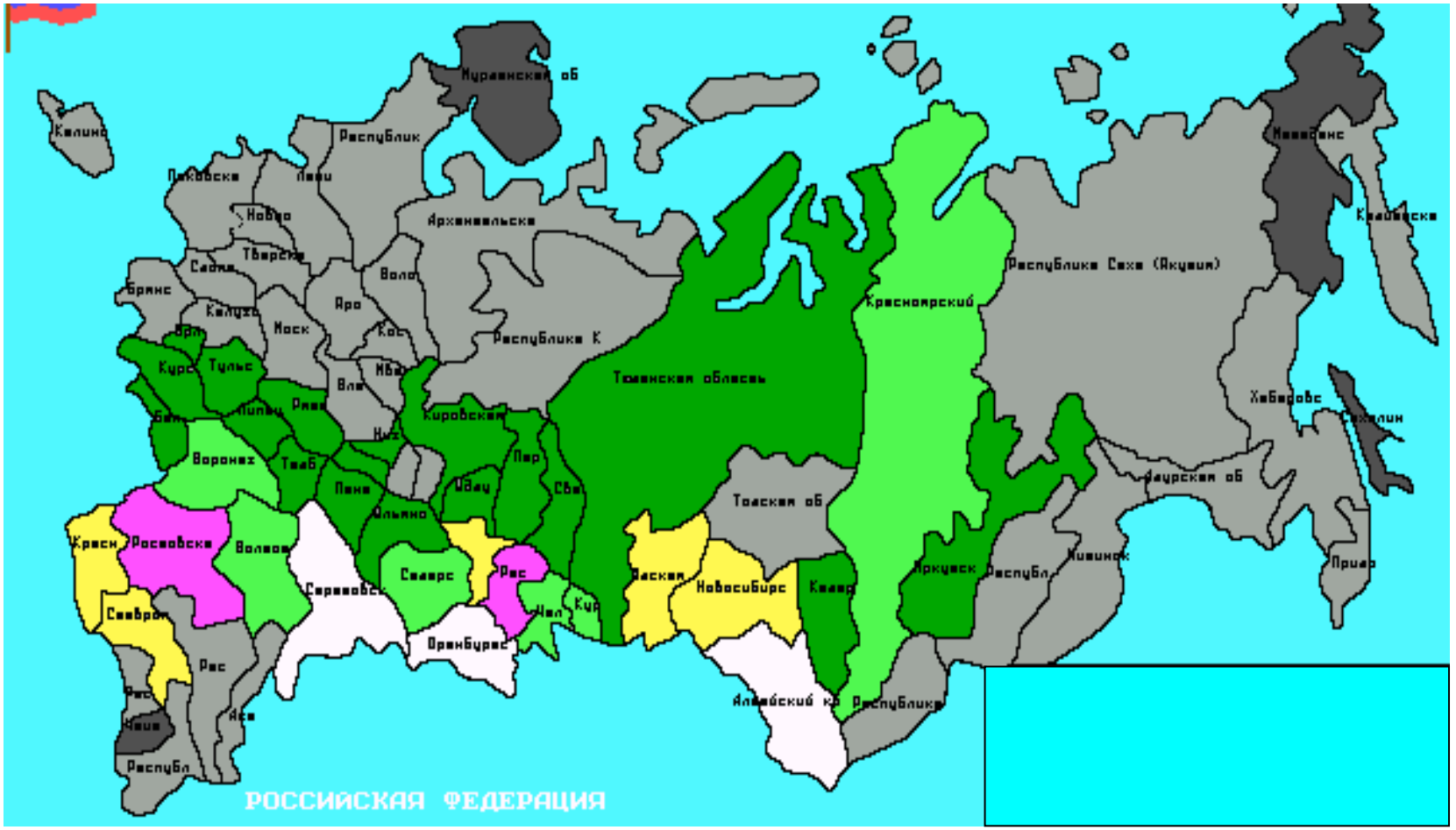
RUSSIAN FEDERATION, GNU VIM ROSSELKHOZACADEMY

MARCHENKO
OLEG
STEPANOVICH,

REPRESENTATIVES OF RUSSIAN FEDERATION AND CIGR IN OECD

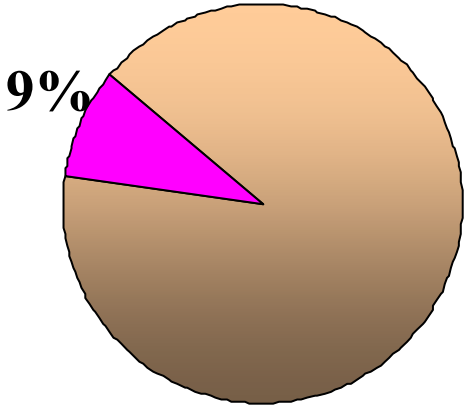
Section "TRACTORS AND CODES"

Regions of Russian Federation

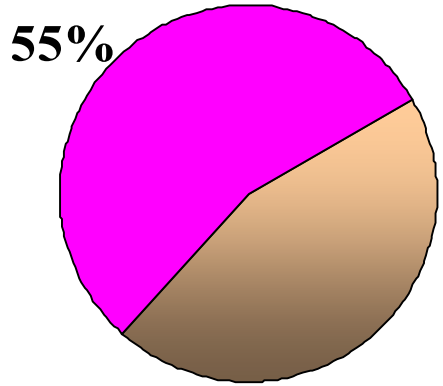


Share of Russia in world resources

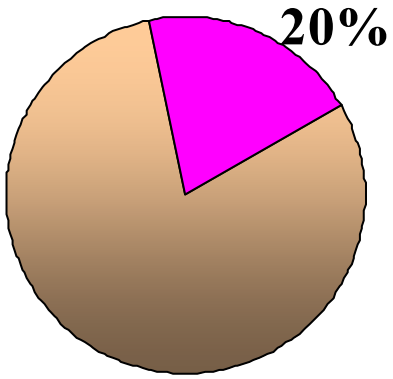
Arable land



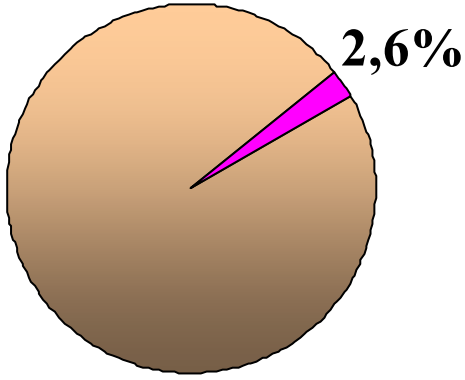
Chernozem soil



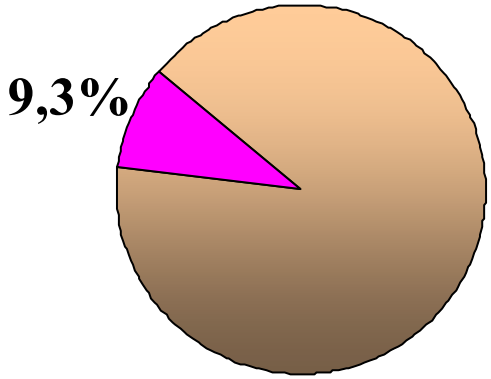
Fresh water



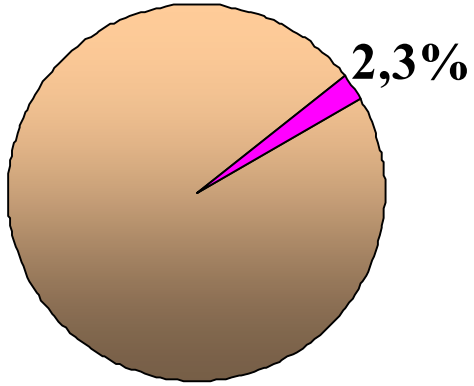
Pastures



Fertilizer



Population



Strategy of resources exhaustion (also of a biosphere) is destructive as for future and for present generations (Rio-de -Janeiro, 1992)

The Differentiation of Provision with Farm-Resources and Technique also the Average Level of Profitability in Priority Regions of Russia

Farm-resources, Technique, Economy Indices	Number of Priority Regions*	Farm-resources Used in Priority Regions, % of total amount
Mineral Fertilizer	9	52
Machines for Mineral Fertilizer Application	20	40
Chemicals for Plants Protection, including: -diseases control chemicals -pest control chemicals	 5 5	 70 63
Machines for Chemicals Application	10	40
Diesel Fuels, Lubricants	12	50
Tractors	15	44
Grain Harvesters	15	53
Forage Harvesters	15	47
Sugar-beat Harvesters	10	81
Average Gross output of Farm-products per 1 hectare, $	16 18	200 and above 130…200
Profitable Farm-producers, numbers	15	(5672 numb.) 58
Level of profitability on all activity without the State subsidies and compensation	8 8	10 and above 3 and above

*) Total number of regions in Russia – 89 but about 45 regions with developed Agrarian Sector

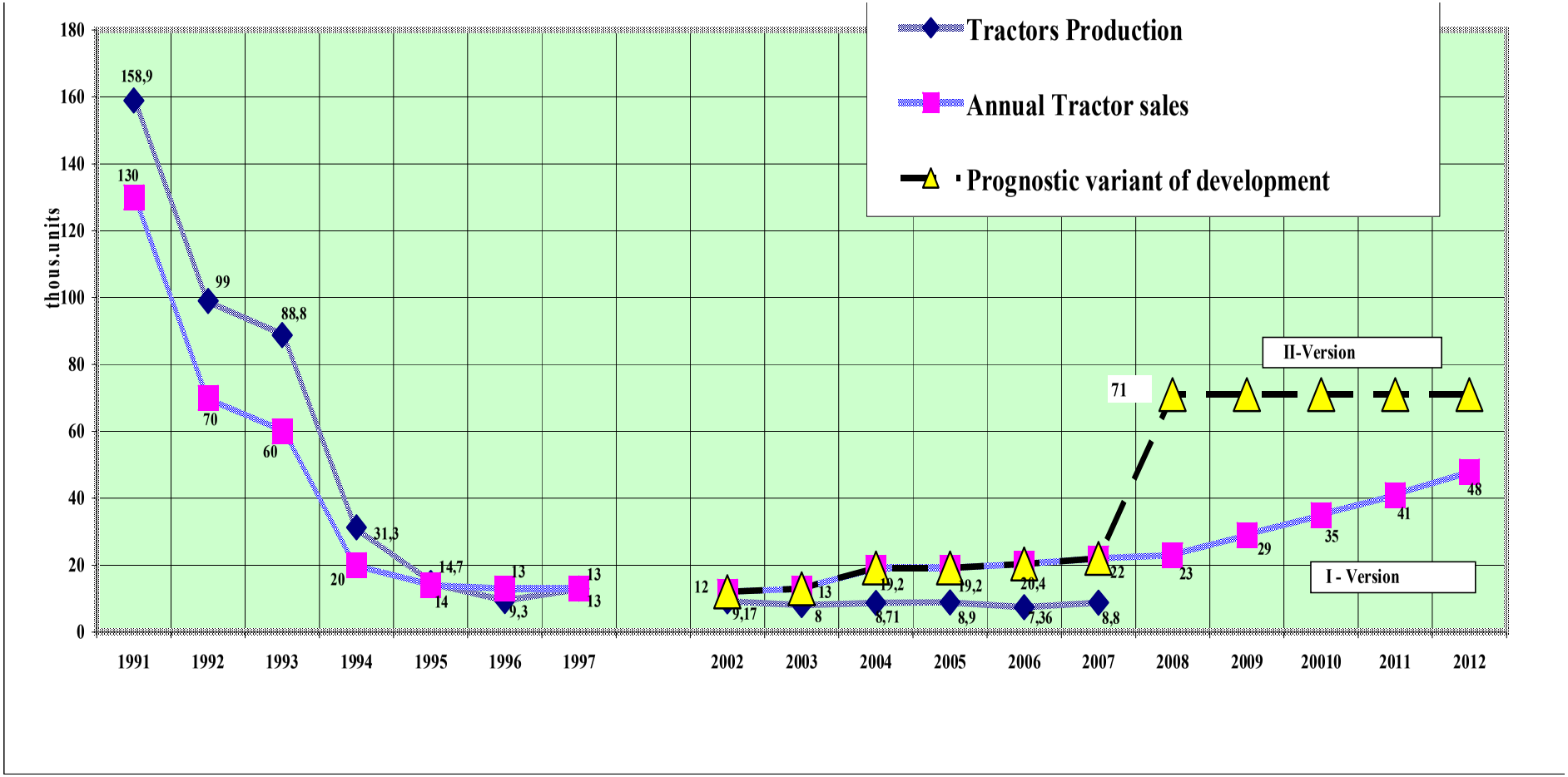
THE SPECIFIC CONSUMPTION OF DIESEL FUEL IN CROPS PRODUCTION TECHNOLOGIES (l / hectare)

FARM CROPS	USA	RUSSIA
Winter Wheat	30,9…43,9	71,1…96,4
Corn for Grain	74…88	161,5…217
Corn for Silage	52,4…81,3	156,8…206,1
Oat	30,9	60,6…101,6
Barley	30,9	56,4…101,6

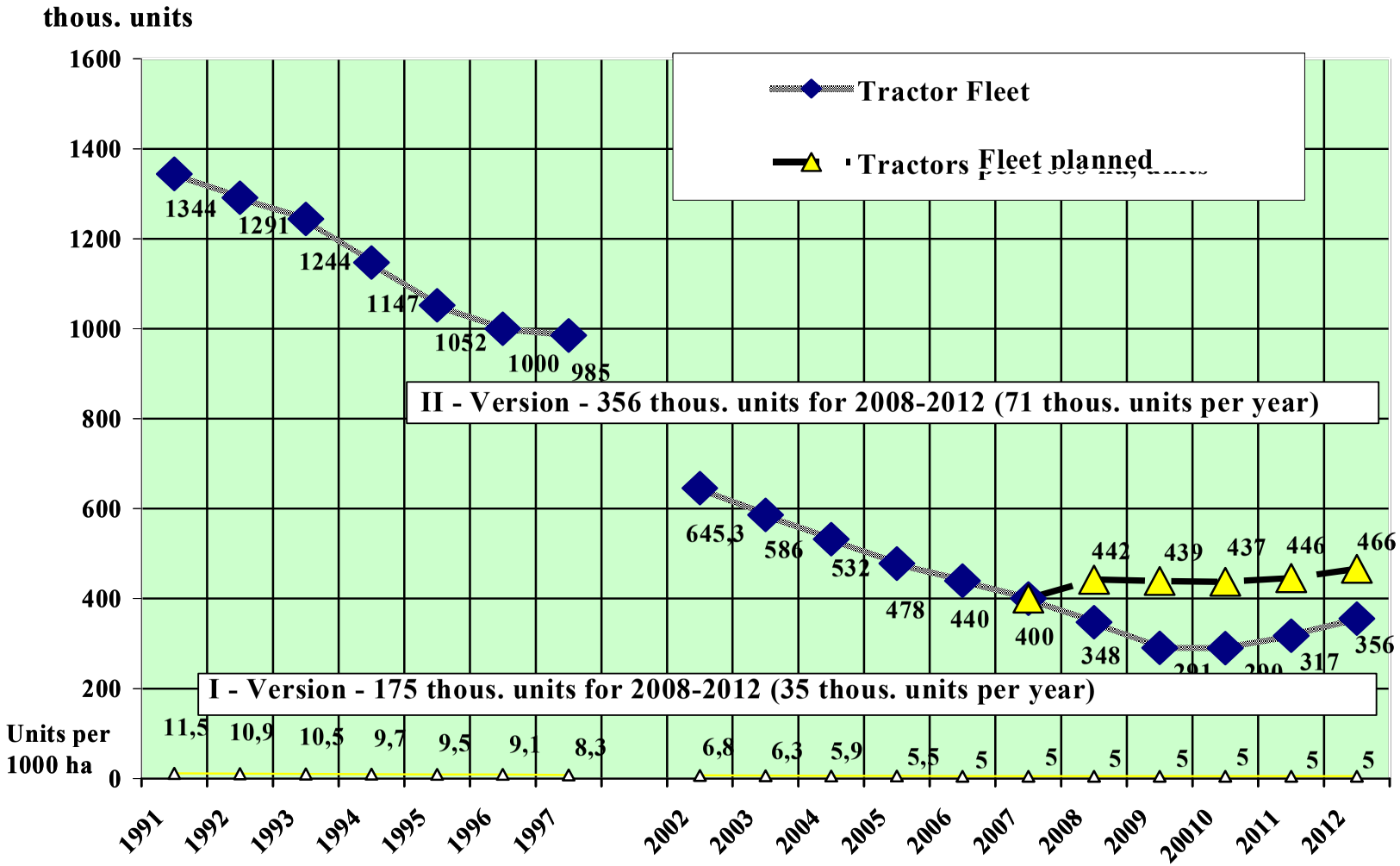
*) Data of VIM (Drincha V.M.)

About 40 mln. ha of arable long-fallow land in Russia are not used now

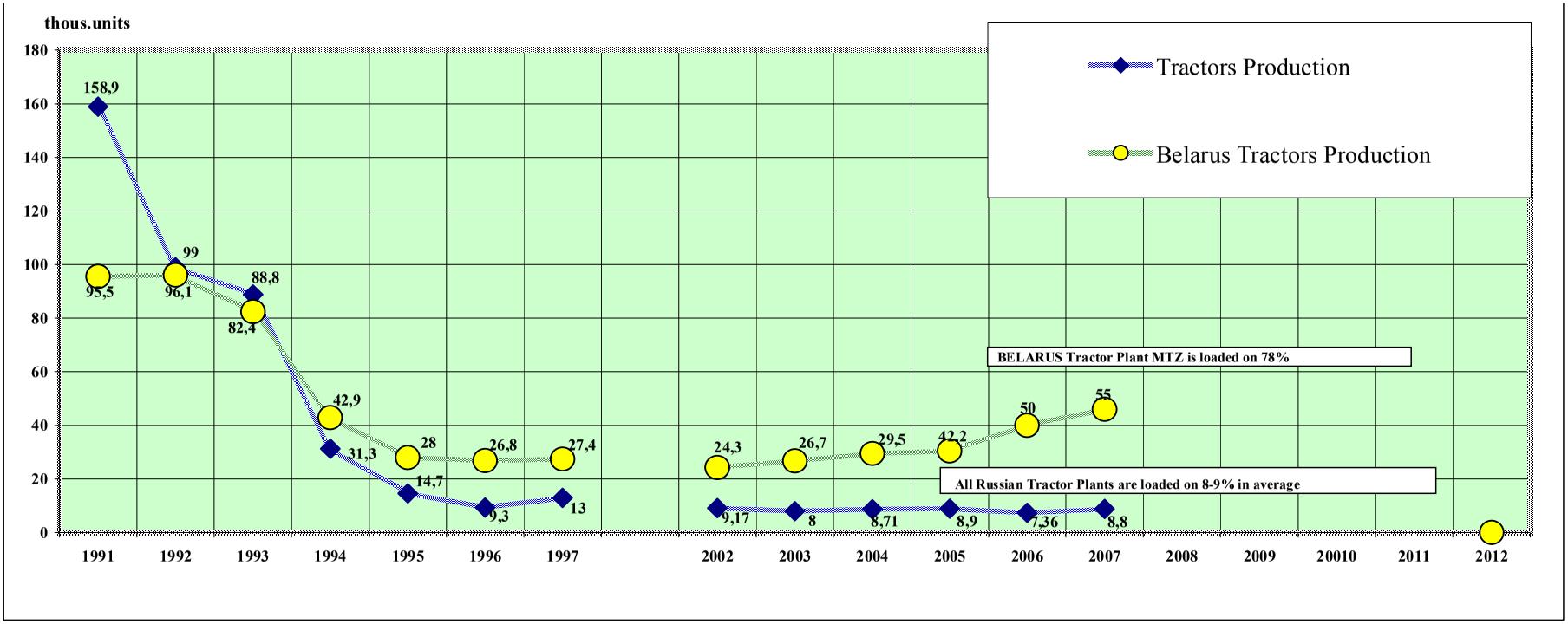
Annual Tractors Production and Sales in Russia during



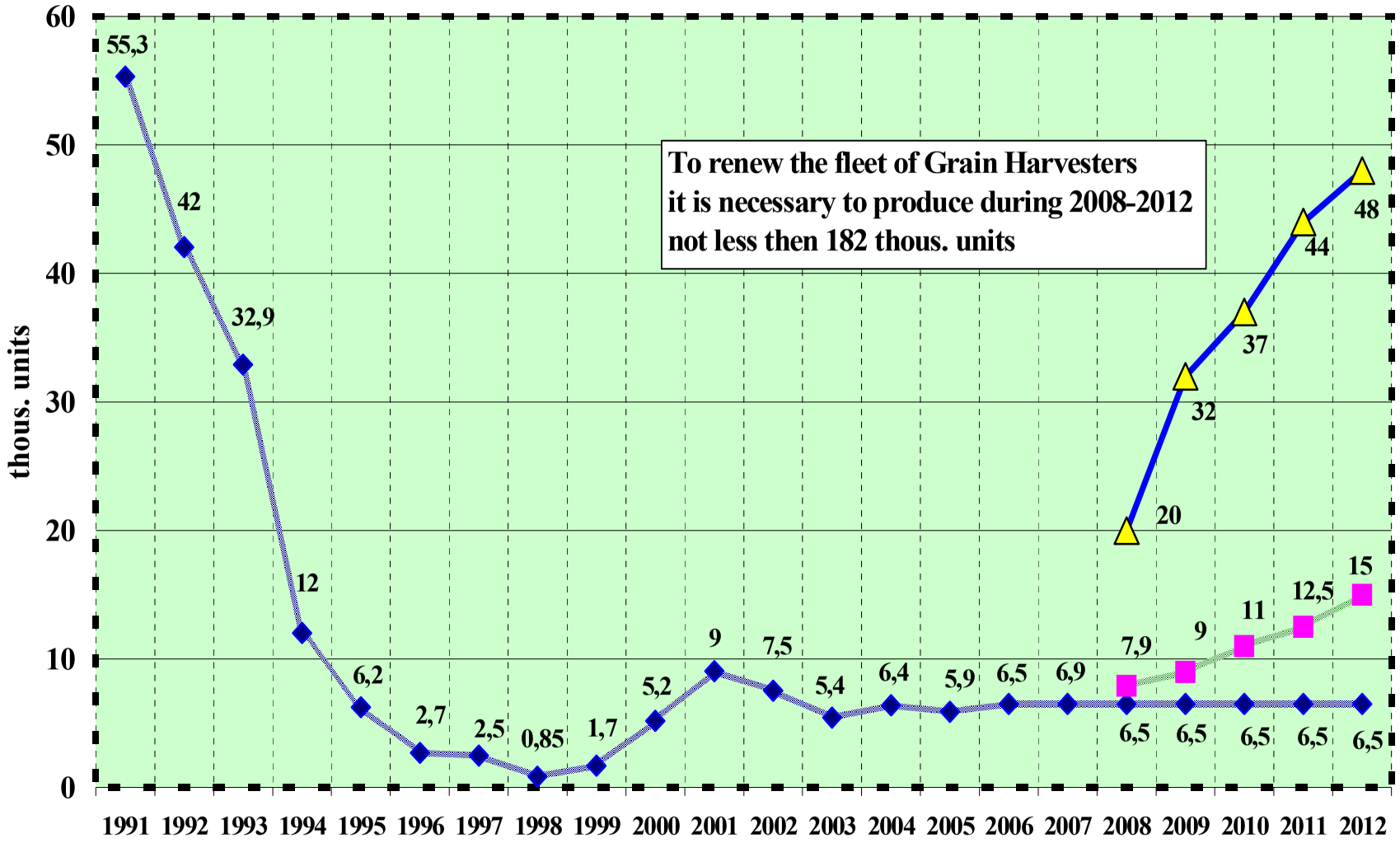
Russia Agriculture Tractor Fleet decreasing for 1991-2007 and conditions of its stabilization on the level of 2006



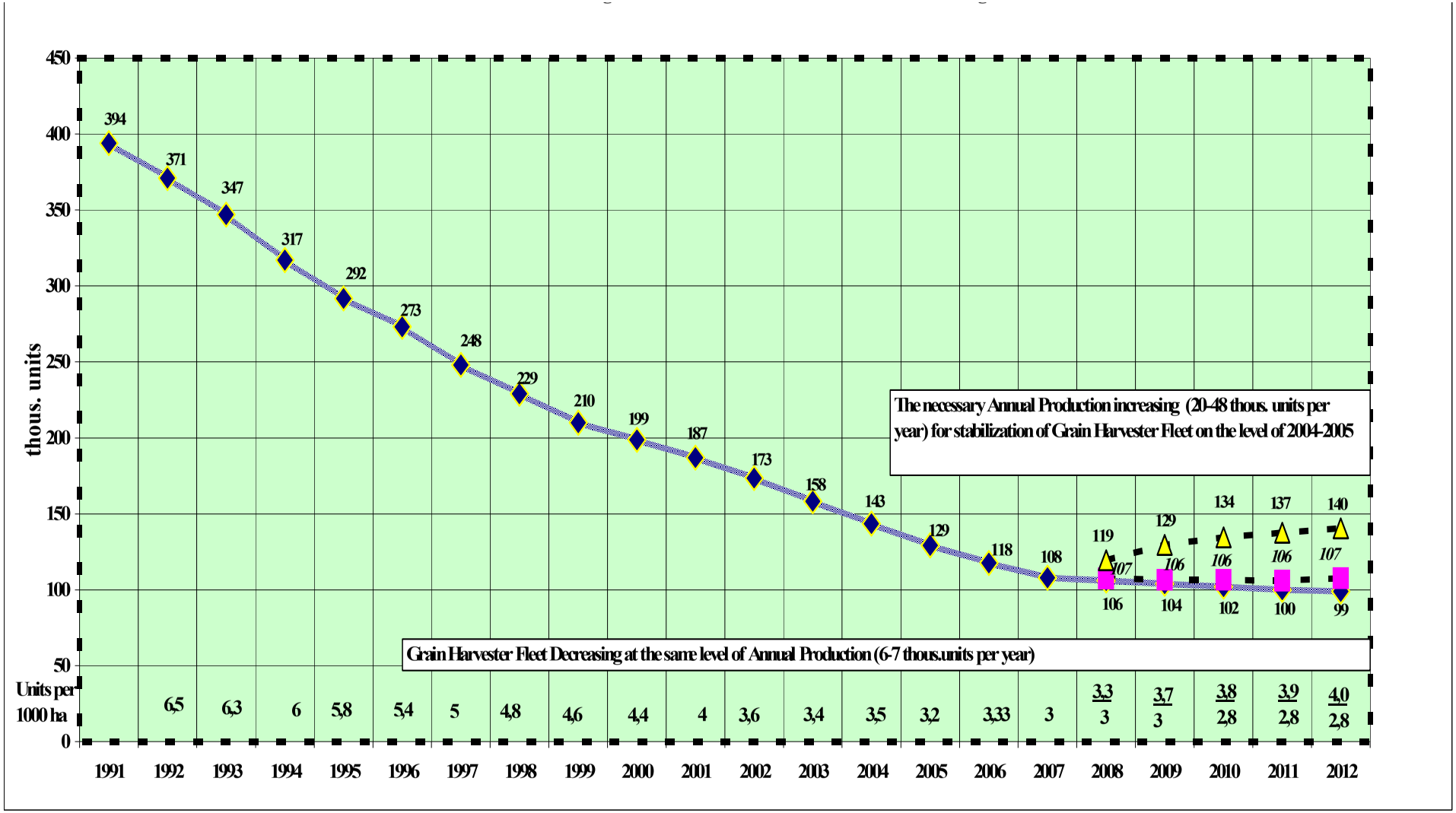
Tractors Production and Sales in Russia and Belarus during 1991-2007



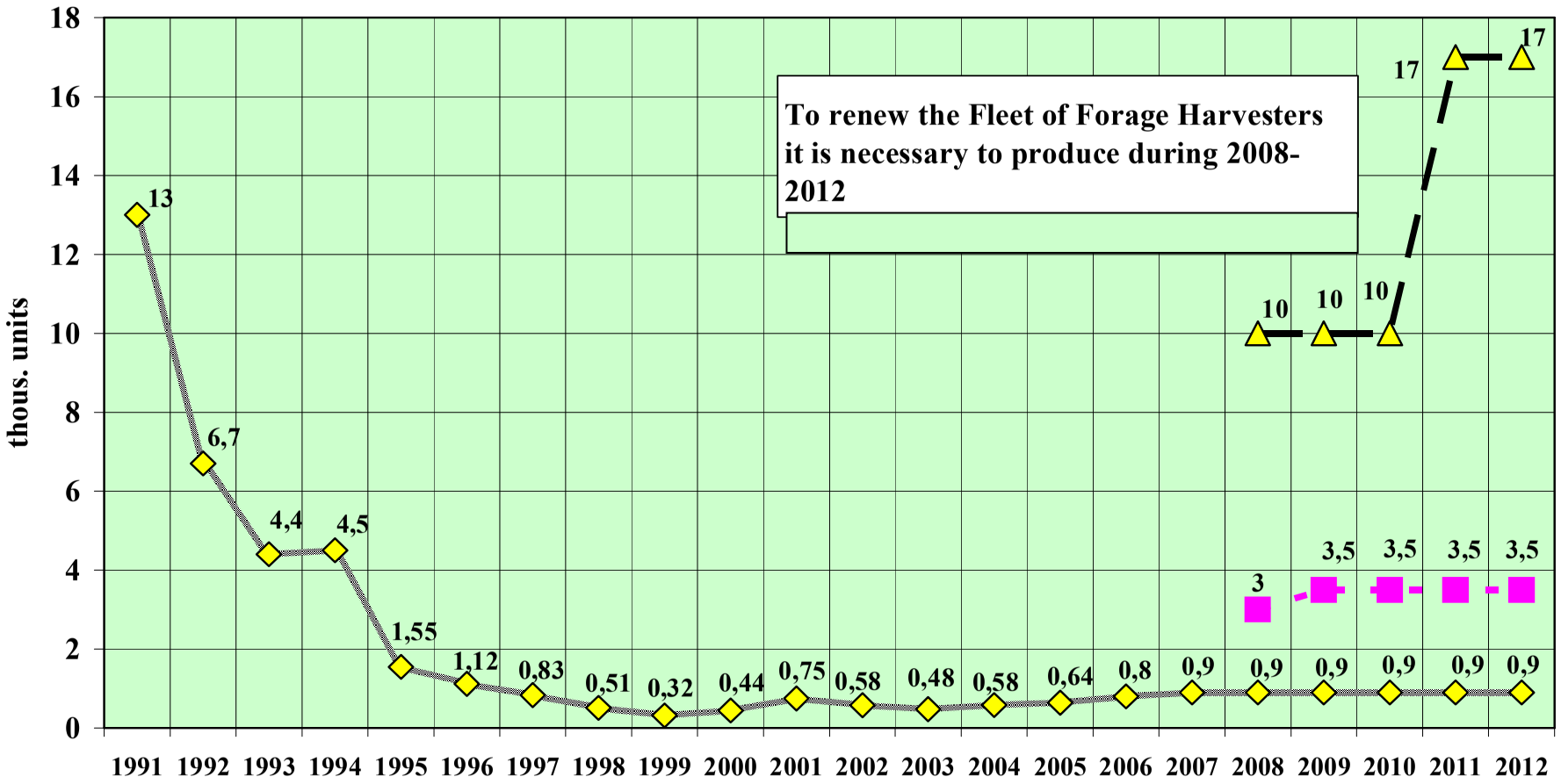
Grain Harvester Annual Production and the necessary its increasing



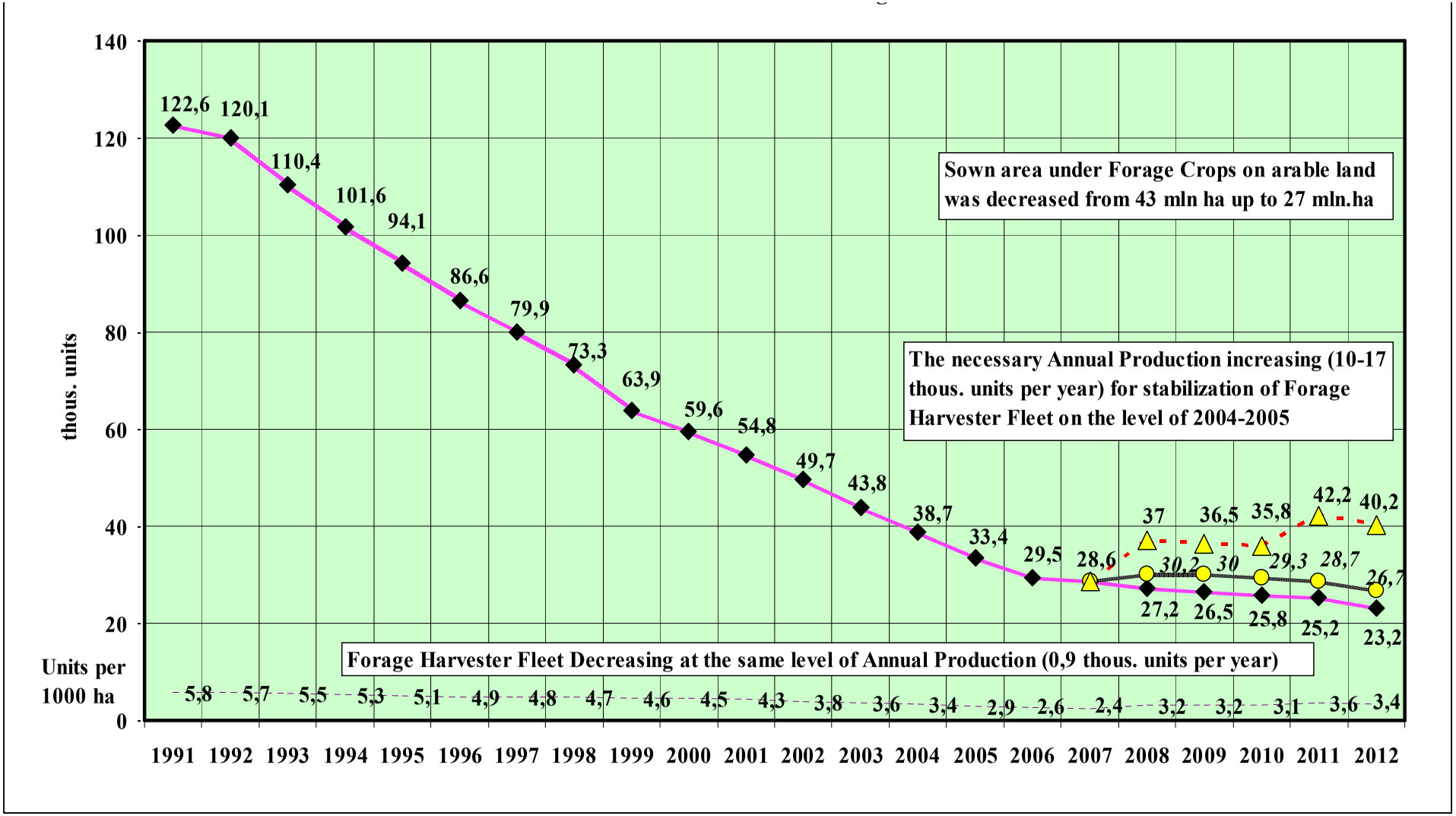
Grain Harvester Fleet decreasing for 1991-2007 and the conditions of its stabilization during 2008-2012



Forage Harvester Annual Production for 1991-2007 and the necessary its increasing during 2008-2012 for stabilization of the Forage Harvester Fleet on the level of 2004-2005



Forage Harvester Fleet decreasing for 1991-2007 and the conditions of its stabilization during 2008-2012



Analysis of tendencies of development of the agricultural tractors and the proposals for optimization of the tractor fleet structure

1. Analysis of the tractor market in RUSSIA and BELARUS;
2. The tendencies of development of the tractor market in Italy;
3. Comparison of market of tractors in RUSSIA, BELARUS and ITALY;
4. Analysis of the application of the rotary tillage machines in ITALY;
5. Market of Grain and Forage Harvesters in RUSSIA;
6. Tractor Fleets and Arable land Resources of the 8 Countries;
7. Proposals for optimization of Tractor Fleet Structure in the UNION STATE.

THE EXPERIMENTAL DATA OF INFLUENCE OF THE MACHINE AND TRACTOR AGREGGATES ON THE CROPS YIELD LOSSES

***DEPENDS ON*:**

-MASS OF TRACTORS and MACHINERY;

- INFLATION PRESSURE in TYRES;

- NUMBERS OF PASSAGES OF THE DIFFERENT WEIGHT TRACTORS AND MACHINES IN THE FIELD.

THE YIELD LOSSES DEPENDS ON NUMBERS OF PASSAGES OF THE DIFFERENT WEIGHT TRACTORS AND MACHINES IN THE FIELD

Tractor mark	Inflation pressure, kPa at	Number of passages on the field	Losses of yields, %	Coefficient of variation
MTZ-80(3,87t)	150	1	9,0	80,8
YMZ-62 (4,2t)	150	2-3 4-5	14,1 19,8	66,5 50,0
DT-75(6,18t)	Track layer (150)	1	8,2	36,2
T-74 (4,2t)	Track layer	2-3 4-5	13,3 19,2	62,3 53,1
T-150 K (8t)	180	1 2-3 4-5	13,3 23,3 30,3	45,7 35,4 39,2
K-700 (13,0t)	200	1	17,2	41,4
K-700A(13,6t)	200	2-3	28,0	29,5
K-701(14,6 t)	200	4-5	35,1	28,6

THE YIELD LOSSES OF GRAIN AND FORAGE CROPS DEPENDS ON THE SOIL COMPACTION BY THE DIFFERENT TRACTORS WITH THE SAME DRILL SEEDER

Indicators	Т-150К, ДТ-175	ДТ-75М, Т-74	Т-150К	Т-150К with double tyres	К-700	К-700 with double tyres
Pressure on the soil, kPa	80	160	180	136	200	135
Yield, %	100	90,3	82,6	85,5	76,9	84,2

The experiments were conducted in the 18 real agricultural enterprises in different regions of Russian Federation

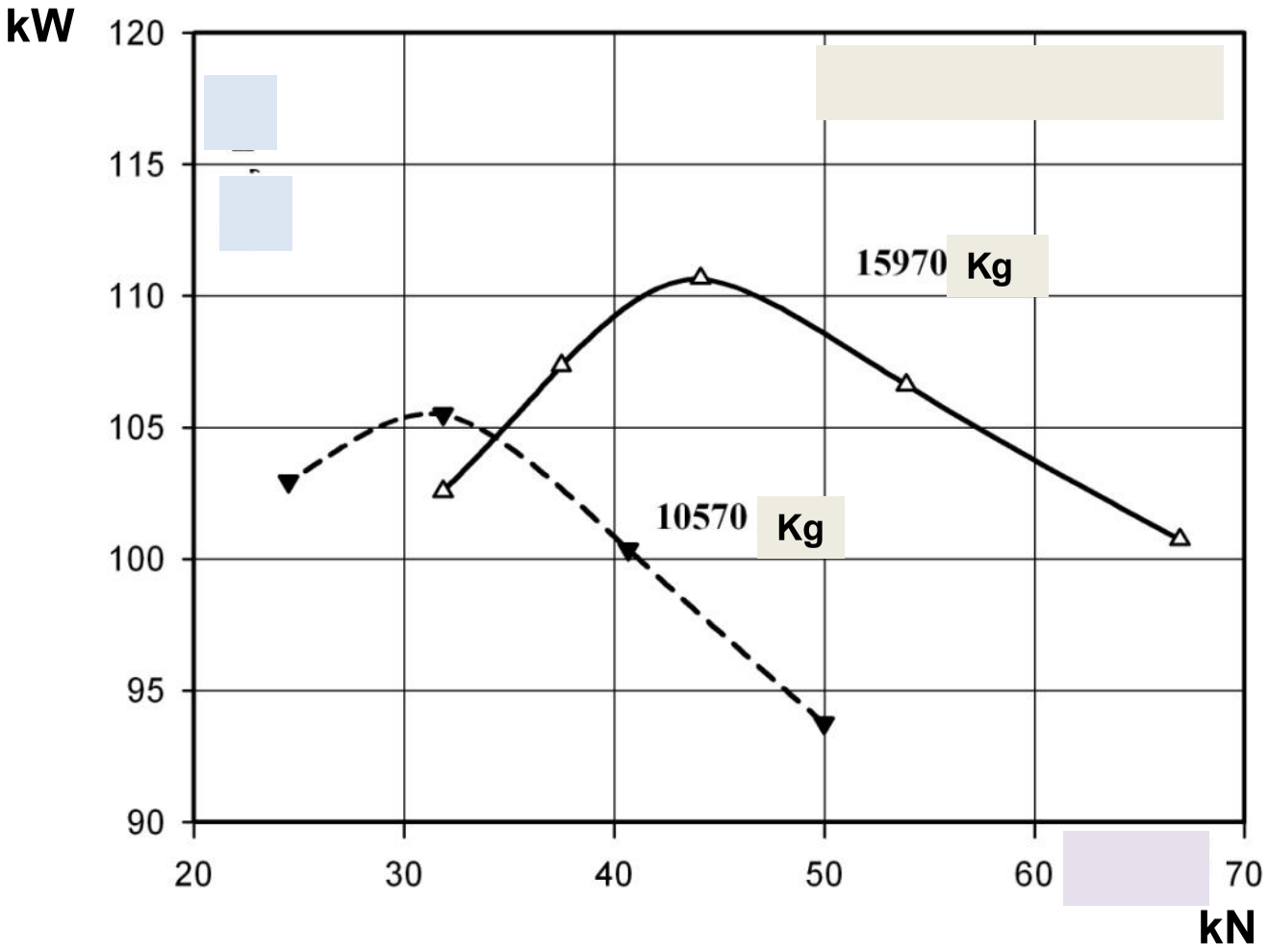
TRACTIVE EFFORT TESTS OF TRACTORS MTZ-1221 and MES-200 IN EXPERIMENTAL CENTER OF VIM

TRACTOR MTZ-1221(4WD)
TEST ON THE ROAD

Tyres rear axle 28LR26
Power - 90,4 kW
Mass - 4,64 t

MOBILE POWER UNIT MES-200
WITH CHANGEABLE LOAD
from 10570 Kg up to 15970 Kg
Power – 147 kW, Mass - 8 t

TRACTIVE EFFORTS (kN) and POWER (kW)
of the MES-200 on the stalk field tests at empty capacity (f=0,69 at 105,1 kW and 32 kN). When it filled with 5400 Kg (f=0,724 at 110,7 kW and 44,1 kN). When mass is 15970 Kg and traction force increased to 70-75 kN, the slippage was ~14% and ratio of weight usage was decreased on 15-25%



The results of tractive efficiency of 225 wheeled tractors of different models at OECD Codes testing

1. As known the increase of the mass of wheeled tractor of different types and their ballasting allows to increase the tractive efficiency at different soil conditions;

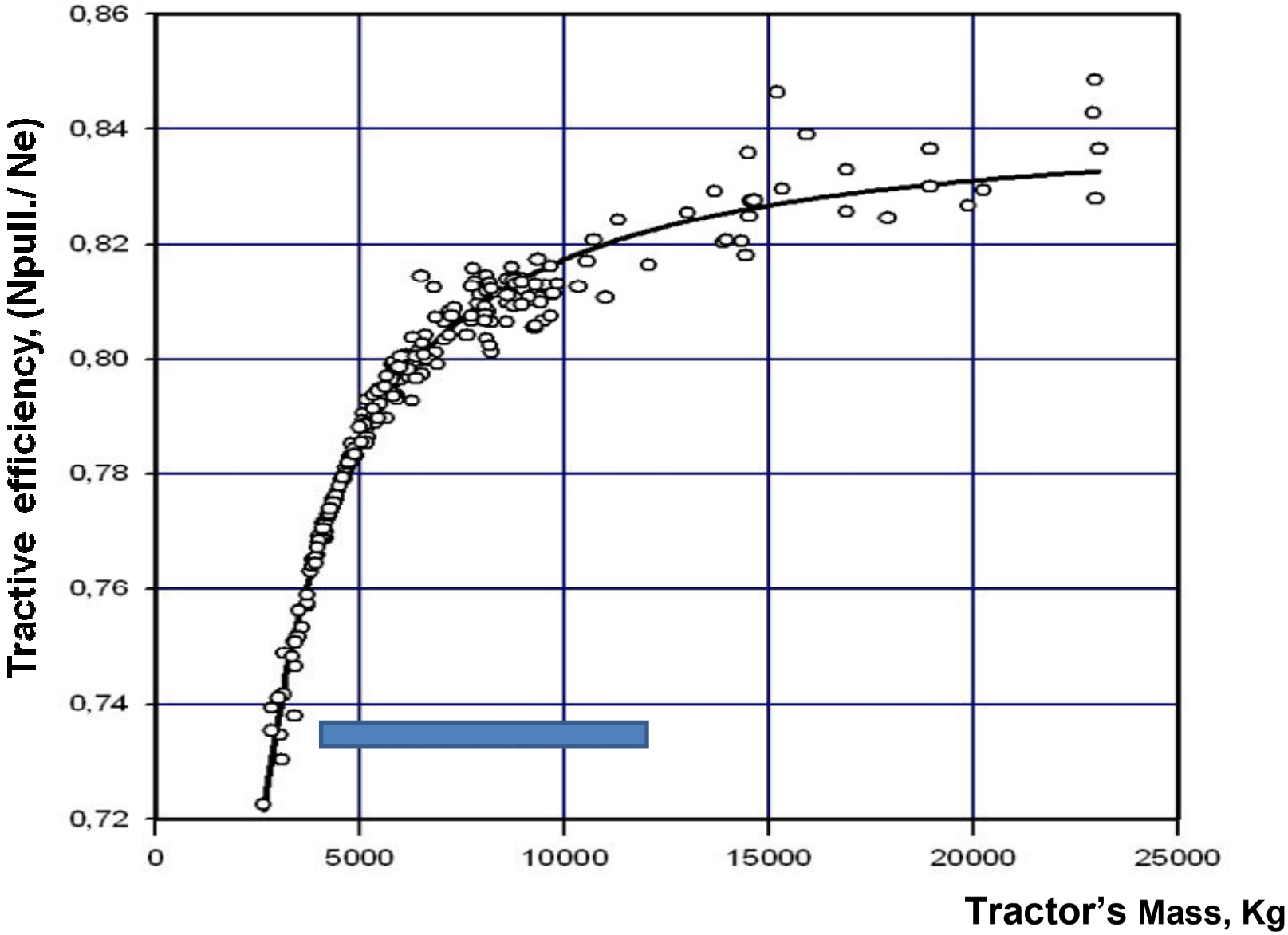
2. However the utilization of the very heavy tractors with mass above the 15-18 tons are not justifiable because of high compaction on the soft soils in the fields;

3. The experimental data made by VIM shows that the use of the heavy tractors in different regions of Russia and CIS countries the losses of yields of grain and forage crops increase up to 9-17% at one pass and they reach 25-30% at 4-5 passes of machine-tractor aggregates;

4. So all the real advantages concerning with increasing of the high output at comparatively low specific fuel consumption of powerful and heavy tractors cannot precede of the negative features of soil compaction;

5. The next picture shows that the tractive efficiency of tractors with mass about 10000 Kg (~0,82) not exceed it much when tractors has a mass of 15000 Kg (~0,825) and of 20000 Kg (~ 0,83).

The tractive efficiency (Npull. / Ne) of 225 wheeled tractors at different weight



THE CHARACTERISTIC OF THE NEW TYPE OF THE UNIVERSAL POWER UNIT UES-290/450 FOR THE UNION STATE (RUSSIA – BELARUS).

Mark of machine	Engine power, HP	Working speed, km/h	Transport speed, km/h	Rated draw bar pull, kN	Lift load of mounted systems, kN		Mass, Kg
					Front	Rear	
UES-290/450	290…450	до 15	до 30	50	60	25	12800

Standard Tyres model (rear axle) and inflation pressure, kPa	Standard Tyres model (front axle) and inflation pressure, kPa	Set of changeable wheels			Mass distribution for axles, %
		Wide profile with the tyres models		Double wheels with the tyres models	
480/70R30 250 kPa	30,5L32 160 kPa	800/65R32 540/65R30	1050/50 R32 800/45R30,5	20,8 R32 480/70R30	~50/50

INNOVATIONS IN CONSTRUCTION OF UNIVERSAL POWER UNIT UES-290/450

-application the modern engine (Euro-3) with “Common Rail system” and with optimal fuel consumption;

- utilization of the engine power up to 100% from the front power take off and up to 60% - from rear one with a high efficiency;

-aggregate UES with front and rear harvest machines and other machines with the active working tools;

-application of the double flow hydro-mechanical transmissions to get the draw bar pull up to 50-60 kN and high efficiency on tillage, transportation and other operations;

-improvement of the conditions of operator work, reversible post of steering, safety in work and maintenance of UES;

-application of navigation system;

-the high annually load of UES (1200-1500 hours) for fulfillment of different agricultural and other job in any time of the year;

INNOVATIONS IN CONSTRUCTION OF MACHINES FOR WORKING WITH UES-290/450

-application of rotary plow and rotary tillers on the base of UES gives the high efficiency, low level of resistant because they generate the support strength up to 4 kN/m;

-high quality of tillage of sward land of grasslands and pastures with rotary tillers for one pass of aggregate on the base of UES decrease the labor cost to 1,5-2 fold, fuel consumption to 30-40% and metal materials to 2,4 fold;

-application of the rotary working tools in harvest machines gives the possibility to support the optimal regime of the active working tools and to allow to regulate the parameters of technological processes of the cutting the forages and other materials.

ANALYSIS OF TRACTORS AND SELF-PROPELLED HARVESTERS

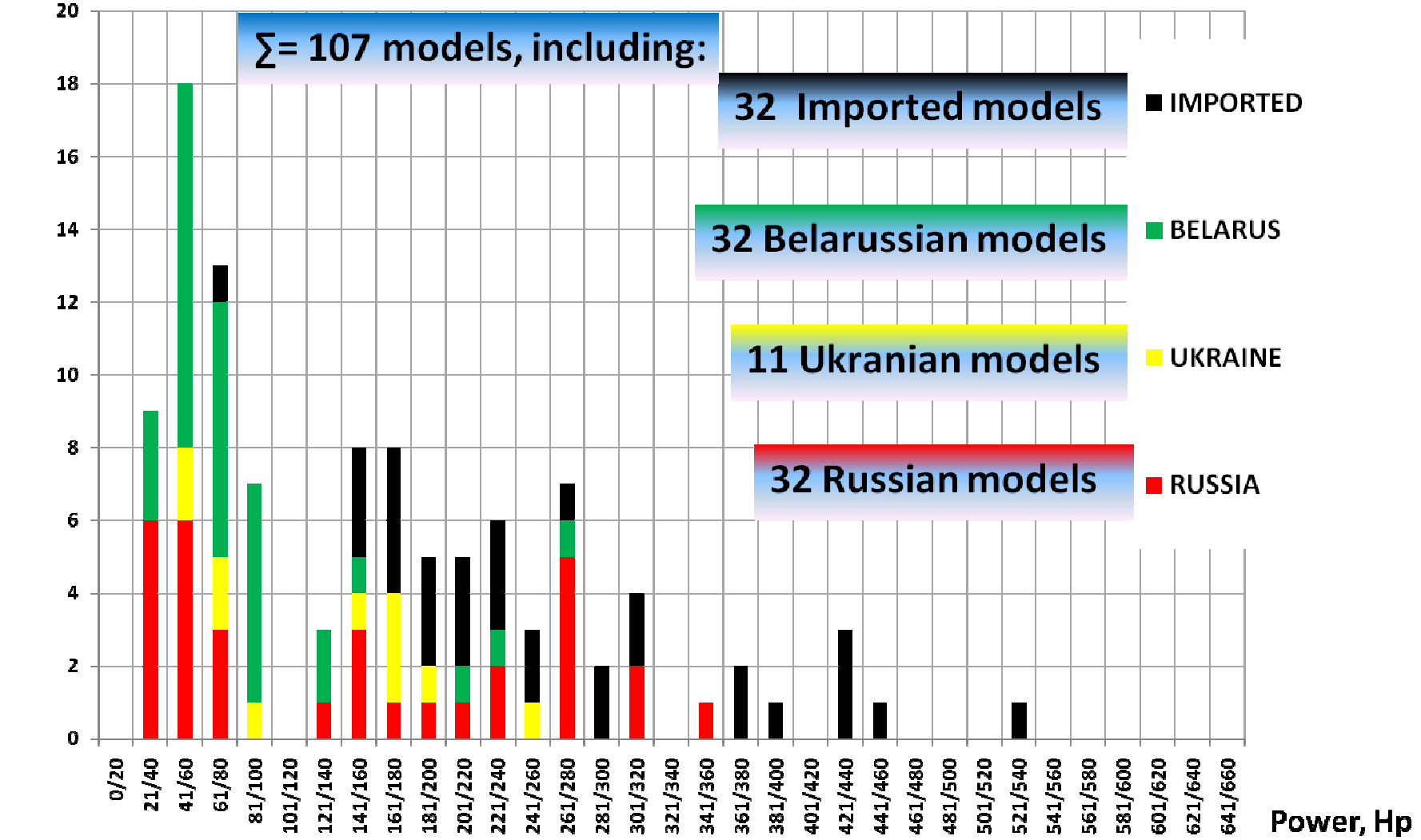
AND

PROPASALS FOR THE OPTIMISATION OF THE STRUCTURE

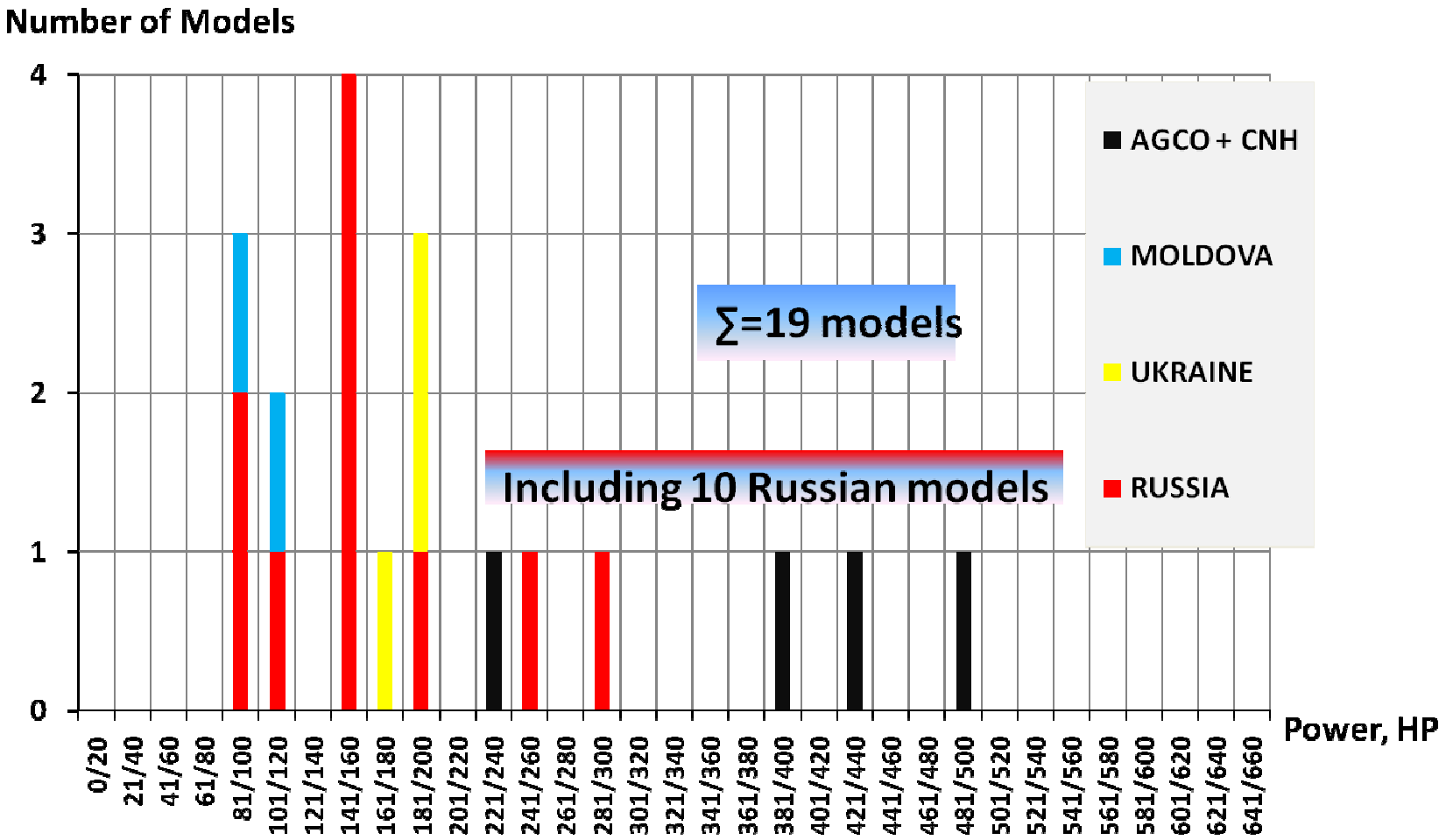
OF THE TRACTOR FLEET OF UNION STATE

(RUSSIA-BELARUS)

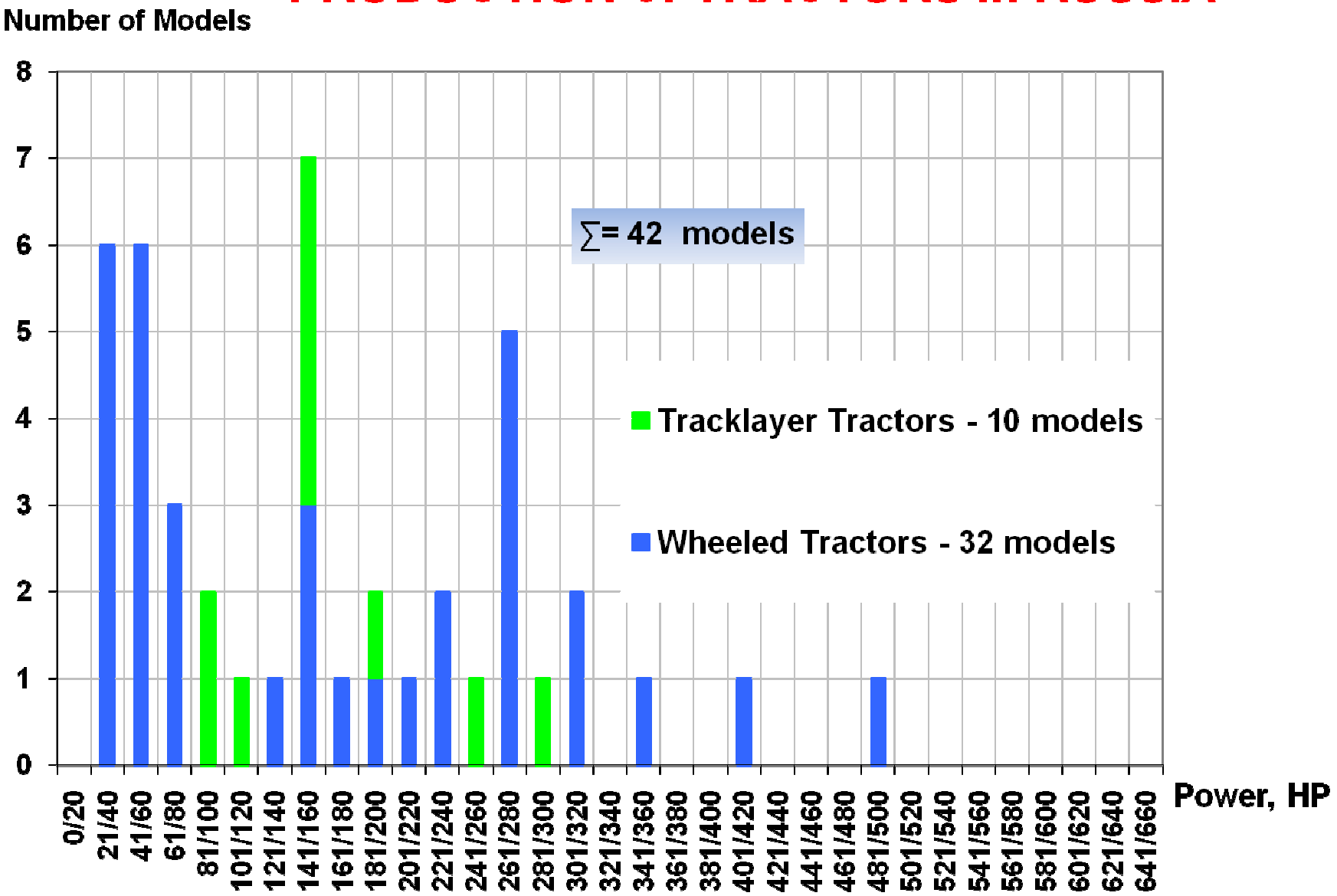
Market of wheeled Tractors in RUSSIA



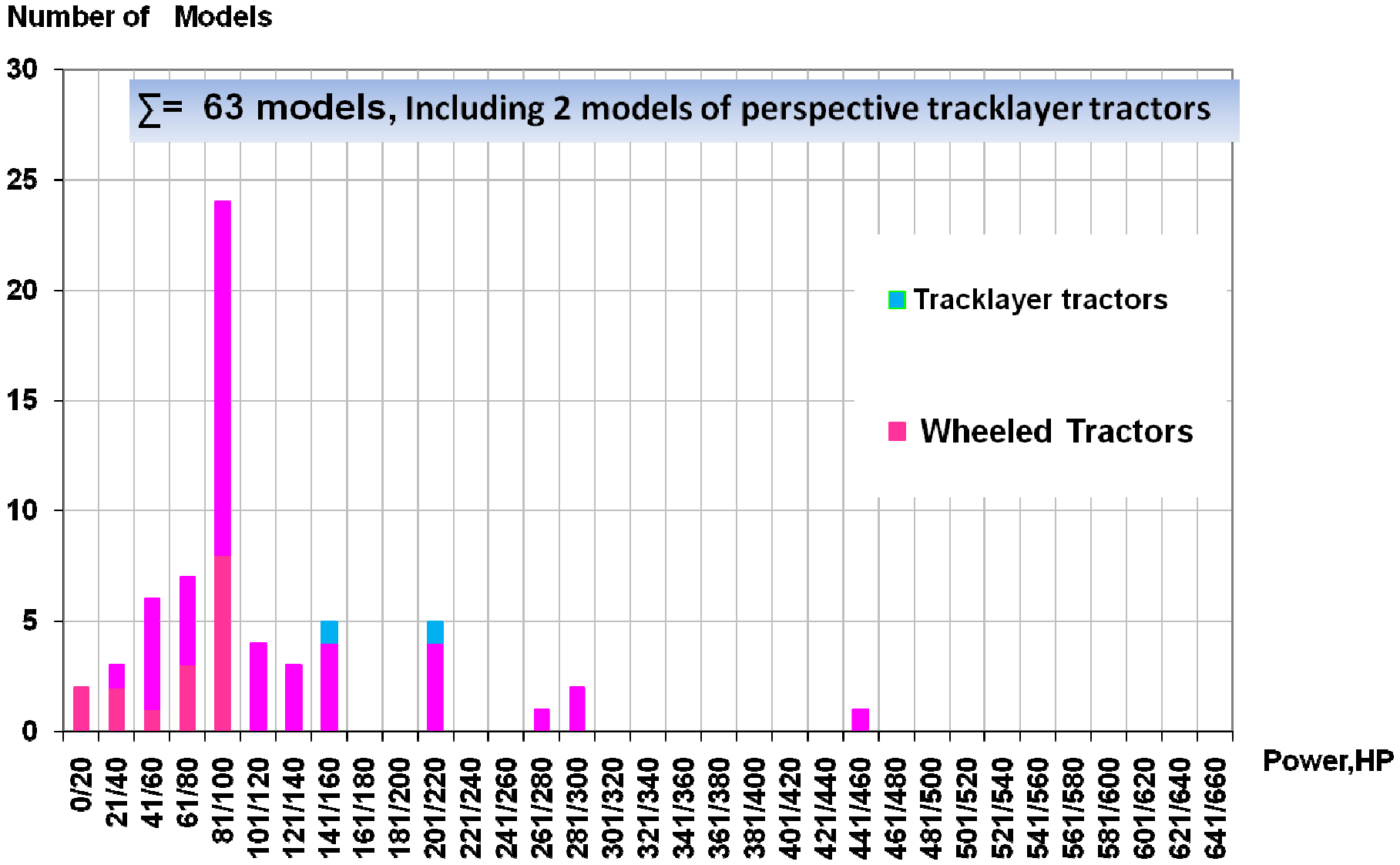
Market of Tracklayer Tractors in RUSSIA



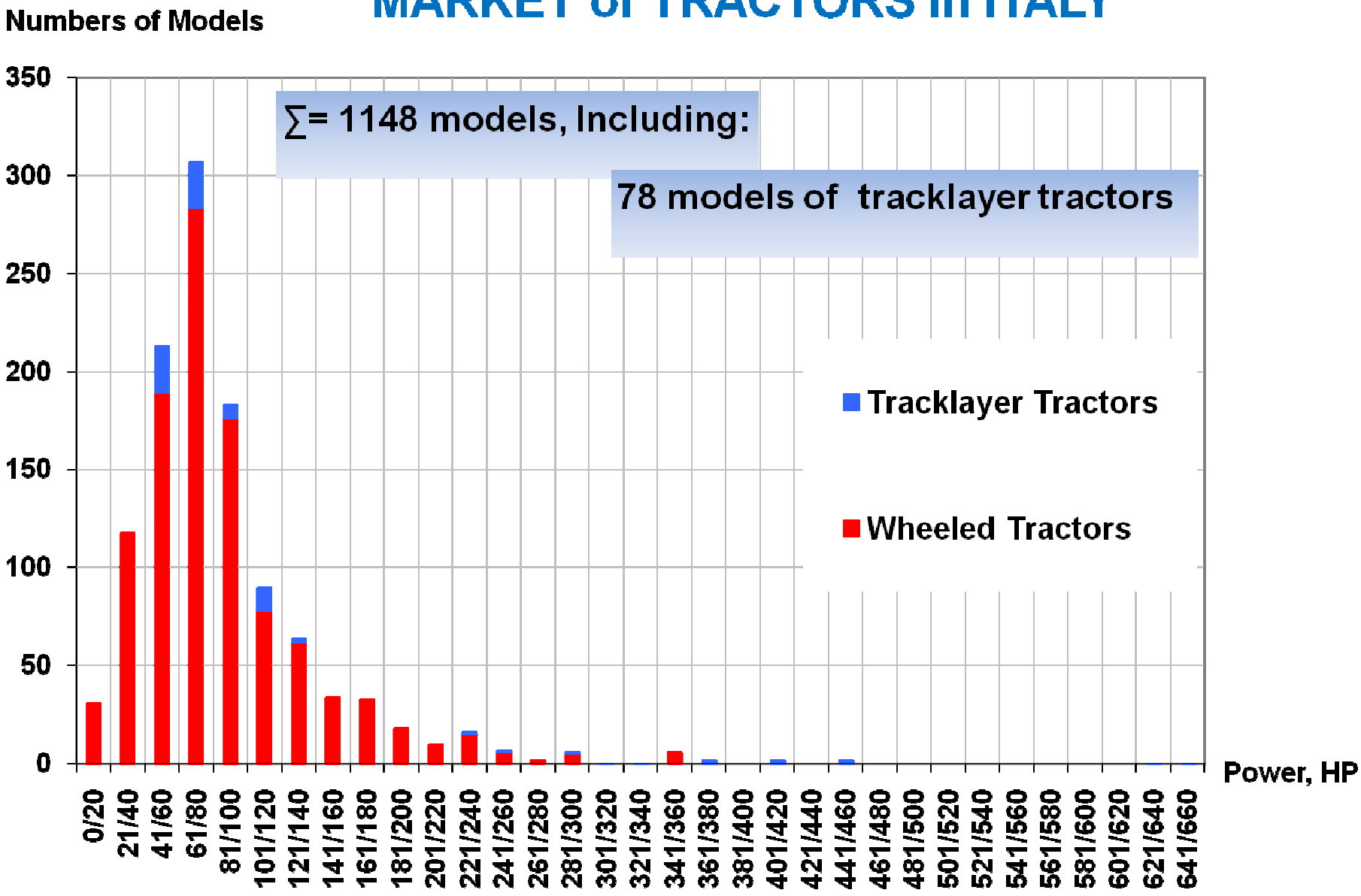
PRODUCTION of TRACTORS in RUSSIA



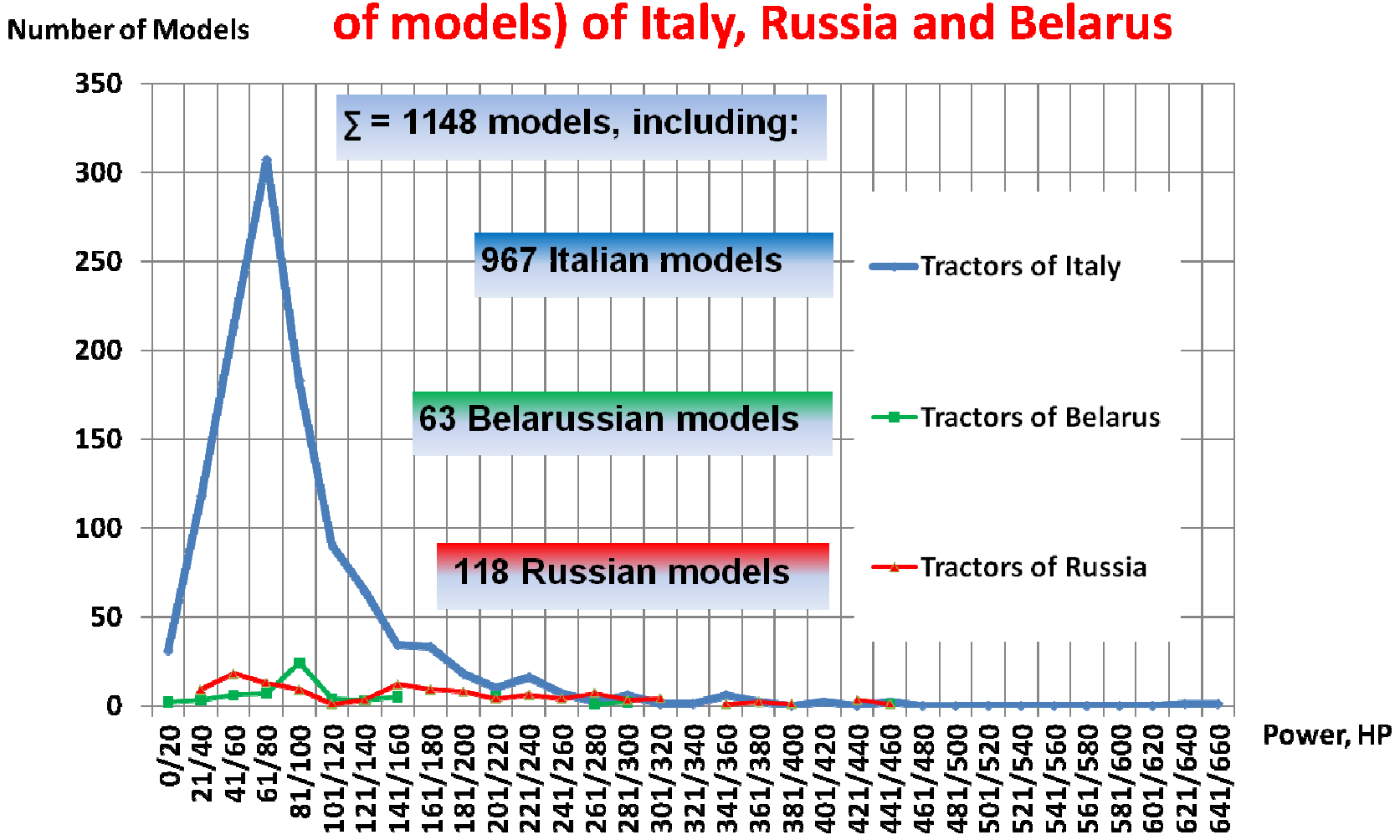
PRODUCTION of TRACTORS in BELARUS



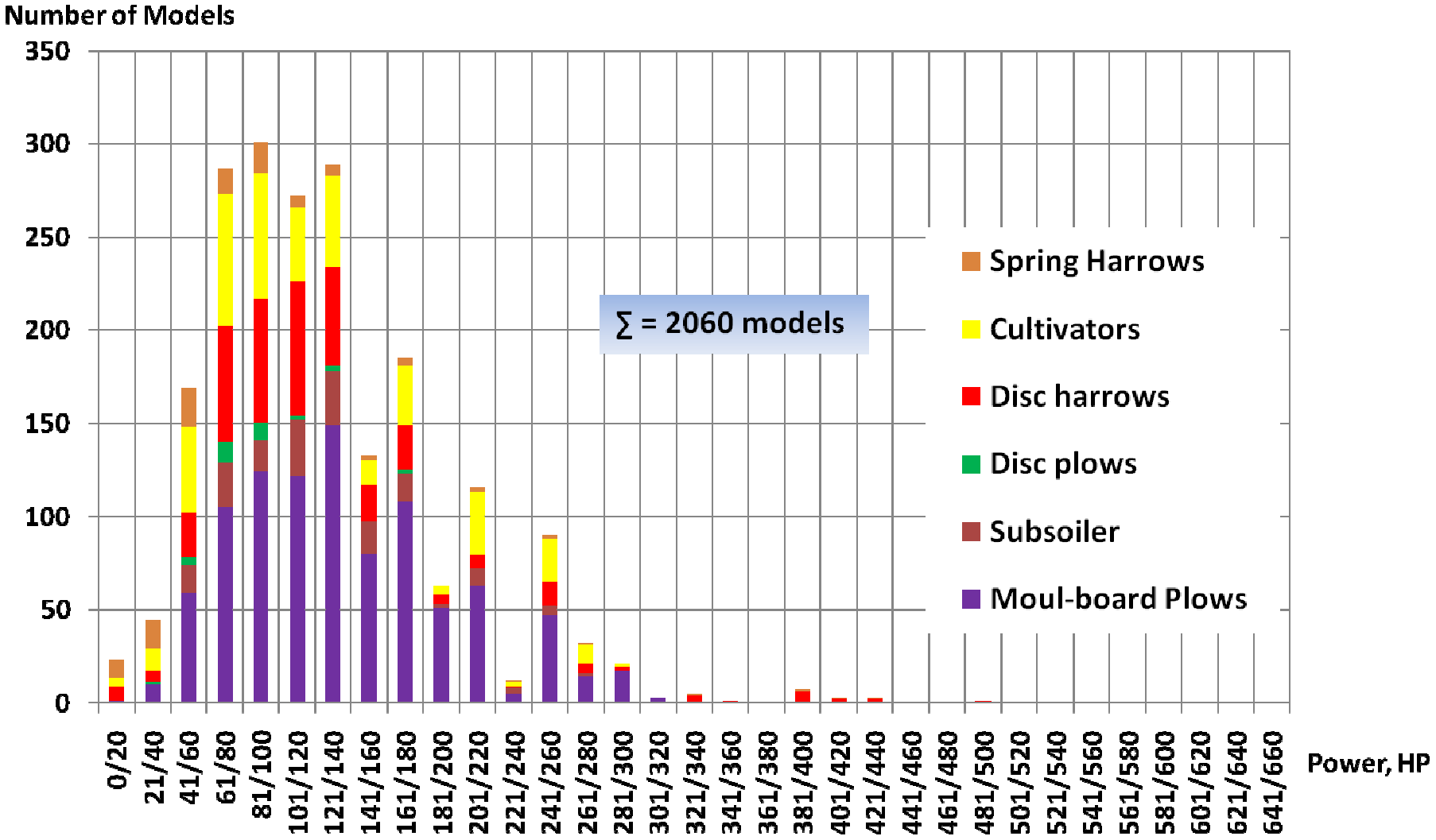
MARKET of TRACTORS in ITALY



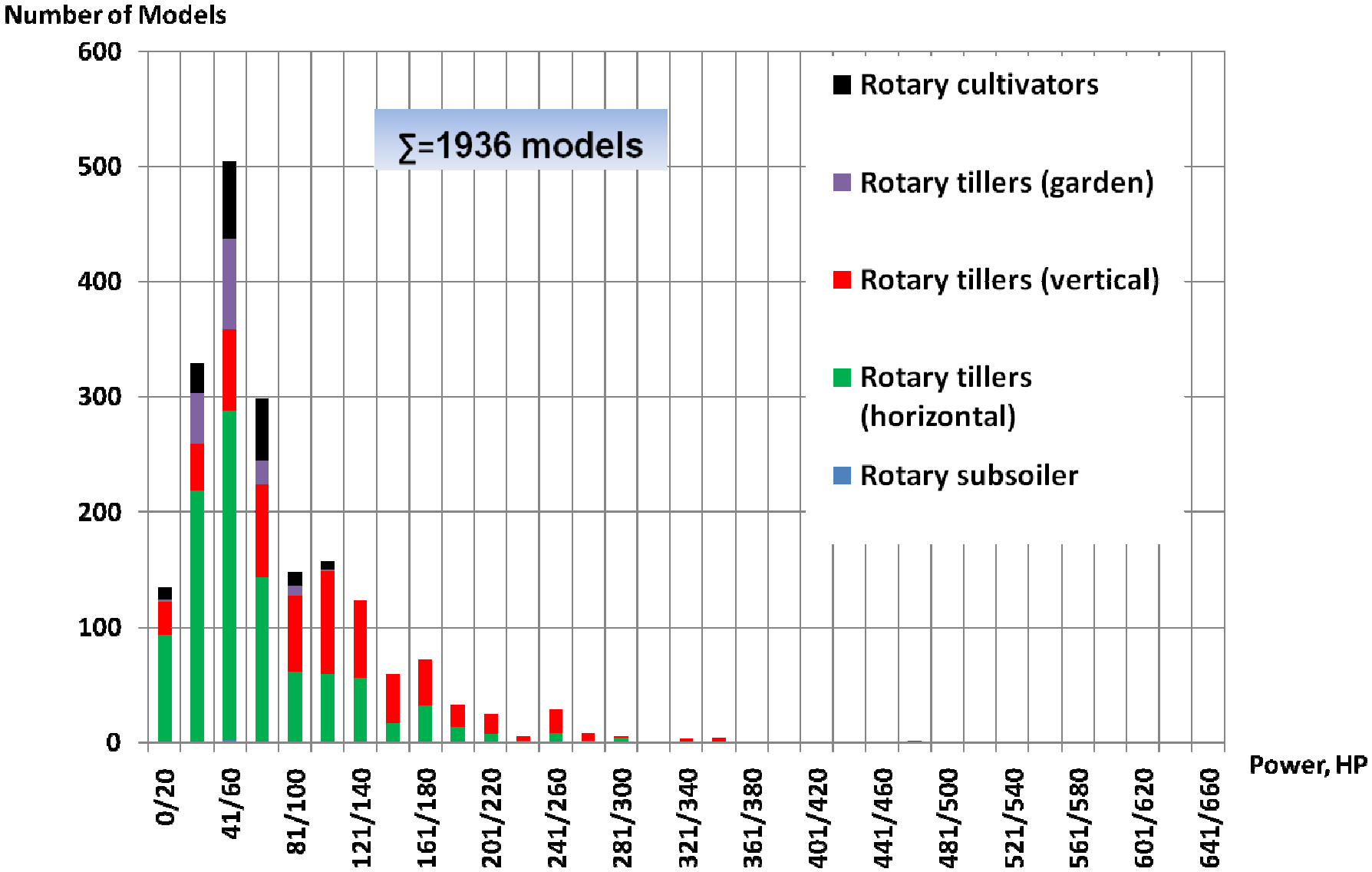
Comparison of Tractor Market (number of models) of Italy, Russia and Belarus



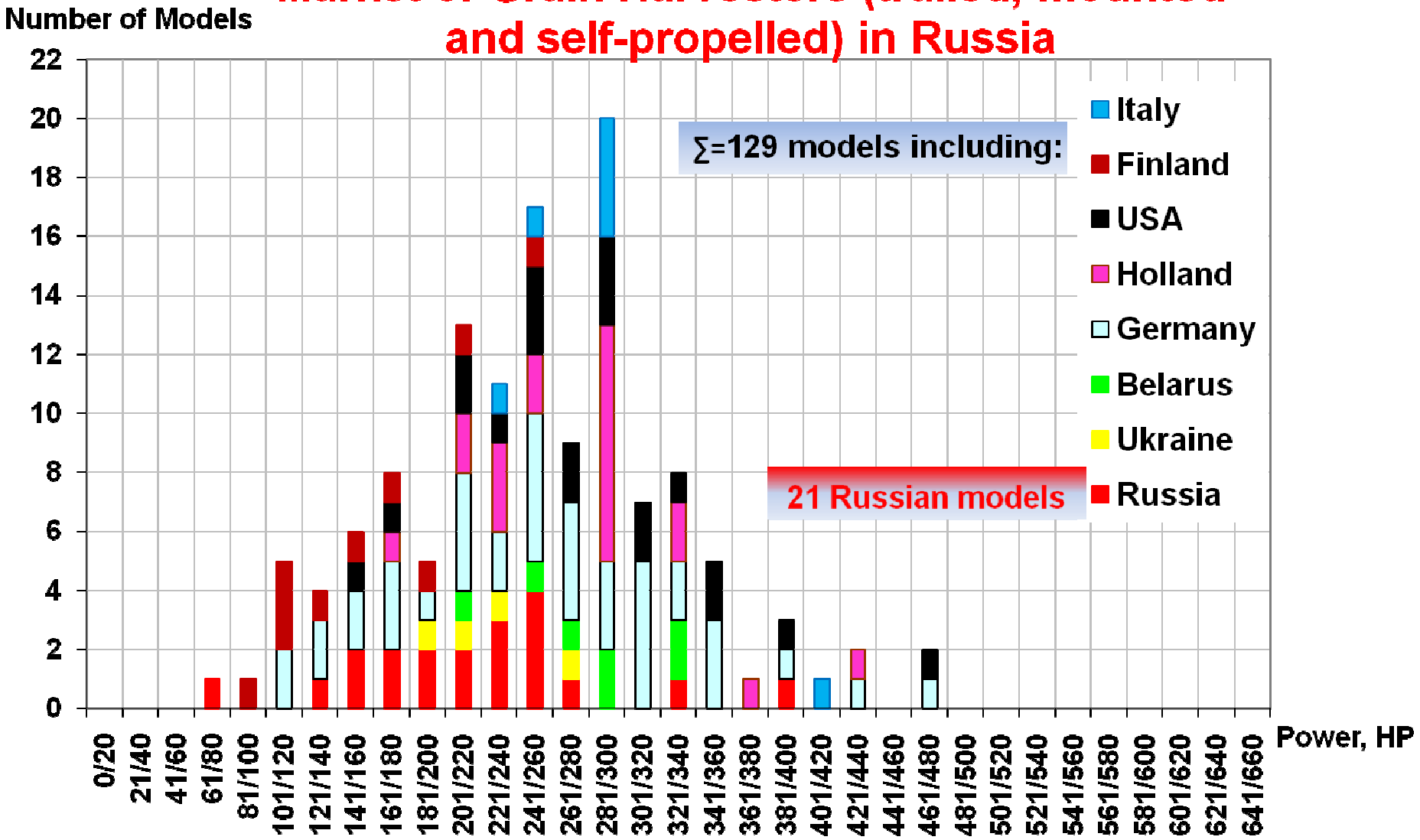
Market of Tillage machinery with passive working tools in ITALY



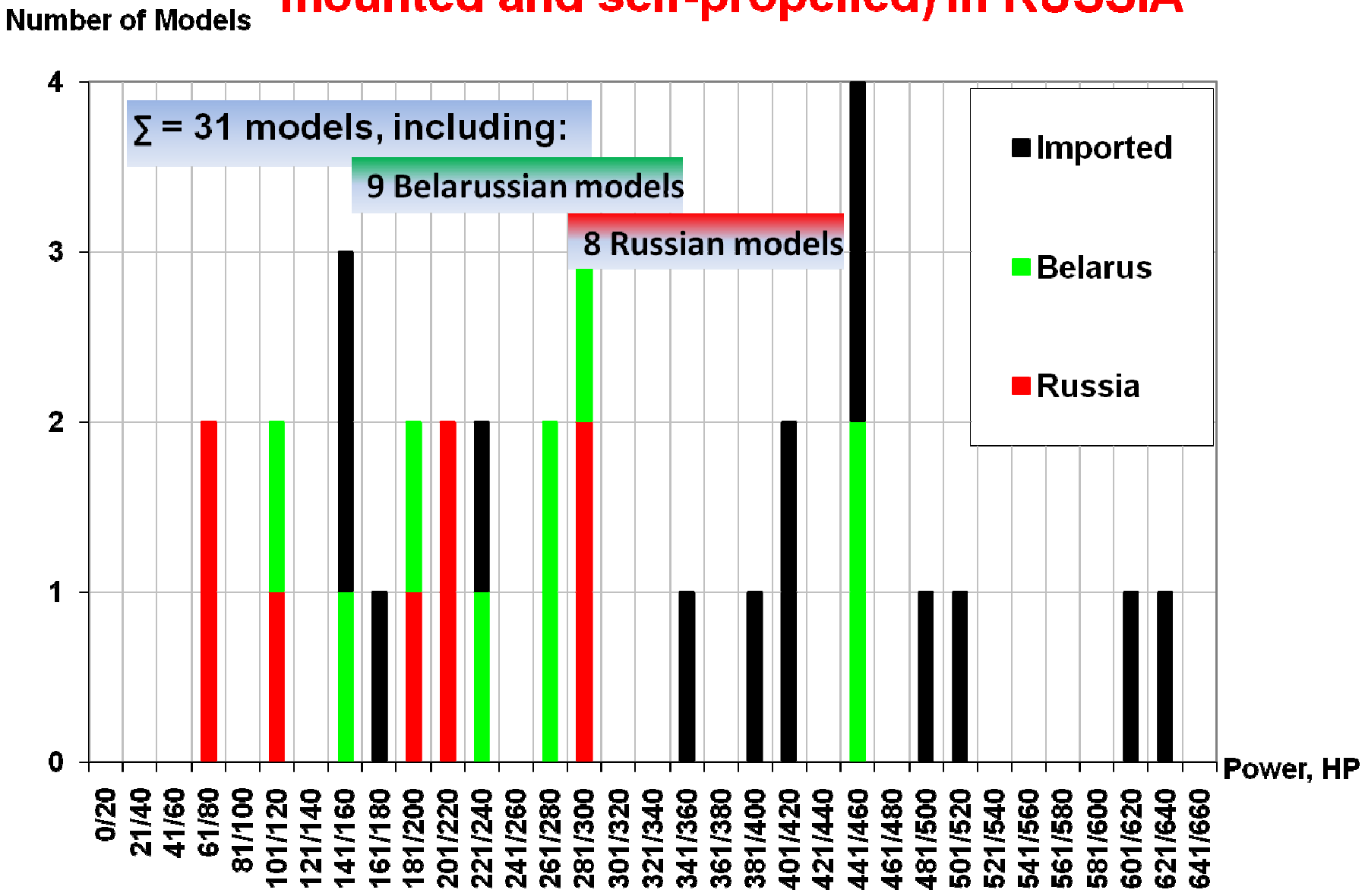
Market of Rotary tillage machinery in ITALY



Market of Grain Harvesters (trailed, mounted and self-propelled) in Russia



Market of Forage Harvesters (trailed, mounted and self-propelled) in RUSSIA



Tractor Fleets and Arable land Resources of the 8 Countries

№/№	Country		Arable land, mln. ha	Tractor Fleet, Thous. units	Number of tractors per 1000 ha of arable land	Rate of load per one tractor, ha
1.	RUSSIA	Agro-Enterprises	72,9 estim.	364,4	5,0	200,0
		Private farms	15,5	70,0	4,5	222,0
		Population plots	3,2	-	-	-
		Total	91,6	434,4	4,7	212,8
2.	USA		172,0	4760,0	28,0	35,7
3.	FRANCE		18,4	1264,0	69,0	14,5
4.	CANADA		45,9	733,0	16,0	62,5
5.	ITALY		8,0	1680,0	210,0	4,8
6.	GERMANY		11,9	944,0	79,0	12,7
7.	GREAT BRITAN		5,6	500,0	89,0	11,2
8.	JAPAN		4,7	2400,0	510,6	2,0

PROPOSALS FOR OPTIMISATION OF TRACTOR FLEET IN UNION STATE (RUSSIA-BELARUS)

The global standardization and unification of the key types of Tractors and Machinery are necessary for the next reasons:

1. **To decrease the mass of the high power Tractors and self-propelled Harvesters with using of the high efficient tyres and tracks systems;**

2. **To save resources, labor and increase of the agricultural machinery efficiency;**

3. **To decrease considerably cost of industrial production and maintenance of the agricultural machines;**

4. **The introduction of the progressive technologies and efficient techniques to decrease the impact on the environment and support the fertility of land.**

COMPARISON OF MASS (t) AND POWER (HP) AND TRACTION FORCE (kN) OF THE TRACTOR FLEET IN RUSSIA WITH IMPORTED HEAVY POWERFULL TRACTORS

AND

A PERSPECTIVE TRACTOR FLEET WITH OPTIMIZED STRUCTURE ON THE BASE OF SYSTEM OF UNIVERSAL POWER UNITS,

WITH INTERVAL OF POWER (60-700 HP) AND POSSIBLE APPLICATION OF TRACKS FOR ONE OR TWO AXLES (STEP BY STEP):

UES - 60/100;

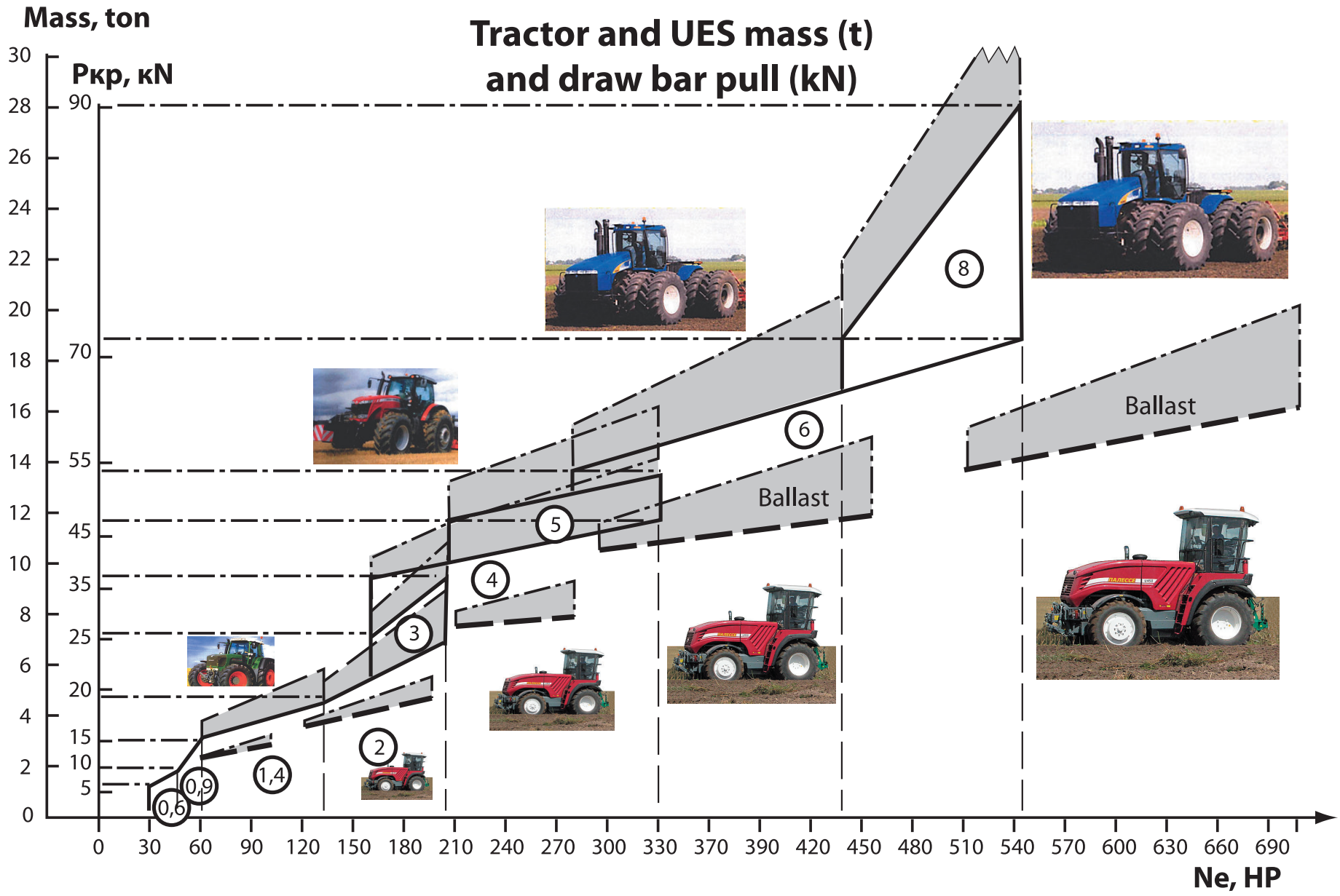
UES -120/200;

UES - 210/280;

UES - 290/450;

UES - 500/700.

System of universal mobile power units:
UES-60/100; UES-120/200; UES-210/280; UES-290/450; UES-500/700
(interval of power, HP)



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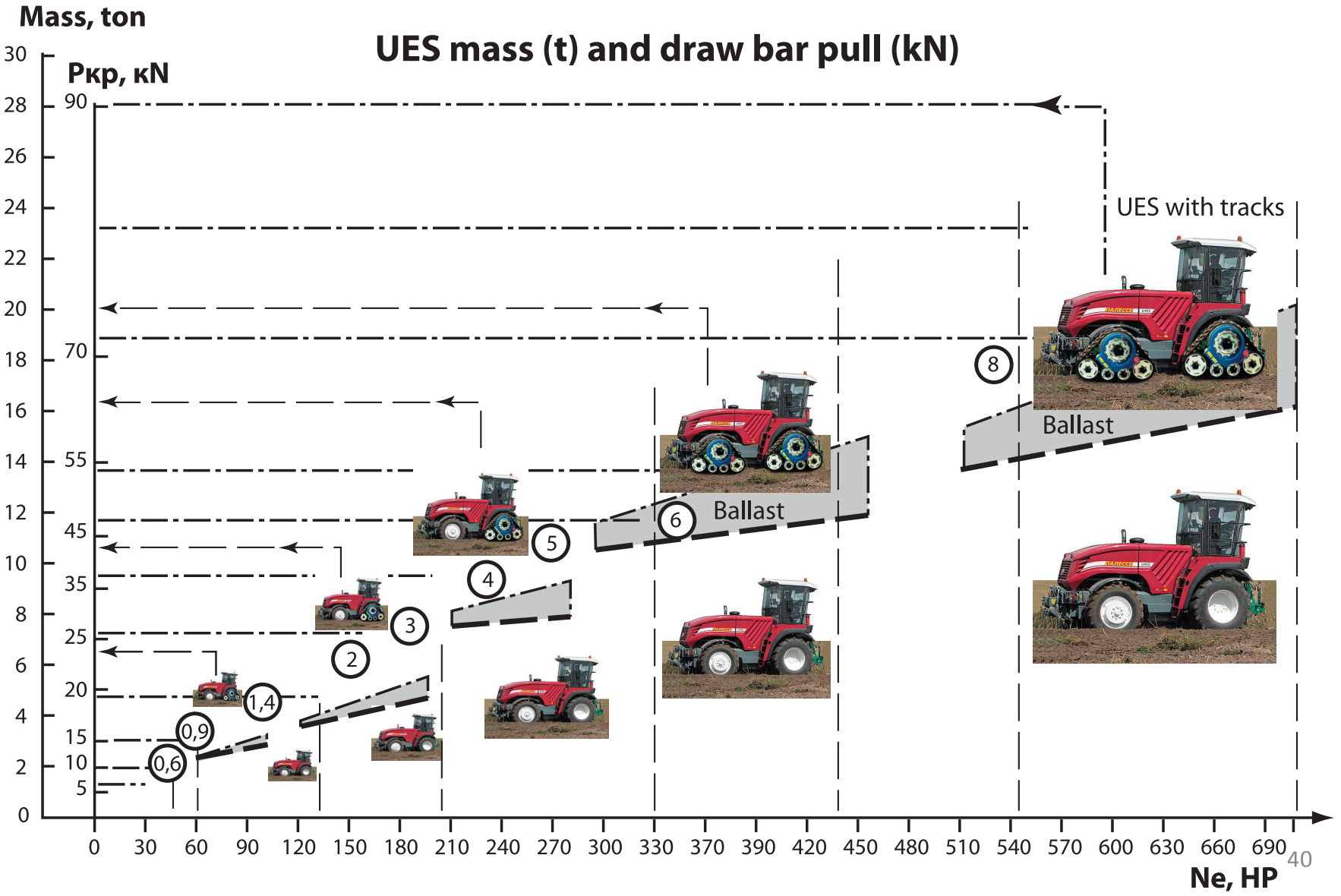

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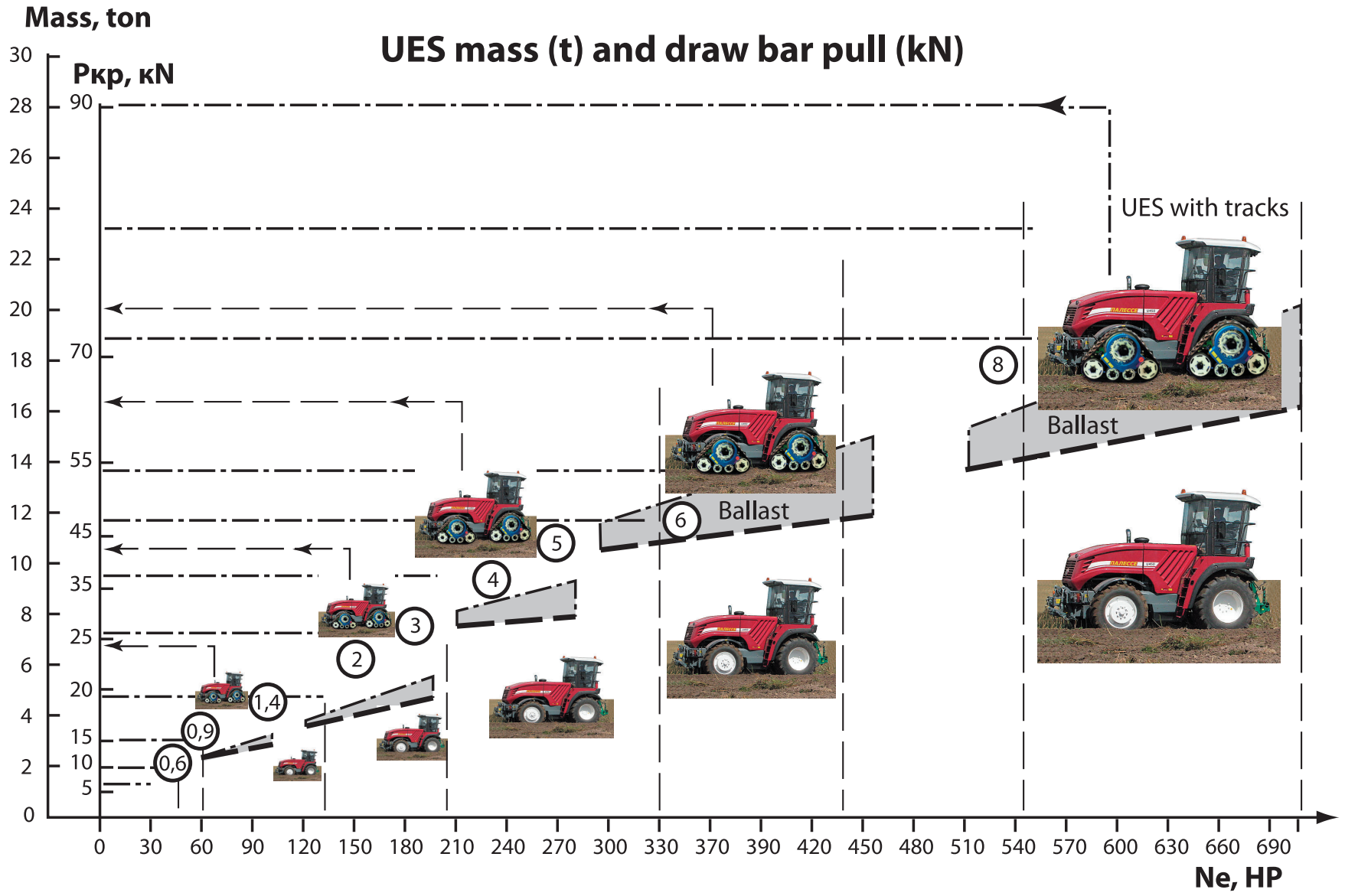

THE FUTURE OF AGRICULTURAL MECHANIZATION IN RUSSIA

JOIN US, PLEASE