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## 新疆典型膜下滴灌棉花种植模式的用水效率与效益

### Water use efficiency and benefit for typical planting modes of drip-irrigated cotton under film in Xinjiang

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中文摘要:

膜下滴灌技术因具有显著的节水、保温、抑盐、增产效果,在新疆自治区棉田中已获得大面积推广应用。在目前的大田棉花生产条件下,结合当地的光热、土壤、机械等条件,因地制宜选择合理的膜下滴灌种植模式,对合理调控棉田土壤水盐分布、促进棉花生长与增产、提高劳动生产率和增加棉农收入等具有十分重要的意义。迄今为止,在新疆自治区主要存在3种典型的膜下滴灌棉花种植模式,分别为传统模式、机采模式和超宽膜模式。该文通过开展实地调查取样,基于种植密度、灌溉定额、根区土壤水盐分布、覆膜宽度以及其它影响棉花生产收益的因素,对3种典型膜下滴灌棉花种植模式的水分利用效率与经济效益进行了对比分析。结果表明,由于各种种植模式下不同的种植密度、灌溉定额、根区土壤水盐分布、覆膜宽度等对棉花的耗水与产量产生了较大影响,导致棉花的水分利用效率存在明显差异:超宽膜模式棉花的水分利用效率为1.04 kg/m<sup>3</sup>,明显高于传统模式的0.98 kg/m<sup>3</sup>与机采模式的0.89 kg/m<sup>3</sup>。另外,经济效益受种植模式(影响前期投入与棉花产量)与采棉方式(影响采棉支出与籽棉收购单价)的影响较大:超宽膜模式具有最高的经济效益,其单位面积纯收入达18 582元/hm<sup>2</sup>,稍高于机采模式下的18 298元/hm<sup>2</sup>,传统模式下纯收入最低,仅11 725元/hm<sup>2</sup>。因此,为高效利用农业水资源并增加种棉收益,建议在新疆自治区大力推广超宽膜模式,并对现有采棉机进行适当改进以在超宽膜模式下实现采棉机械化;或适当调整现有机采模式下的滴灌带布置形式(如将其布置在窄行的中央),但相关的效应仍有待更进一步研究。

英文摘要:

Abstract: Drip irrigation under film has been widely applied in cotton field of Xinjiang autonomous region, because of its significant advantages on saving water, raising soil temperature, decreasing soil salinity in root zone, and consequently increasing cotton yield. Under current field conditions of cotton production, choosing a suitable planting mode for drip irrigated cotton under film according to the local conditions of heat, radiation, soil and mechanization, is very important for adjusting the distribution of soil water and salt in field, advancing cotton growth, raising cotton yield and labor productivity, and increasing income of farmers. Total three typical planting modes of drip irrigated cotton under film, such as traditional mode, mechanical picking mode and super wide film mode, have been built up in Xinjiang autonomous region up to now. Based on planting density, irrigation quota, the distribution of soil water and salt in root zone, the width of plastic film and other factors impacting cotton production benefit, this study compared the three typical planting modes regarding water use efficiency and economic benefit by carrying out field investigation. Obvious difference in water use efficiency was found among the three typical planting modes because of the great difference in water consumption and yield, which might be caused by the specific planting density, irrigation quota, distribution of soil water and salt in root zone and width of plastic film for each planting mode. Water use efficiency for the super wide film mode was 1.04 kg/m<sup>3</sup>, and was much higher than 0.98 kg/m<sup>3</sup> for the traditional mode and 0.89 kg/m<sup>3</sup> for the mechanical picking mode. Moreover, economic benefit was greatly affected by both planting modes (influencing initial investments and cotton yield) and cotton-picking types (influencing cotton-picking cost and cotton price). The economic benefit for the super wide film mode topped with 18,582 yuan/hm<sup>2</sup>, and was slightly higher than that for the mechanical picking mode (18,298 yuan/hm<sup>2</sup>), while that for the traditional mode was the lowest with only 11,725 yuan/hm<sup>2</sup>. Therefore, in order to utilize agricultural water resource efficiently and increase income of planting cotton, the super wide film mode might be a good choice and was suggested to be widely promoted in Xinjiang autonomous region. However, some improvements should be made on the existing cotton pickers in order to bring about mechanization of cotton picking for the super wide film mode. Alternatively, adjusting the location of drip pipes for the mechanical picking mode (e.g. putting drip pipe in the middle of narrow row) might be a good choice, but the resulted water use efficiency and benefit should be further studied.

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