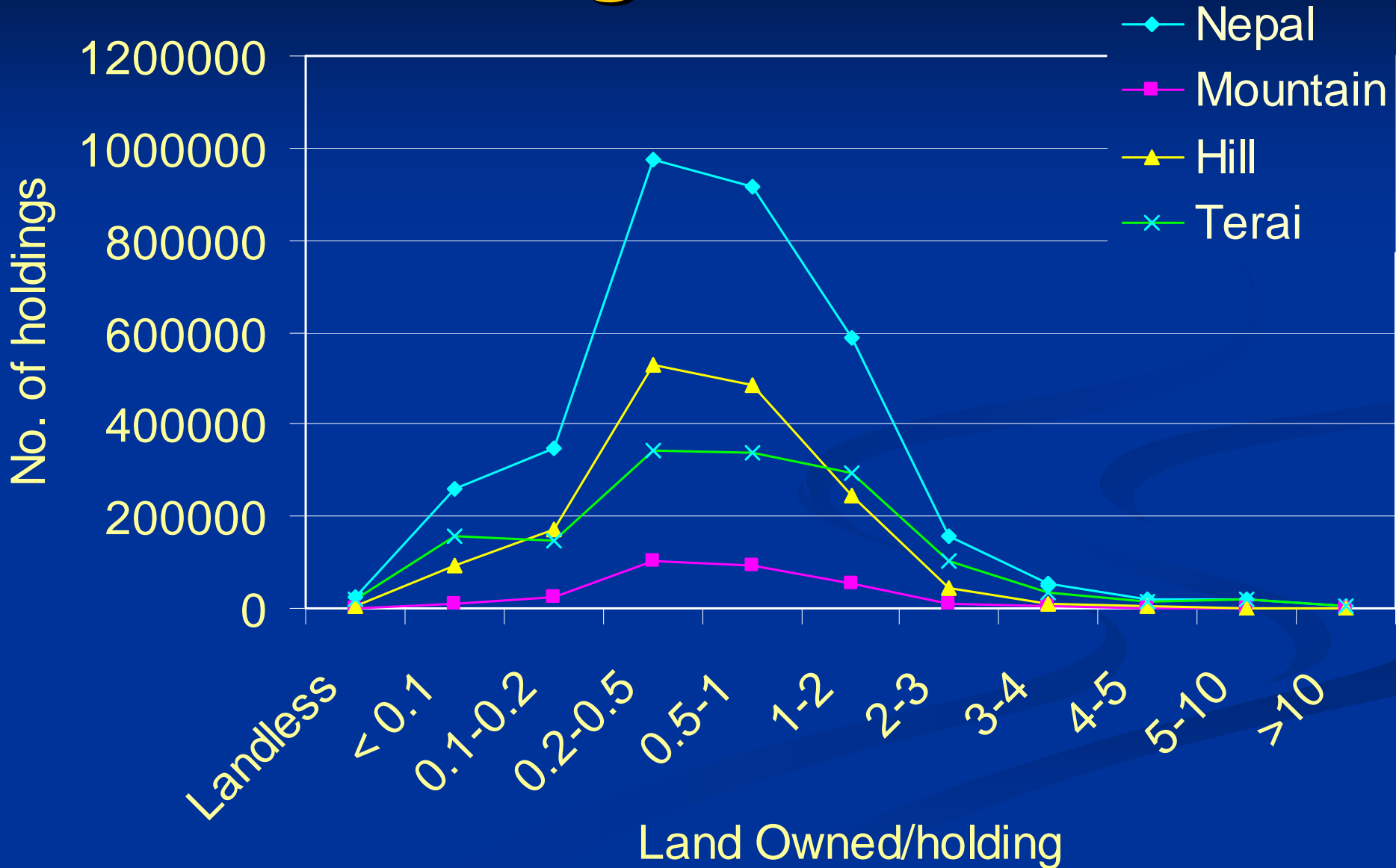
Productivity trend of major cereal crops & fertilizer import in Nepal



Land Holding

	No of Holding	Area of Holding	Av. holding Size, ha	Av. no of parcel/ holding	Average size of parcel, ha
Mountain	298,223	218,707	0.73	4.03	0.18
Hill	1,586,406	1,038,615	0.65	3.18	0.21
Terai	1,479,510	1,396,716	0.94	3.20	0.29
Nepal	3,364,139	2,654,037	0.79	3.27	0.24

Land Holding Size Distribution

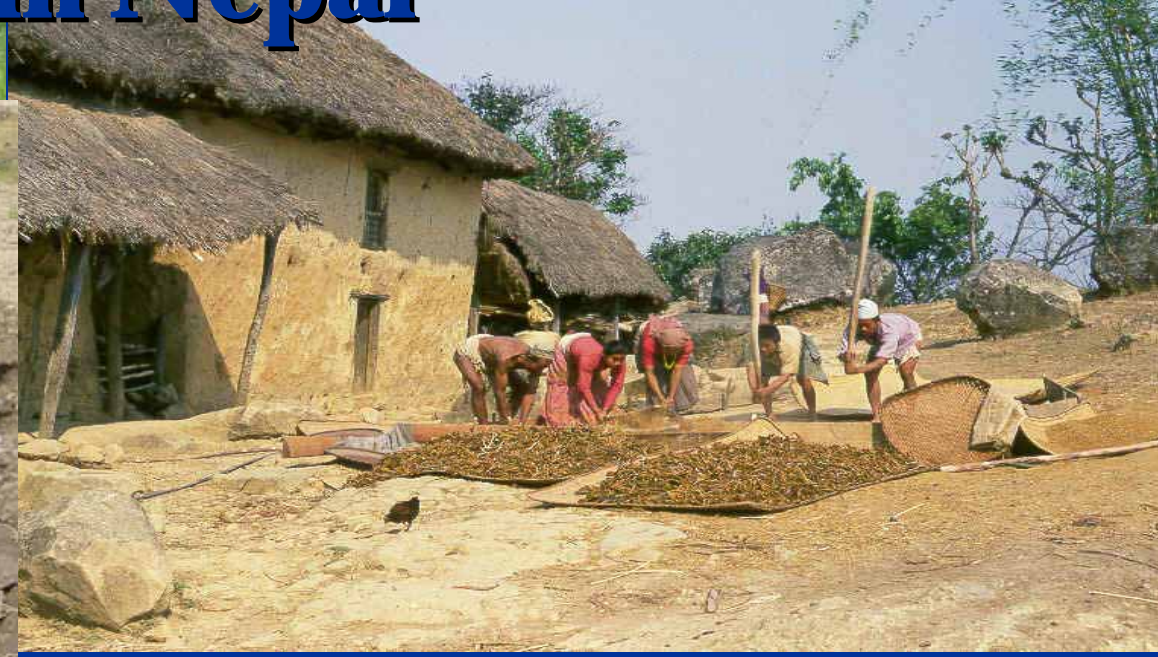


Gender Involvement in Growing Major crops in Hill

Activities	Rice		Maize		Wheat		Millet	
	M	W	M	W	M	W	M	W
Land preparation	68	32	66	44	52	48	nd	nd
Transplanting/sowing	38	62	18	82	22	78	12	88
Applying manure	48	52	27	73	19	81	nd	nd
Harvesting	43	57	30	70	21	79	17	83
Threshing	67	33	nd	nd	46	54	48	52
Drying	nd	nd	nd	nd	28	72	50	50



Glimpses of Agricultural operations in Nepal





Conventional Tillage Operations



Agricultural Land Use System in Nepal



Constraints of Agricultural System in Nepal

- Subsistence agriculture lack of commercialization
- High cost of cultivation
- Stagnant and declining productivity
- Soil loss in hills and mountains
- Farmers' drudgery in agricultural operation (specially women farmers)
- Low level of agricultural mechanization

Common tillage technologies

Manually Operated Plough

Field capacity :0.075 ha /day

Animal Drawn Plough

Types

- Traditional Wooden Plough
- Iron M B Plough
- Field Capacity 0.15-0.25 ha/day
- Hiring charge : Rs. 500/day



Power tiller & multipurpose application



Weight : 565 kg

BHP : 12.6 hp

Cost of 2 WT with

Cultivator :Rs. 90000

Other application: Transportation,
power for pumping threshing etc.

Hiring charge : 200-250/ hr.



Tractor drawn cultivator

4 Wheel Tractor Drawn Cultivator

- Common Primary as well as secondary tillage equipment in terai
- 9 tyne and 11 tyne cultivator available
- Used as even leveler by attaching a wooden plank in the rear tines.



Study on Minimum tillage by power tiller with roto-tiller:

- Treatments :
 - T1: Broadcasting of seed + single pass of PT
 - T2: double pass of PT + broadcasting
- Replications: 7
- Area: at least 250 sq. m
- Crop: Wheat (annapura-4)
- Location : Farmer's field participatory study (Bhaktapur Katunje)



Results of minimum tillage by PT roto-tiller

S N	Parameters	Single pass	Double pass
1	Average time taken per ropani* land area (minutes)	48.3	81.5
2	Maximum of size of clod (cm)	3.8	2.5
3	Average land preparation cost per ropani in NRs.#	201.25	339.58
4	Wheat variety used	Annapurna 4	Annapurna 4
5	Replication (number of farmer's field)	7	7
6	Average wheat yield (kg/ha)	4261.96**	4021.50**

*1 ropani is 1/20th of a hectare; #Nepalese Rupees 1US\$=65 NRs. .** LSD₀₅=0.247 t/ha

Minimum tillage by minimum till drill

- Treatments :
 - T1: Minimum till drill
 - T2: two pass of PT + manual broadcasting
- Replications: 15
- Area: at least 250 sq. m
- Crop: Wheat (annapurna-4)
- Location : Farmer's field participatory study (Bhaktapur Katunje)



Farmer's field results on Minimum till drill

S N	Parameters	Minimum Till Drill	Farmer's Practice (PT roto-till-2 pass)
1	Average time taken for sowing wheat in land area 1 ropani* (minutes)	31.5	79.6
2	Maximum of size of clod (cm)	1.5	2.7
3	Average land preparation cost per ropani in NRs.#	131.25	331.67
4	No of farmers field	15	15
5	Average wheat yield (kg/ha)	3615.91	4438.5

Minimum tillage by Strip till drill

- Modification of Minimum till drill in to strip till drill
- Treatments :
 - T1: Strip till drill
 - T2: Minimum till drill
- Replications: 3
- Plot size: 400 sq. m
- Crop: Wheat (BL- 1473)
- Location : Khumaltar, Lalitpur



Strip till drill in wheat cultivation



Results on performance of strip & min. till drill

S N	Parameters	Minimum Till Drill	Strip till drill
1	Average time taken for land area 1 ropani* (minutes)	33.3	24.6
2	Average land preparation cost per ropani in NRs.#	138.75	102.5
3	No of replications	3	3
4	Crop Variety	BL1473	BL1473
5	Average number of plants emerged after 15 days	231	299
6	Average wheat yield (t/ha)	3.76**	3.95**

*1 ropani is 1/20th of a hectare; #Nepalese Rupees 1US\$=65 NRs.** LSD_{.05}=0.13 t/ha*

Zero tillage in wheat cultivation

- Treatments :
 - T1:Zero till drill (4 Wheel Tractor drawn)
 - T2: Local Practice
- Replications: 4
- Plot size: Min 1000 sq. m
- Crop: Wheat (Bhrikuti)
- Location : Farmer's field participatory study (Belwa VDC of Parsa)



Farmer's field results on Zero till drill

S N	Parameters	Zero till drill	Local practice
1	Average time taken for land area 1 ha (hrs.)	2.65	5.21
2	Land preparation cost per ha. in NRs.#	861.31	2513.0
3	No of replications	4	4
4	Crop Variety	Bhrikuti	Bhrikuti
5	Average wheat yield (t/ha)	3.88*	3.72*

#Nepalese Rupees 1US\$=65 NRs. * $LSD_{.05}=0.58$ t/ha

Jab seeder for maize cultivation

- Treatments :
 - T1: Jab seeder in no till condition
 - T2: Tillage by power tiller and manual dibbling
- Replications: 3
- Plot size: 200 sq. m
- Crop: Maize (Khumal Yellow)
- Location : Khumaltar farm



Results on performance of jab seeder

S N	Parameters	Maize seed dibbled by Jab seeder	Land preparation by Power tiller & manual seeding
1	Average time taken for land area 1 ropani * (minutes)	50	75 for land prep ⁿ PT in 2 pass +79 seeding manually
2	Average land preparation cost per ropani in NRs. [#]	15.62	335.93
3	No of replications	3	3
4	Crop Variety	Khumal Yellow	Khumal Yellow
5	Average maize grain yield (t/ha)	3.04**	3.52**

Findings

- ⑩ Single pass of power tiller operated roto-tiller saves cost for land preparation by 40 percent than tillage by 2 passes power tiller with roto-tiller (local practice) and increased yield by 5 percent.
- ⑩ Minimum till drill (Chinese seed drill) saves cost for land preparation by 61 percent than tillage by 2 passes power tiller with roto-tiller (local practice) and about 22 percent increased average yield.
- ⑩ The minimum till drill is modified in to strip till drill by just replacing the blades and furrow openers with Rs. 4000 additional cost.
- ⑩ Strip till saves 26 percent of cost of land preparation and sowing cost in wheat sowing with 4 percent better yield. The strip till drill needs to be further tested in on farm condition to get the feed back from the farmers.

Findings

- ⑩ Zero till drill saves about 65 percent of the cost of tillage and seeding than the traditional practice and with 4 percent increase in yield. Hence zero till drills needed to be promoted in the terai plains of Nepal by making easy availability of zero till drills.
- ⑩ The jab seeder is adapted in to Nepalese condition. The plant emergence and plant stand is found to be bettering jab seeder dibbled plot than tilled plot with manual seeding.
- ⑩ There is need of further research for identifying appropriate crop residue material for soil cover in no till and minimum till without affecting the demand of crop residue for livestock.
- ⑩ Mindset of the farmers is the major constraint on adoption of conservation tillage technologies. Reduction of of cost of cultivation, timely sowing and increased yield are the major attraction of farmers on conservation tillage technologies.

Thank you

