Public Grassland Grazing Systems on Typical Steppe, Taipusi

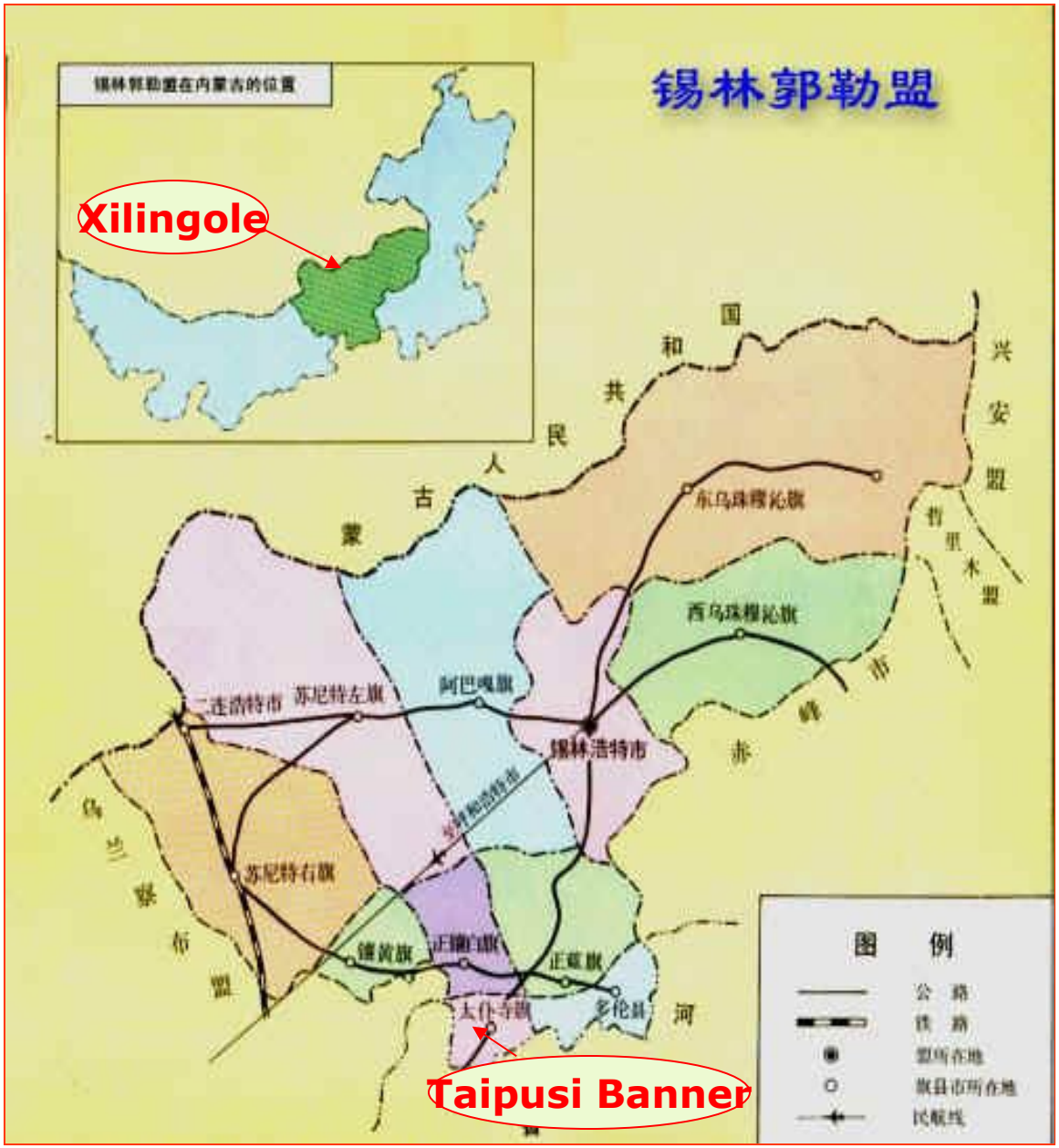
Xu Zhu, Tian Qingsong,
Zheng Yang and Xilin Tuya

Grassland Research Institute of Chinese Academy of Agricultural Science

Outline

- Introduction: General Information of Taipusi Banner
- Current livestock production system
- Optimal grassland and livestock system
- Conclusions

1.Introduction



- Taipusi Banner is located in the middle part of Inner Mongolia **(41°35′-42°10′N, 114°51′-115°49′E),** southern of Xilingole League. The total area is 340,000 ha.

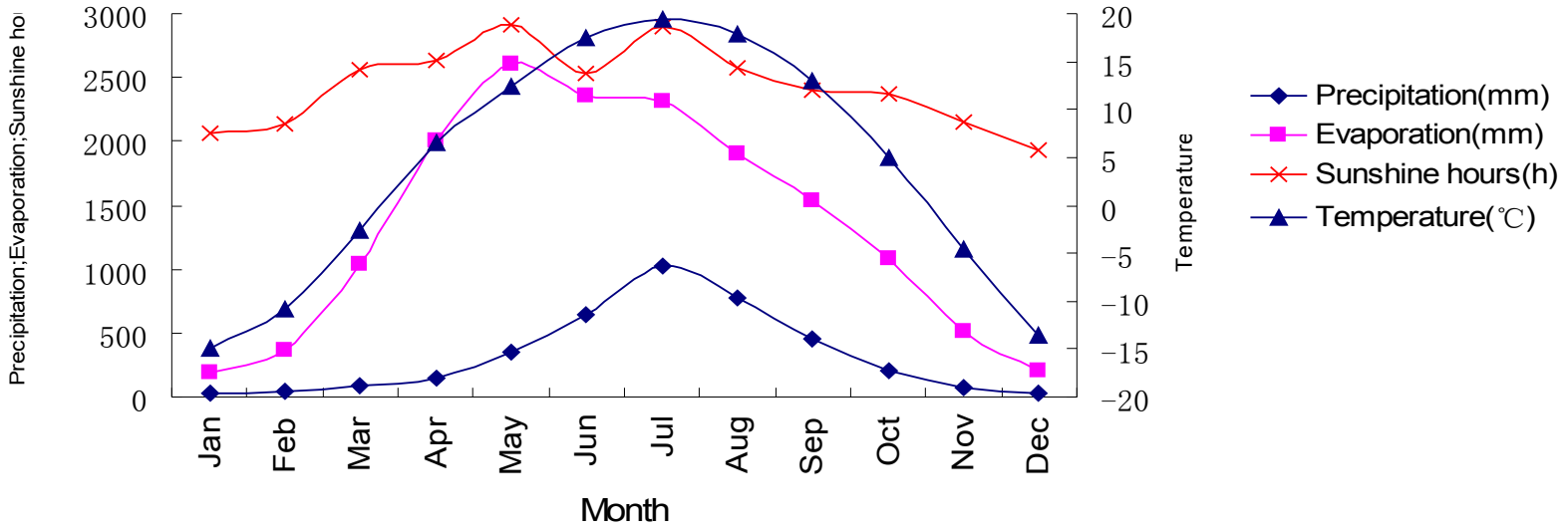


Fig.1 Climate factors in Taipusi Banner(1971-2006)

Climate

- Temperate semi-arid continent climate
- Average temperature: 1.6℃
- Average precipitation : 407 mm
- Average sunshine hour : 2937.4h
- Average evaporation : 1900.6 mm
- 115 frost-free days

Soil

- Chestnut soil(80.38%)
- Chernozem
- Meadow soil

Soil type	Utilization mode and intensity	Bulk density (g/cm3)	Hardness(kpa)	pH	Organic matter (%)	Total N(%)
Meadow soil	Clipping pasture	1.1	536	7.7	6.6	0.3
Chestnut soil	Severely utilization	1.3	1134	7.6	3.6	0.2
	Middling utilization	1.2	1007	7.5	3.7	0.3
	Light utilization	1.1	958	7.5	6.1	0.2
	Clipping pasture	1.3	499	7.3	6.3	0.3

Grassland

- Type: typical steppe
- Plant species:
- 40 families, 120 genera and 200 species
- The main composition species : *Gramineae*, *Leguminosae* and *Compositae*
- The dominant species : *Leymus chinensis*, *Stipa krylovii* and *Serratula centauroides*
- The accompanying species : *Agropyron cristatum*, *Elymus dahuricus*, *Carex duriuscula*, *Melilotoides ruthenica*, *Artemisia capillaries, Phlomis tuberose*, *Iris dichotoma etc.*

- Total grassland area : 190,000 ha
- Degraded grassland area : 130,000 ha

  light-grade degradation : 60000 ha (31.5 %)

  middle-grade degradation : 57000 ha (29.89 %)

  severe-grade degradation : 16000 ha (8.4%)

2.Current livestock production system

- sheep production system (Mutton cross :Mongolia Mutton ×Fine wool)

  Lambing: January-March

  Shearing : June

  Sales: September

- Supplementation: November-May (meadow hay, maize seed, maize silage, maize straw)

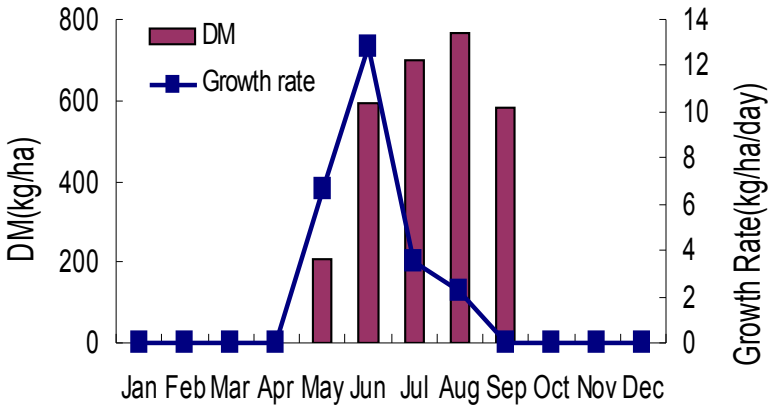


Fig.2 Grassland Production

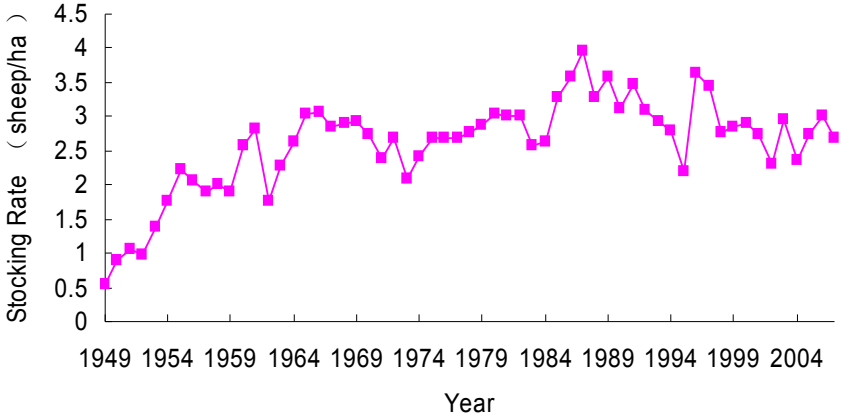


Fig 3.stocking rate in Taipusi(1949-2007)

- Grazing system: public grazing all of the year (grazing ban:4.5-5.20)
- Current stocking rate:2.5-3sheep equivalent/ha
- Grassland condition: low in quality and quantity
- Desirable grass: *Leymus chinensis , Cleistogenes squarrosa, Artemisia frigida, Stipa krylovii, Melilotoides ruthenica* etc.

Feed balance (result of stage 1 model)

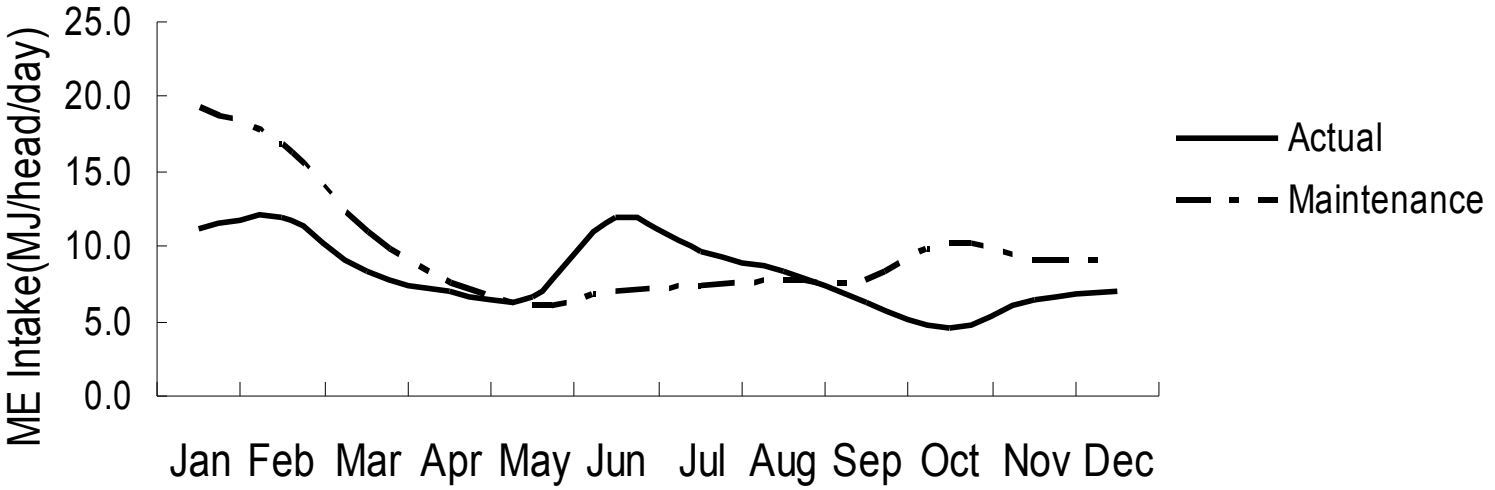


Fig.4 ME Balance

- The model shows that there is energy deficit from September to early May.
- It has the same trend as the experiment of weigh the livestock, in which we found that the sheep lose body weight and score from October to May.
- The cause of this deficit is (1) grass shortage (2) low temperature and insufficient supplementation , from October to late May
- Chain response: little milk-smaller lamb-becomes less productive mother-even less milk

Net farm income (result of stage 2 model)

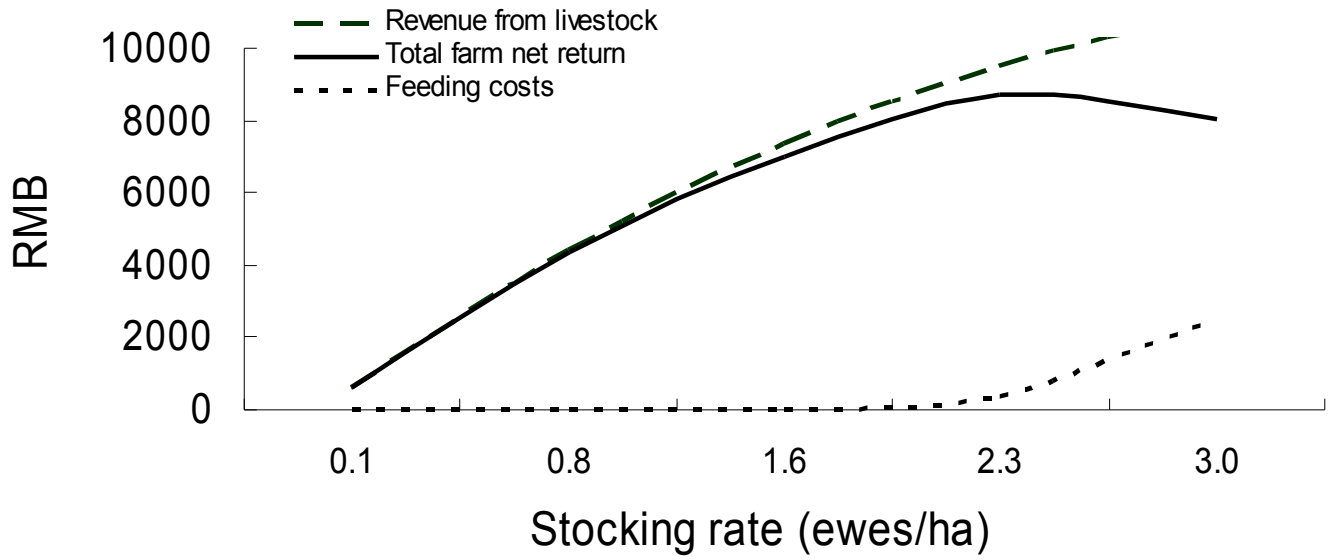


Fig.5 Financial returns

- The figure shows that the total net farm income increases while the stocking rate is less than 2.2 ewe/ha and then decreases as stocking rate increases.
- But in Taipusi, the current stocking rate is 3 sheep equivalent/ha. This is the largest reason for the poor livelihood condition of farmers.

3. Optimal grassland and livestock system

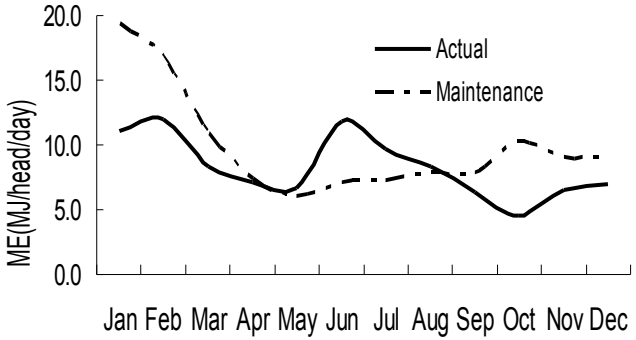


Fig.6 ME Balance(a)--lambing in Jan

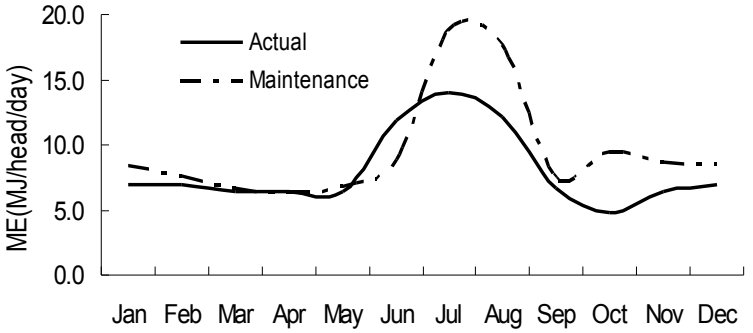


Fig.8 ME Balance(c)--lambing in Jul

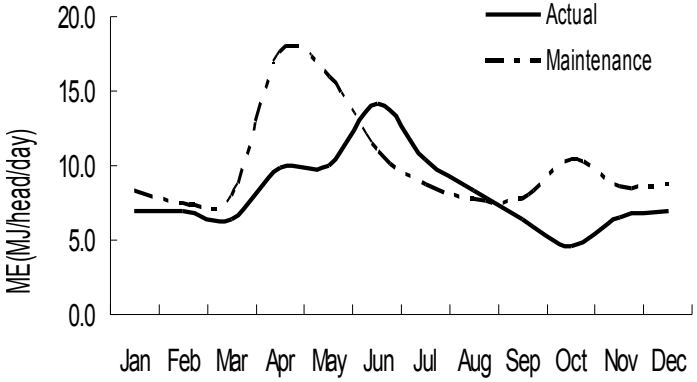


Fig.7 ME Balance(b)--lambing in Apr

- Here are the result of different lambing time from stage 1 model. Supply matches demand best with July lambing, which should result in better condition of livestock.

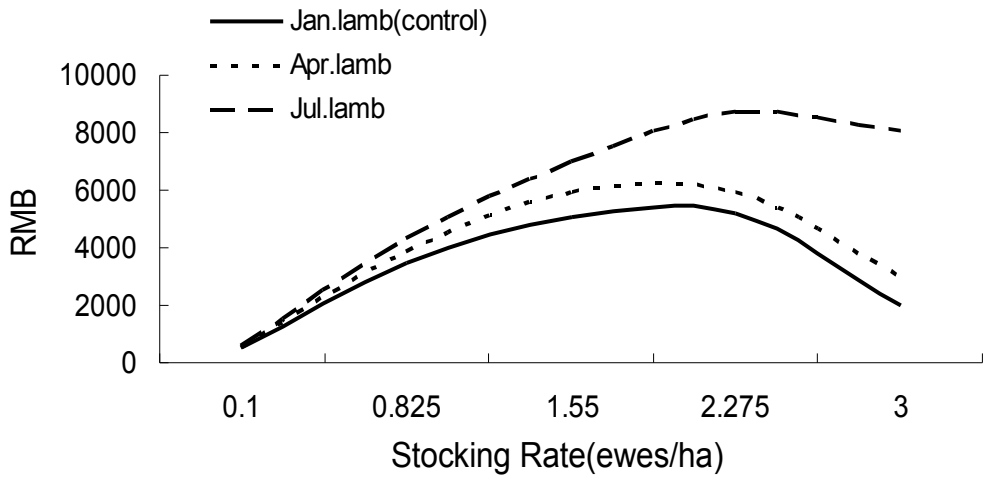


Fig.9 Total farm net income

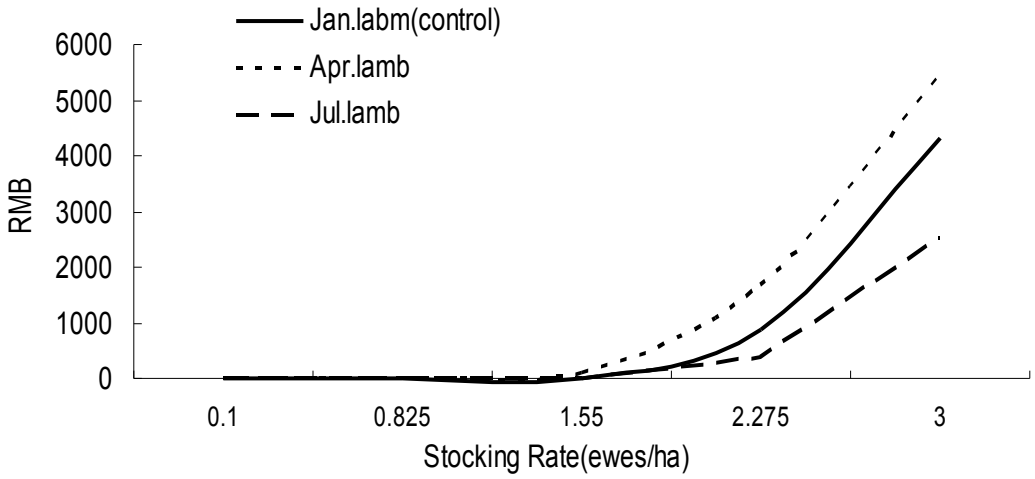


Fig.10 Feeding Cost

- The figures of different lambing time in stage 2 model show that with lambing in July the farms net income is higher and feeding cost is lower than lambing in January and April.
- Reasons for poor profitability of winter lambing:
- very cold weather
- long distance walk hence large energy loss on frosted grassland
- much money to feed
- high mortality rate, low weaner weight in winter
- Connected stage 1 result with stage 2 result , we find that better feed balance also results in more money for farmers.

Feasibility of the optimal strategy

- two models predict that July lambing gives better resource use and economy
- however February joining might not suit the local conditions and might result in low conception rate
- availability of supplements in December-February is also uncertain
- while it is possible that all these downsides are outweighed by better energy balance, it is necessary to test the feasibility of this newly proposed strategy
- field experiment is the next step, (hopefully) followed by on-farm demonstration

Different livestock breeding

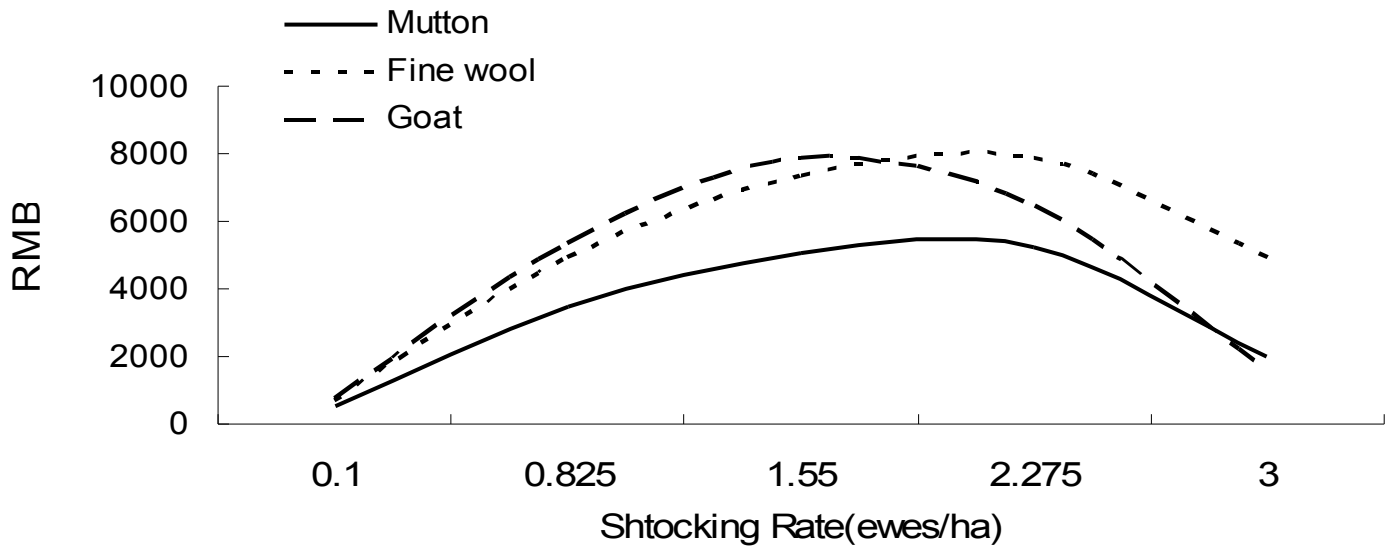


Fig.11 Total farm net income

- We changed the different livestock type with mutton sheep, fine wool sheep and goat. The graph shows that when stocking rate is over 2.2ewes/ha, farm net income from fine wool is higher than that with mutton sheep and goat. But if the stocking rate is decreased to around 1.6ewe/ha the farm net income with goat would be higher than mutton sheep and fine wool sheep.
- In a long run farmers may be better off by shifting to fine wool and cashmere at low stocking rate.

4. Conclusions

- Lambing in July looks better for livestock production and farm net income. However its feasibility needs to be tested on field before policies are implemented.
- Fine wool breeds and goats will likely get more profit to farmers if they decrease the total number of livestock. This, together with July lambing *may* be the optimal system strategy.
- In the long run, (1) improvement in supplement quality to meet livestock feed balance and (2) reduction of stocking rate to improve grassland condition are the key to both profitability and sustainable growth.

Thank you!