

松嫩平原农牧交错区牲畜放牧场的空间转移

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摘要:研究了松嫩平原农牧交错区牲畜放牧场空间转移动态、不同放牧场对当地畜牧业的贡献率。研究表明:松嫩平原农牧交错区的牲畜放牧场月际变化很大,草地、防护林草地和农田在不同阶段是牲畜的主要放牧场;牲畜放牧场具有明显的空间转移现象,总体趋势为农田(1~3月份)→草地(4~6月份)→防护林草地(7~10月份)→农田(11~12月份);3种放牧场在不同时期对畜牧业的贡献率变化也很大,其变化趋势与放牧场空间转移趋势基本一致;草地、防护林草地和农田对松嫩平原农牧交错区畜牧业均起着重要作用,贡献率大小分别为农田(38.8%)>防护林草地(31.8%)>草地(29.4%)。草地在当地畜牧业中的地位明显下降,农田和防护林草地对当地畜牧业的贡献已相当重要。因此,应加强松嫩平原农牧交错区防护林草地放牧和农田放牧研究,在保护防护林的基础上合理利用防护林草地和杨树叶资源,充分利用农田杂草和农田残茬,增加可获得性牧草资源,促进地区畜牧业发展。

关键词:农牧交错区;放牧场;空间布局;空间转移

Spatial transference of grazing space in the ecotone between agriculture and animal husbandry in the Songnen Plain

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Abstract: The phenomenon of transference of grazing space is universal in a number of ecosystems. People had been aware of and had extensively investigated it in the past decades. Ecotone between agriculture and animal husbandry in the Songnen Plain, northeast China, bears many of heterogeneous landscapes, such as typical grassland, protective plantation, and farmland. The mosaic distribution of these kinds of landscape reduces the area of typical grassland, leading to evident or obvious to some extent spatial transference of grazing space in this region. In the past few years, along with the increase of the number of livestock and degradation or salinization of typical grassland, more and more grassland, such as *Leymus chinensis*, is already unsuitable to graze, resulting in that the production of typical grassland can not meet the increasing forage demand of livestock. Therefore, those primary landscapes (including typical grassland, grassland under protective plantation and farmland) become the main and important grazing space of livestock in the ecotone between agriculture and animal husbandry in the Songnen Plain. Although grassland under protective plantation or farmland is playing an increasingly important role in the development of stock-breeding in this region, relatively little is known about how much contribution of grassland, grassland under protective plantation and farmland to stockbreeding and how to quantify them. Of course, people know little about what time the spatial transference of grazing space takes place and what is the route of spatial transference of grazing space to different livestock. Moreover, to accelerate the development of stockbreeding in this region, it is essential to make clear the contribution ratio of different grazing space, the current situation of spatial transference of grazing space, and their transfer time and route of grazing space. The aim of this study is to discuss these questions mentioned above. We conducted an investigation to explore the spatial transfer dynamics of grazing space and the respective contribution ratio of various grazing

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space to native stockbreeding in the ecotone region. Results indicated that monthly dynamics of grazing space among different kinds of livestock change significantly; there is significant differences in the selection of grazing space among different kinds of livestock; grazing space of sheep is limited mainly by growth season of crop, but grazing space of cattle is limited not only by growth season of crop and spatial character of grazing space, but also by the number of cattle flock, so that its grazing space is relatively less in grassland under protective plantation when the number of cattle flock is more than ten. Furthermore, typical grassland, grassland under protective plantation and farmland may become the most important grazing space to various livestock in different months, i. e., an evident spatial transference of grazing space exists. The main tendency is farmland (January to March)→typical grassland(April to June)→grassland under protective plantation(July to October)→farmland (November to December). The limiting factor of availability to livestock, such as the growth season of crop in farmland, dynamics of grass production in different season in grassland, and spatial character of protective plantation (such as size, length) in grassland under protective plantation, is different evidently among different grazing space. The contribution ratio of various landscapes in different months also changes significantly and its main tendency is similar to spatial transference of grazing space. Grassland, grassland under protective plantation and farmland in the ecotone also play important roles in the development of regional stockbreeding, and the total contribution ratio of different grazing space is 38.8% in farmland, 31.8% in grassland under protective plantation, and 29.4% in grassland per year. The role of grassland in stockbreeding is not dominant, and farmland and grassland under protective plantation are becoming more important. Due to the contribution ratio of typical grassland decreasing markedly and the role of farmland and grassland under protective plantation ascending, we should take these changes into account and thus should strengthen the research on grazing in grassland under protective plantation and farmland. The grassland under protective plantation and the poplar leaves need to be used reasonably in the mean while of protecting the protective plantation. Weed and remnant of farmland also need to be fully used. These can obtain more available forage resources and can accelerate the development of livestock farming in the ecotone region of agriculture and animal husbandry in the Songnen Plain.

Key words: ecotone between agriculture and animal husbandry; grazing space; spatial pattern; spatial transference

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松嫩平原位于我国农牧交错区北端,该区草地、防护林地和农业用地镶嵌分布,畜牧业生产对该区经济起着重要的作用^[1]。对松嫩平原羊草草原放牧研究已开展了大量工作,对不同放牧压下草地植被组成变化、群落演替规律、牧草对放牧的反应等均作了深入研究^[2,3]。20世纪90年代以前,羊草草原是当地牲畜的主要放牧场,近年来随着牲畜数量增加,草地退化和盐碱化加重,越来越多的草地已不适合放牧,草地已远不能满足当地牲畜对牧草资源的需求,牲畜(主要是牛和羊)放牧场已发生了较大变化,防护林草地和农田在不同时期成为牲畜主要放牧场。草地对松嫩平原畜牧业的作用已有所下降,防护林草地和农田在当地畜牧业生产中的地位明显上升,但关于防护林草地和农田在松嫩平原畜牧业发展中的地位和作用还没有定量研究。松嫩平原农牧交错区是否也存在河西走廊耦合农业系统山地、荒漠和绿洲的空间转移^[4,5],还是像长江流域复合生态系统养殖业生产布局区际空间转移不明显^[6]?为了促进农牧交错区畜牧业的发展,弄清放牧场空间转移现状、以及草地、防护林草地和农田三者对畜牧业的贡献率是有必要的。本文从牲畜放牧场空间转移出发,分析农牧交错区是否存在牲畜放牧场空间转移现象,研究不同放牧场对松嫩平原畜牧业的贡献,弄清草地、防护林草地和农田在当地畜牧业中的地位和作用,为加强农牧交错区防护林草地和农田放牧研究作一些探索性工作。

1 研究地自然状况

研究地位于吉林省种马场,东经123°44',北纬44°40'附近,该区位于东北农牧交错区北端,属于温带湿润季风气候,且有明显的大陆性季风气候特征:春季干旱多风,降水稀少,地表蒸发剧烈;夏季降水集中,造成地表径流和积水;冬季降雪较少。年降水量310~580mm,70%集中在6~8月份。年均气温4.9℃,无霜期136~163d。现有土地6990hm²,其中草地4800hm²,耕地960hm²,防护林1000hm²,村落面积为100hm²,其它景观约为130hm²。牲畜主要是羊8600只,牛2100头,其它大型牲畜有马、驴、骡等,但数量均很少。

2 研究方法

野外调查发现羊群大小对放牧方式和放牧场选择的影响不大,而牛群大小对放牧方式和放牧场选择有重要影响,因此,实验中按放牧牛群的大小分别处理,牛群数量<10头记为牛群I,牛群数量>10头记为牛群II。实验于2001年进行,随机选取羊群、牛群I和牛群II各3群,记录其放牧场变化情况,同时分别统计全区羊、牛群I和牛群II的总数量。由于当地只在母畜产羔

期进行补饲,因此牲畜在草地、防护林草地和林地的放牧时间和放牧规模基本上能反映各放牧场对当地畜牧业的贡献。

放牧场对畜牧业贡献率主要由放牧时间和放牧规模两个指标所决定,因此仅根据单一的放牧时间或放牧数量不能很好地反映放牧场对当地畜牧业贡献。为综合考虑不同景观中牲畜放牧时间和放牧规模,本文采用贡献率指数来分析不同放牧场对畜牧业的贡献。计算公式如下:

$$P_i = \frac{X_i \times Y_i}{\sum_{i=1}^3 X_i \times Y_i}$$

式中, P_i 指 i 放牧场的贡献率, X_i 指在 i 放牧场放牧的时间, Y_i 指在 i 放牧场的放牧规模(计算中牛单位被换算成标准羊单位); $i=1,2,3$ 分别代表草地、防护林草地和农田。

3 结果与分析

3.1 农牧交错区牲畜放牧场空间转移动态

松嫩平原农牧交错区主要由草地、防护林和农田 3 种景观组成,草地、防护林草地和农田在不同时期是当地牲畜的主要牧场,由于不同牲畜的特性不同以及不同景观自身的特点(主要是植被生长动态和放牧场空间特征),羊群、牛群 I 和牛群 II 放牧场月份间变化都很大,且牲畜不同放牧场空间转移的特征也相差很大。牲畜放牧场月份动态分析表明:不论是羊群或牛群,每个月份均有一段时间在草地和防护林草地放牧,但农田放牧场存在明显的间断性。5~7 月份草地是羊群的主要放牧场,7~9 月份防护林草地是其主要放牧场,1~4 月份、10~12 月份羊群主要放牧场是农田(如图 1)。4~6 月份牛群 I 的主要放牧场是草地,7~10 月份主要放牧场在防护林草地,1~3 月份、11~12 月份主要在农田(如图 2)。牛群 II 的放牧场变化与牛群 I 和羊群有较明显的差异,主要表现在 4~10 月份牛群 II 主要放牧场都是草地(如图 3),在防护林草地放牧时间较短,主要是因为牛群太大时,防护林中放牧不易看管,容易损害防护林和防护林周围的庄稼,限制了牛群 II 放牧场的分布。农牧交错区当前牲畜放牧场月份间变化是存在的,草地、防护林草地和农田在不同阶段会成为牲畜的主要放牧场。

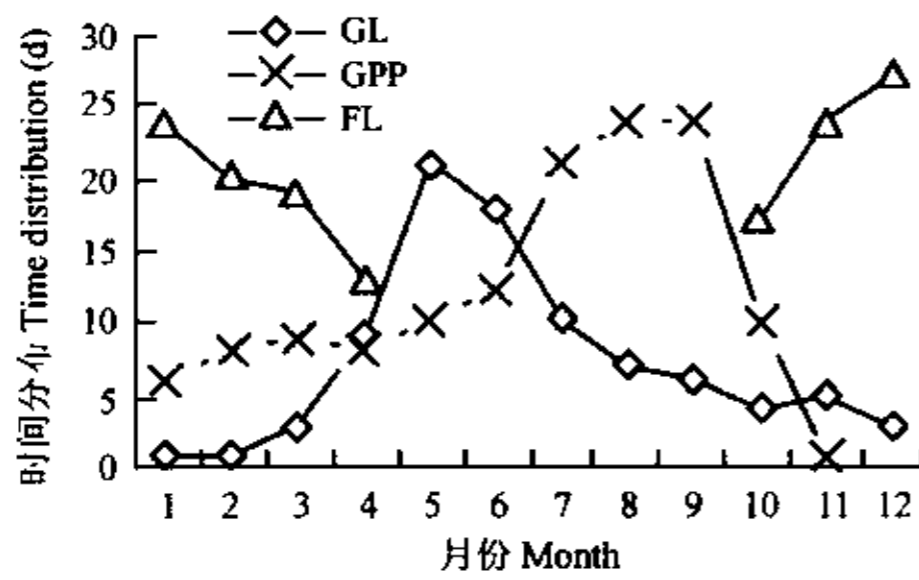


图 1 羊群放牧场变化动态

Fig. 1 Dynamics of grazing space of sheep

GL 草地 Grassland, GPP 防护林草地 Grassland under protective plantation, FL 农田 Farmland

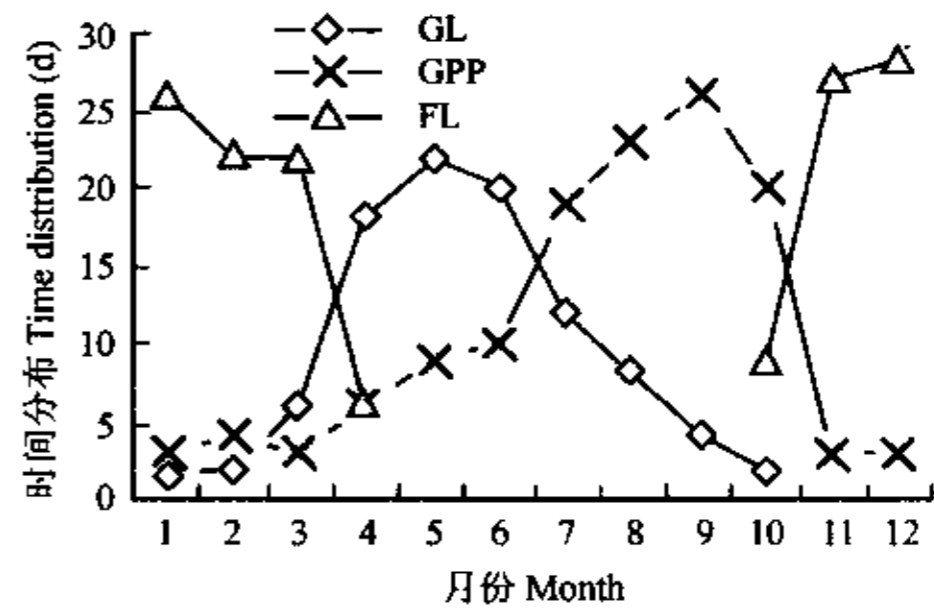


图 2 牛群 I 放牧场变化动态

Fig. 2 Dynamics of grazing space of cattle I

GL 草地 Grassland, GPP 防护林草地 Grassland under protective plantation, FL 农田 Farmland

牲畜放牧场空间转移是指牲畜在不同景观中放牧顺序、放牧时间和放牧持续时间的变化。当前,松嫩平原农牧交错区牲畜放牧场存在明显的空间转移现象,转移的总体趋势为农田(1~3 月份)→草地(4~6 月份)→防护林草地(7~10 月份)→农田(11~12 月份)。不同牲畜在 3 种放牧场放牧时间也存在差异,草地、防护林草地和农田分别占羊群放牧时间的 22.7%、37.8% 和 40.3%,分别占牛群 I 放牧时间的 25.8%、35.6% 和 38.6%,分别占牛群 II 放牧时间的 52.1%、12.3% 和 37.8%(如图 4)。羊群和牛群 I 的放牧场明显向防护林草地和农田转移,二者放牧时间之和所占比例均超过 70%,牛群 II 放牧场空间转移与羊群和牛群 I 的主要差异在于草地放牧时间所占比例较高,防护林草地放牧时间所占比例较低。总的来说,农牧交错区牲畜放牧场存在草地、防护林草地和农田三者间的空间转移,牲畜在草地放牧的时间明显减少,防护林草地和农田已成为当前松嫩平原牲畜的重要放牧场。

3.2 不同放牧场对农牧交错区畜牧业贡献率

综合考虑放牧时间和放牧规模两个指标,贡献率指数可以较合理地体现不同放牧场对当前农牧交错区畜牧业的贡献率。贡献率分析表明:草地和防护林草地对当地畜牧业的贡献是连续的,而农田对畜牧业的贡献是间断的,4~9 月份对畜牧业贡献率为零。草地对当地畜牧业贡献高峰期出现在 4~6 月份,防护林草地贡献高峰期出现在 7~10 月份,农田贡献高峰期出现在 1~3 月份、11~12 月份,草地、防护林草地和农田在贡献高峰期贡献率均超过 60%(如图 5),农田在 1 月份、11 月份和 12 月份贡献率

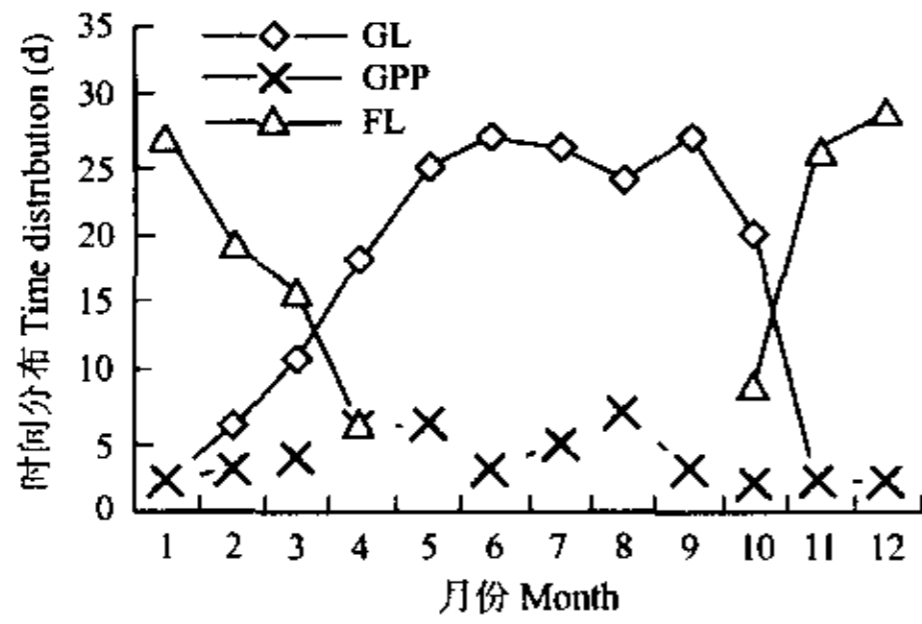


图3 牛群 I 放牧场变化动态

Fig. 3 Dynamics of grazing space of cattle I

GL 草地 Grassland, GPP 防护林草地 Grassland under protective plantation, FL 农田 Farmland

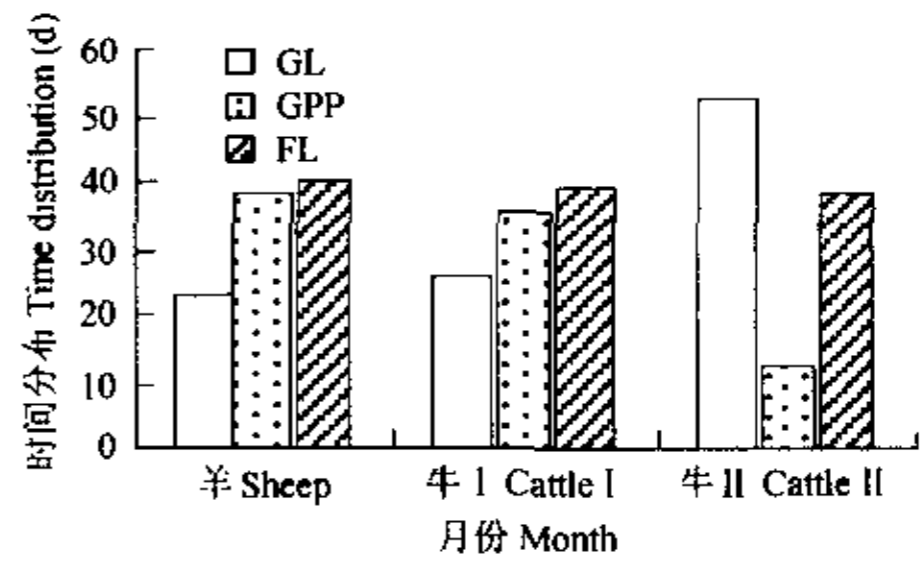


图4 牲畜放牧场空间转移

Fig. 4 Spatial transfer of grazing space in a year

GL 草地 Grassland, GPP 防护林草地 Grassland under protective plantation, FL 农田 Farmland

均超过 80%。草地、防护林草地和农田在不同时期对当地畜牧业起着主要贡献,三者 在时间上形成了良好的互补。不同放牧场对畜牧业贡献率全年统计表明:草地、防护林草地和农田均对当地的畜牧业发展起着重要作用,三者贡献率分别为 29.4%, 31.8%, 38.8%(如图 6)。草地贡献率最小,还未超过三分之一,农田和防护林草地的贡献率较大。传统的草地在当地畜牧业发展中的地位明显下降,而农田和防护林草地的作用已变得越来越重要。

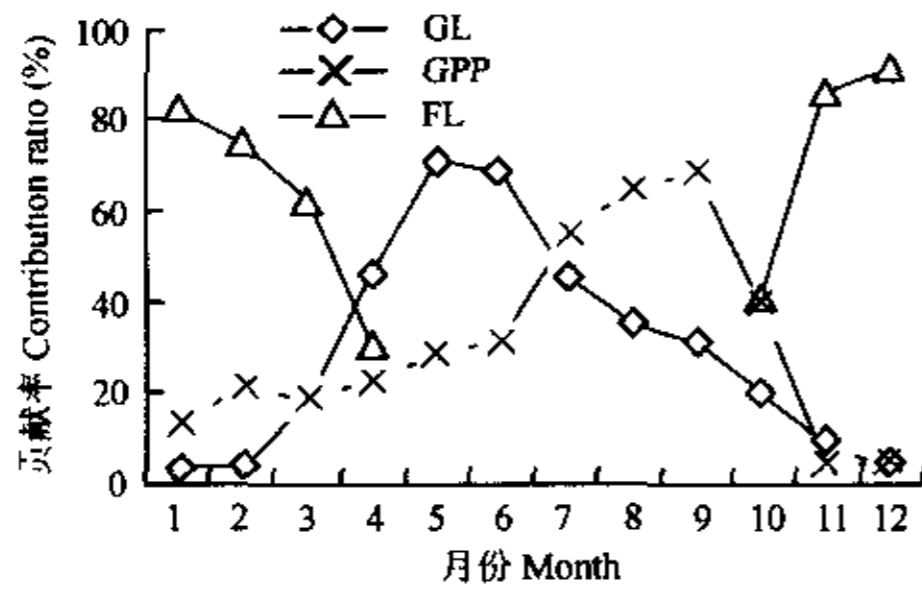


图5 不同放牧场贡献率动态

Fig. 5 Dynamics of contribution ratio among grazing space

GL 草地 Grassland, GPP 防护林草地 Grassland under protective plantation, FL 农田 Farmland

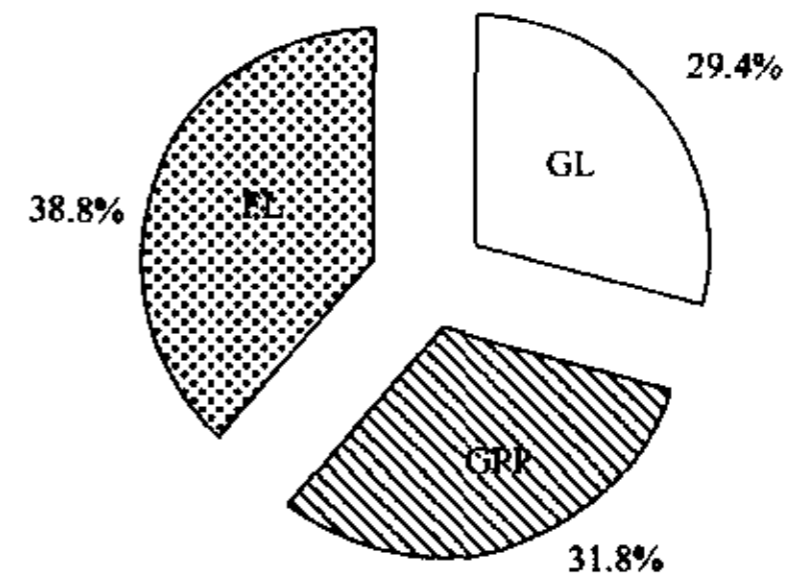


图6 不同放牧场对畜牧业贡献率

Fig. 6 Contribution ratio among different grazing space

GL 草地 Grassland, GPP 防护林草地 Grassland under protective plantation, FL 农田 Farmland

4 结论与讨论

松嫩平原农牧交错区牲畜放牧场月份动态变化很大,草地、防护林草地和农田在不同时间段成为其主要放牧场。牲畜放牧场存在明显的空间转移现象,即农田(1~3 月份)→草地(4~6 月份)→防护林草地(7~10 月份)→农田(11~12 月份)的总体趋势。由于农牧交错区特定的地理位置,其畜牧业必然与典型牧区和农区存在着差异。松嫩平原农牧交错区的放牧场是草地、防护林草地和农田 3 个子系统的复合体,它们是在人为干预下形成草地-防护林草地-农田放牧子系统的良好耦合,三者间在时间上形成互补,空间上相互转移。牲畜放牧场空间转移现象在河西走廊也存在,山地、荒漠和绿洲在不同时期对当地畜牧业发展起着重要作用,三者 在时间和空间上也形成良好的互补⁽⁴⁾。

松嫩平原农牧交错区的草地、防护林草地和农田对当地畜牧业贡献率月份间差异很大;3 种景观对当地畜牧业均起着重要的作用,贡献率大小顺序为农田(38.8%)>防护林草地(31.8%)>草地(29.4%),草地仍是当前松嫩平原农牧交错区重要的牧草资源之一,但其在当地畜牧业中的地位已明显下降,农田(农田杂草和农田残茬)和防护林草地在当地畜牧业发展中起着重要作用。

防护林草地和农田是松嫩平原畜牧业重要的牧草来源,如何在保护防护林的基础上合理地利用防护林草地、树叶资源已成为农牧交错区畜牧业发展的重要环节,1~3 月份、11~12 月份间农田杂草和农田残茬对农牧交错区畜牧业贡献很大,使牲畜在草地资源不足的状况下顺利越冬,也是重要的牧草来源。因此,在规划和管理农牧交错区的畜牧业发展时,应充分考虑到这些特殊情况,加强农牧交错区防护林草地和农田放牧的研究和管理,为合理地利用防护林草地及其杨树叶资源、农田杂草及农田

残茬,提供理论基础,增加可获得性牧草资源,促进该地区畜牧业发展。

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