Crop Situation Update

A joint assessment of 2014/15 summer crops and outlook of 2015 winter crops

Ministry of Agricultural Development

Food and Agriculture Organization

World Food Programme

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Acknowledgements

This report is a joint product of the Ministry of Agricultural Development (MoAD), World Food Programme (WFP), and Food and Agriculture Organization (FAO).

New partnerships with the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the International Centre for Integrated Mountain Development (ICIMOD) have enabled the integration of crop yield forecasting and remote sensing in this report and expanded the field presence and range of expertise available during joint crop assessment missions.

Thanks are due to staff members of the Agribusiness Promotion and Market Development Division (ABPMDD) of the Ministry and the Department of Agriculture and staff members of WFP, FAO, CCAFS, and ICIMOD.

नेपाल खाद्य सुरक्षा अनुगमन प्रणाली
Nepal Khadhya Surakshya Anugaman Pranali (NeKSAP)
Nepal Food Security Monitoring System

The Nepal Food Security Monitoring System (NeKSAP) collects, analyzes and presents information on household food security, emerging crises, markets and nutrition from across Nepal. Initiated by WFP in 2002, NeKSAP is now jointly operated by the Ministry of Agricultural Development and WFP under the strategic guidance of the National Planning Commission and with support from the European Union.

http://www.neksap.org.np

This product is funded by the European Union. The views expressed in this publication do not necessarily reflect the views of the European Commission.

Highlights

2014/15 summer crop situation

Production of summer crops (paddy, maize, millet and buckwheat) was estimated at 7.2 million mt, an increase of 3.45 percent compared to the preceding five-year average and a decrease of 5.12 percent compared to 2013/14. At 7.2 million mt, production of paddy, maize, millet and buckwheat was estimated at 4.7 million mt, 2.1 million mt, 308,000 mt and 10,870 mt respectively. With 1.97 million mt of production, the eastern region has the largest share of summer crop production (27.24 percent) followed by the central region (27 percent).

Paddy contributed to 66 percent of the total summer crop output in 2014/15. With 1.3 million mt of paddy production, the central region contributed the largest share (28 percent). Jhapa, Rupandehi, Morang, Kailali and Kapilvastu were the top five paddy producing districts in 2014/15.

Overall, growing conditions for 2014/15 summer crops were reported as poor. The monsoon was delayed and weak at the onset, which delayed paddy transplantation, especially in the eastern Terai. On the other hand, torrential rainfall and flash floods damaged standing crops in some mid-western districts. Average rainfall (June to September) was 94 percent of the preceding 30-year average.

Trade and food market situation

According to the Trade and Export Promotion Centre (TEPC), the value of foreign trade during fiscal year 2070/71 stood at 814.14 billion NPR, which is an increase of 19.98 percent compared to the same period last year (2069/70). The share of exports and imports stood at 11.2 percent (91.36 billion NPR) and 88.8 percent (722.78 billion NPR) respectively. During this period, the share of cereals in total imports was recorded at 4 percent (28.6 billion NPR), which over the same period last year was recorded at 3 percent (20.9 billion NPR).

In December 2014, the wholesale price of paddy and maize increased by 2 percent and 5.1 percent respectively year-on-year, the overall wholesale price index (WPI) increased by 6.6 percent year-on-year, the WPI of food grains increased by 11.0 percent year-on-year, the overall wage rate index (WRI) increased by 11.1 percent year-on-year and the WRI of agricultural labour increased by 9.5 percent year-on-year.

In India, the first advance estimate projects 2014/15 Kharif (monsoon) crop production at 120.27 million mt, which is 8.97 million mt less than last year's Kharif crop production.

2015 winter crop outlook

Based on the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) Regional Agriculture Forecasting Toolbox (CRAFT), the preliminary wheat production forecast suggests an estimated production of 2,230,660 mt (within a range of 1,896,061 to 2,565,259 mt). Based on satellite imagery, the International Centre for Integrated Mountain Development (ICIMOD) has forecasted a 10 percent increase in the wheat crop area compared to last year.

Background and objectives

The Crop Situation Update is published twice a year by the Ministry of Agricultural Development (MoAD), the World Food Programme (WFP), and the Food and Agriculture Organization (FAO). It is part of the Nepal food security monitoring system (NeKSAP) with support from the European Union.

Since 2014, partnerships with the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the International Centre for Integrated Mountain Development (ICIMOD) have expanded the use and integration of new technologies in crop monitoring and assessment in NeKSAP. These outputs are included in this report.

While periodic updates on crop performance and the food security situation are provided through the Nepal Food Security Bulletin (issued by MoAD and WFP on a trimester basis), the Crop Situation Update provides a comprehensive overview of the domestic food supply situation by focusing on the production and trade of major summer and winter crops in Nepal. This edition of the Crop Situation Update covers the 2014/15 (Nepali Fiscal Year 2071/72) summer crop production and the outlook of winter crops for 2015 (Nepali Fiscal year 2071/72). In addition, it also looks at the trade of key cereals between 2014 and 2015.

The Crop Situation Update is available in print as well as electronic format at: www.neksap.org and https://sites.google.com/site/nefoodsec/home/crop-situation-update

Methodology

The Crop Situation Update relies on the following secondary and primary sources of information.

Secondary data is compiled from MoAD's preliminary estimates of summer crop production (See Annex A) and information on input supplies, including fertilizers and seeds; NeKSAP District Food Security Network (DFSN) information on crop performance and the overall food security situation; Department of Hydrology and Meteorology (DHM) weather-related data, including rainfall; and Ministry of Commerce and Supplies Trade and Export Promotion Centre (TEPC) data on trade.

Furthermore, the International Centre for Integrated Mountain Development (ICIMOD), through the use of remote sensing technology and satellite imagery of TERRA/AQUA MODIS, calculated the Normalized Difference Vegetation Index (NDVI) and identified anomalies of crop plantation area and crop growth pattern in the Terai region. The NDVI was also used to assess the flood inundation areas. For this purpose, MODIS satellite imagery, from two weeks in August, was used to assess the flood inundation areas in districts in the mid- and far-western regions. A flood mapping tool was used to remove clouds and generate a cloud-free image for this purpose.

In addition, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) Regional Agriculture Forecasting Toolbox (CRAFT), a crop yield forecasting tool customized for the South Asia Region, was used to estimate the national wheat production. CRAFT incorporates a crop simulation model (DSSAT), weather and seasonal forecast module (CPT) and a GIS mapping module (Map Win GIS).

Primary data is collected through joint crop assessment missions, comprised of representatives from MoAD, WFP, FAO and ICIMOD. Missions include field verifications and stakeholder consultations in

selected districts to substantiate the secondary information and document key issues, constraints, and opportunities of the 2015 winter crop production. Missions included the following activities:

- Consultations with District Agricultural Development Officers to get an overview of agricultural production and to understand the reasons behind deviations (if any);
- Discussions with district line agencies and stakeholders, including Chief District Officers, Local Development Officers, and the District Chamber of Commerce and Industries, on issues related to crop production and associated impacts on food supply and food security; and
- Community interactions to verify information obtained through the DADO and other stakeholders, and to understand the communities' perceptions on agricultural production issues, weather conditions, livelihoods, and food security.

Joint crop assessment missions were undertaken from 12 to 21 November 2014 in 15 districts (See **Map 1** in Annex B) in order to: (i) cover districts that were expected to have winter crop production losses; (ii) ensure coverage from each development region (3 districts in each of the five development regions); (iii) cover districts that were not included in earlier missions; and (iv) cover the districts with observed NDVI anomalies during the normal plantation season. Prior to the missions MoAD organized a series of meetings to reach a common understanding among the mission members on the process and outputs. Following the missions, MoAD organized a debriefing meeting to share the preliminary findings from the field.

2014/15 national summer crop output

Paddy and maize are the major summer crops of Nepal. Paddy is the first major crop and is grown mostly in the Terai and mid-hills, whereas maize is the second major crop, largely grown in the hills. Finger millet and buckwheat are other summer crops grown in some areas of the country and occupy a small share of land and make a marginal contribution to overall food availability in the country. In 2014/15, the share of paddy in total winter crop production was estimated at 66 percent.

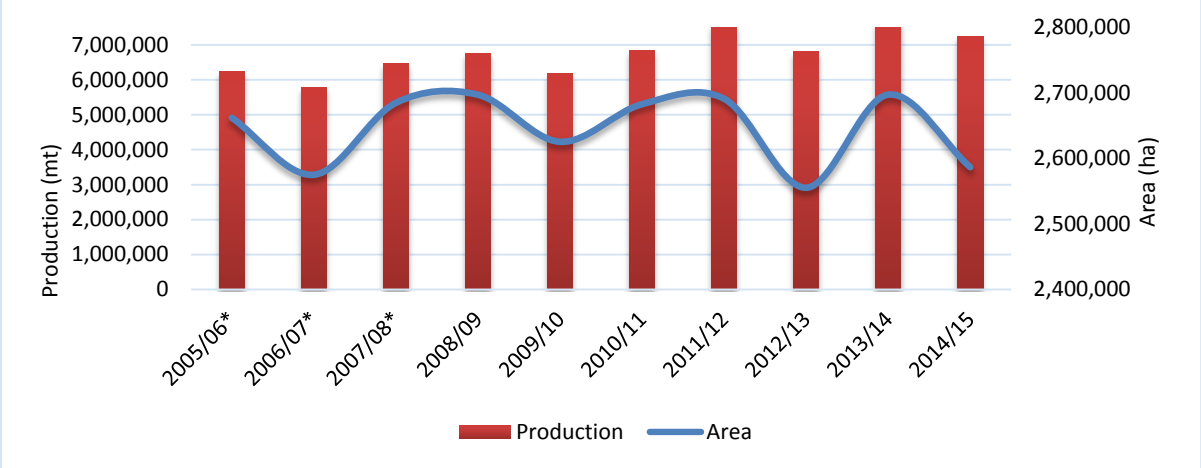


Figure 1: Area and production of summer crops (2005/06 to 2014/15 *- buckwheat not included). Source: MoAD

Figure 1 shows the area and production of summer crops (paddy, maize, millet and buckwheat) from 2005/06 to 2014/15. In 2014/15, the summer crop area was 2.6 million ha with the corresponding production of 7.2 million mt. Over the past ten years the area and production of summer crops have fluctuated each year with a gradual increase in production. The summer crop area was lowest (2.5 million ha) in 2012/13 because of a dry spell and delayed monsoon.

The normal level, which is the average of area and production over the preceding five years (2009/10 to 2013/14) is 2,650,433 ha and 7,011,696 mt respectively. Compared to the normal level, in 2014/15, production has increased by 3.45 percent, whereas area has decreased by 2.41 percent. Compared to 2013/14, when area and production were 2,697,405 ha and 7,644,709 mt respectively, both area and production declined in 2014/15 by 4.11 percent and 5.12 percent respectively. The eastern Terai had the largest summer cereal production of 1,161,682 mt, followed by the western hills and central Terai with their respective production estimated at 1,031,126 mt and 1,003,015 mt respectively. See **Map 2** in Annex B for the summer crop production at the sub-regional level.

Paddy

Paddy is the most important crop of Nepal in terms area and production. It is also the most preferred and consumed cereal. It is chiefly grown under submerged conditions in the rainy season, while in some areas, it is also grown during the spring season. In 2014/15, MoAD estimated the area and production of paddy at 1,425,346 ha and 4,788,612 mt respectively. The current level of area and production reflects a production increase of 3.61 percent with a drop in area by 3.91 percent compared to the normal level. Compared to 2013/14, during which paddy area and production were recorded at 1,486,951 ha and 5,047,047 mt respectively, the area and production in 2014/15 decreased by 4.14 and 5.12 percent respectively.

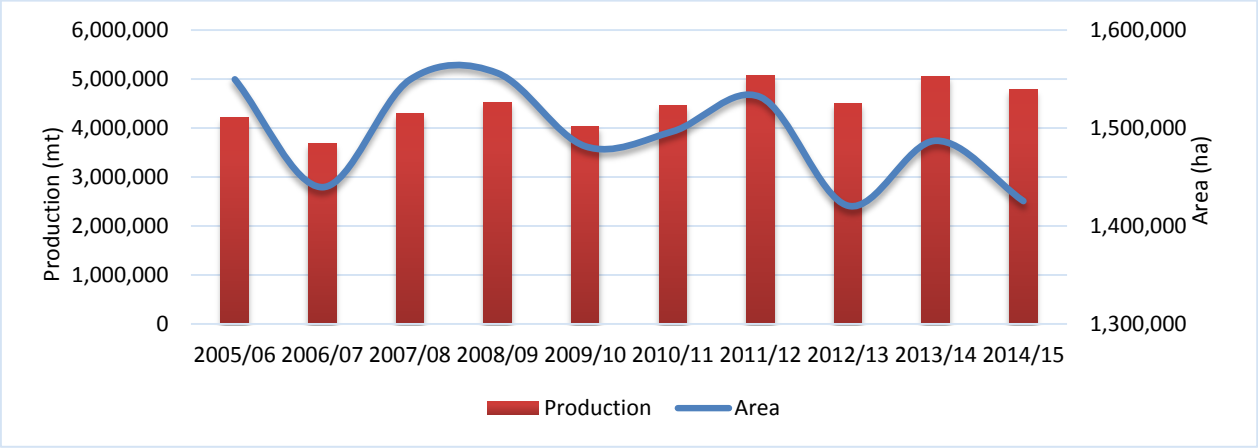


Figure 2: Area and production of paddy (2005/06 to 2014/15). Source: MoAD

Figure 2 shows the area and production of paddy for the last 10 years (2005/06 to 2014/15). In 2014/15, paddy area dropped to a near record level due to late paddy transplantation as a result of the late arrival of the monsoon and the loss of crop area from floods and drought in some mid-western and eastern districts.

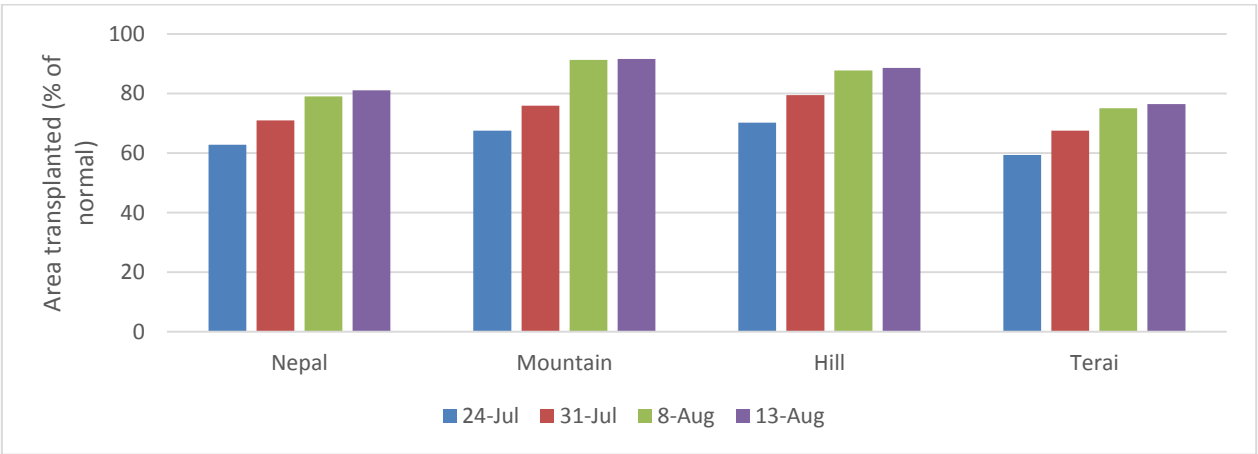


Figure 3: Status of paddy transplantation from 24 June to 13 August 2014. Source: MoAD

Figure 3 shows the status of paddy transplantation from June to August 2014. Mid-July is the period when paddy transplantation normally has to be completed in order to have better yields. By mid-July only 60 percent of paddy areas were transplanted. The situation was worse in the Terai, the paddy producing belt of the country, where paddy transplantation was recorded at less than 60 percent of the normal level. The situation was reported even worse in some eastern Terai districts, namely Saptari, Siraha, Mahottari and Sarlahi, where less than half of the area was transplanted as of mid-August.

Late transplantation of paddy in 2014 was also confirmed by ICIMOD through the use of TERRA/AQUA–MODIS satellite-based fortnightly Normalized Difference Vegetation Index (NDVI) data. By mid-July 2014 about 25 percent of paddy was not transplanted compared to the same period in 2013, and the central Terai faced more loss in paddy crop area than other sub-regions. See **Map 3** in Annex B with rice crop distribution in 2013 and 2014.

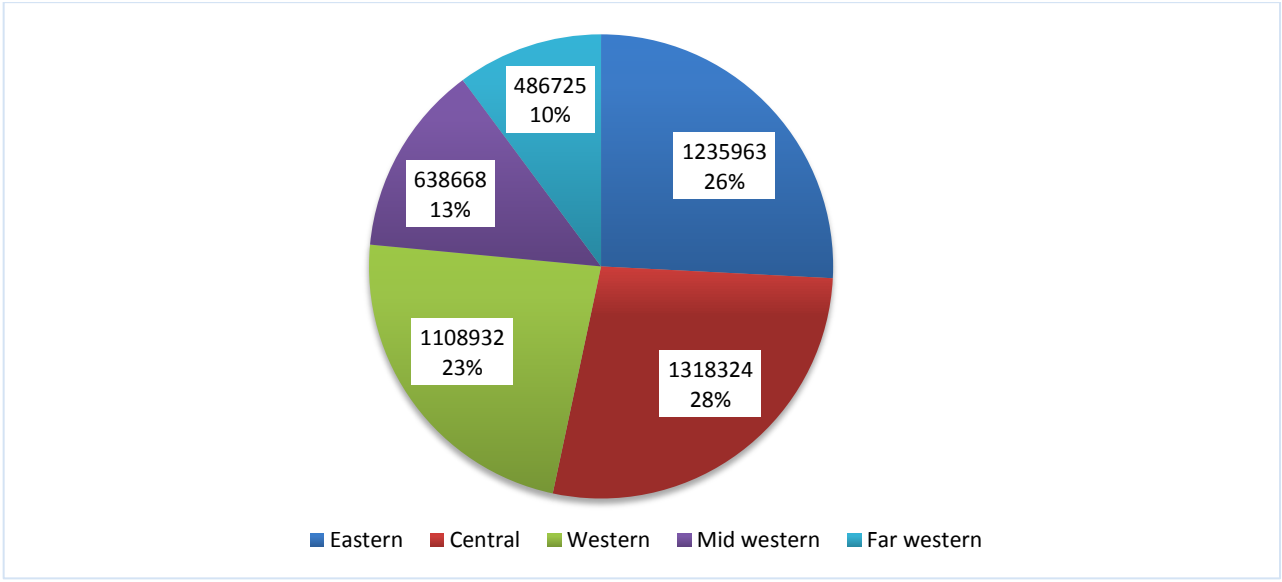


Figure 4: Share of total paddy production by development region. Source: MoAD

Figure 4 shows the share of total paddy production in 2014/15 in the five development regions. The central region is the largest paddy producing region with 1,318,324 mt of production and its share in total paddy production estimated at 28 percent. The eastern and western regions, with their share estimated at 26 percent and 23 percent respectively, have the next highest paddy production. See **Map 4** in Annex B for the edible paddy production at the sub-regional level.

Disaggregation of paddy production across ecological belts shows that the eastern Terai was the largest paddy producing belt with production estimated at 978,801 mt, followed by the central Terai (915,130 mt), western Terai (703,020 mt), mid-western Terai (464,359 mt) and far-western Terai (353,461 mt). At the district level, Jhapa, Rupandehi, Morang, Kailali and Kapilvastu were the top five paddy producing districts in 2014/15 with their respective production recorded at 337,792 mt, 313,200 mt, 288,925 mt, 209,757 mt and 209,520 mt.

Maize

Maize is an integral crop of the hill farming system and can be grown both under rain fed (upland) and irrigated conditions. It is the second most important crop of Nepal in terms of areas and forms the most important staple cereal of the hills. In recent years, however, maize is being increasingly used for poultry

feed and thus demand is on the rise with the growing number of poultry businesses. In 2014/15, maize was grown in 882,395 ha and production was recorded at 2,145,291 mt.

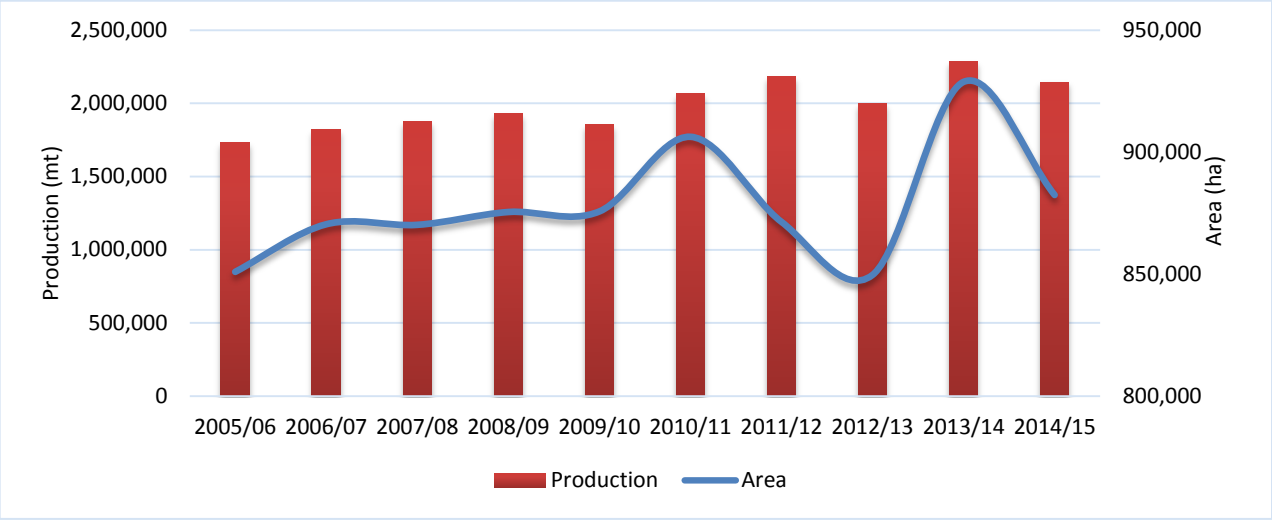


Figure 5: Area and production of maize (2005/06 to 2014/15). Source: MoAD

Figure 5 shows the area and production of maize for the last 10 years, from 2005/06 to 2014/15. The area and production of maize has been gradually increasing with some notable fluctuations. For example, maize area was low in 2012/13 due to an agricultural drought. The average production of the preceding five years, i.e. the normal level, is estimated at 2,076,870 mt. Compared to the normal level, maize production increased by 3.29 percent during 2014/15. However, compared to last year, i.e. 2013/14, during which maize production stood at 2,283,222 mt, this year's production dropped by 6.04 percent.

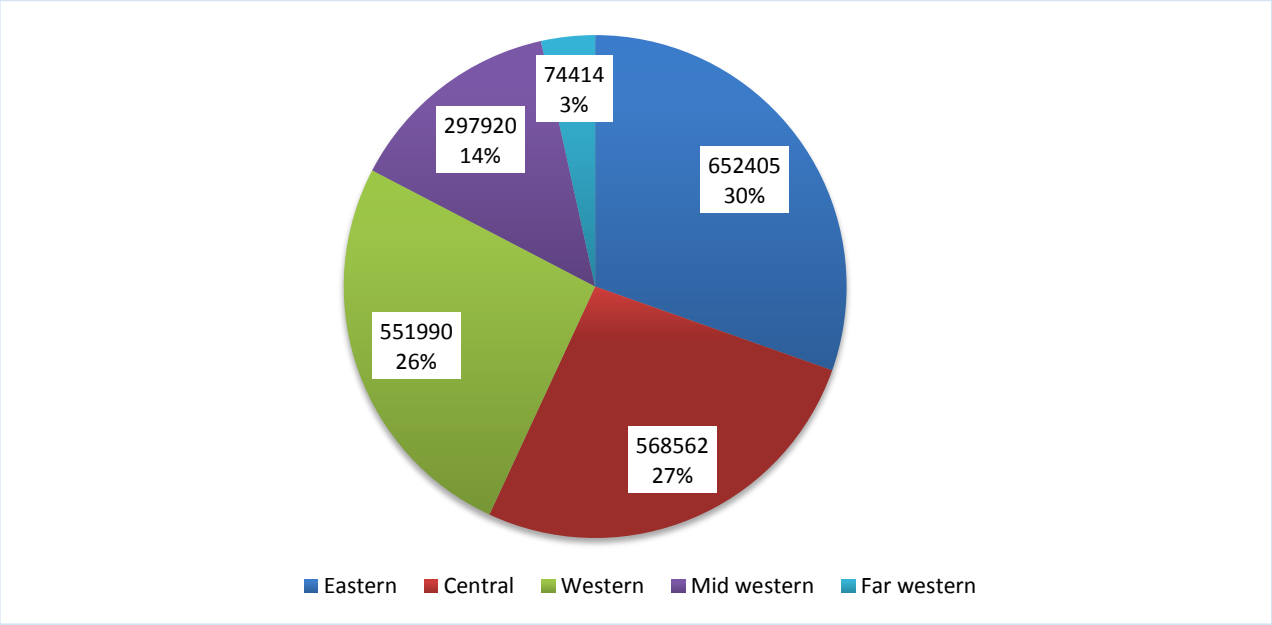


Figure 6: Share of total maize production by development region. Source: MoAD

Figure 6 shows the share of total maize production in 2014/15 in the five development regions. The eastern region is the largest maize producing region with 652,405 mt of production and its share in total maize production estimated at 30 percent. The central and western regions, with their share estimated at 27 percent and 26 percent respectively, have the next highest maize production.

Millet and buckwheat

Millet and buckwheat are marginal crops in Nepal. In 2014/15, millet was grown in 268,050 ha of land from which 308,488 mt of crop was harvested. Millet production this year increased by 1.4 percent compared to 2013/14 when production was recorded at 304,105 mt. Buckwheat is grown as a main crop in some mountain districts. According to MoAD, buckwheat was grown in 10,819 ha in 50 districts and total production was estimated at 10,870 mt.

Growing conditions for 2014/15 summer crops

Overall, growing conditions for 2014/15 summer crops were reported as poor. The monsoon was delayed and weak at the onset, which delayed paddy transplantation, especially in the eastern Terai. On the other hand, torrential rainfall and flash floods damaged standing crops in some mid-western districts.

Rainfall

Almost 80 percent of rainfall in Nepal occurs during the monsoon from June to September. Normally, the monsoon enters Nepal from the east on 10 June and covers the entire country in 24 hours. However, this year the monsoon was late by 10 days: it entered Nepal on 20 June 2014. According to the Department of Hydrography and Meteorology (DHM), the country had 110 monsoon days (compared to the normal number of 105 days). The withdrawal date of the monsoon was 7 October 2014 (compared to the normal withdrawal date of 23 September). DHM also reported that, in 2014, Nepal received near normal to below normal rainfall in most parts of the country and above normal rainfall in high mountainous areas of the central region and adjoining areas of the western and eastern regions.

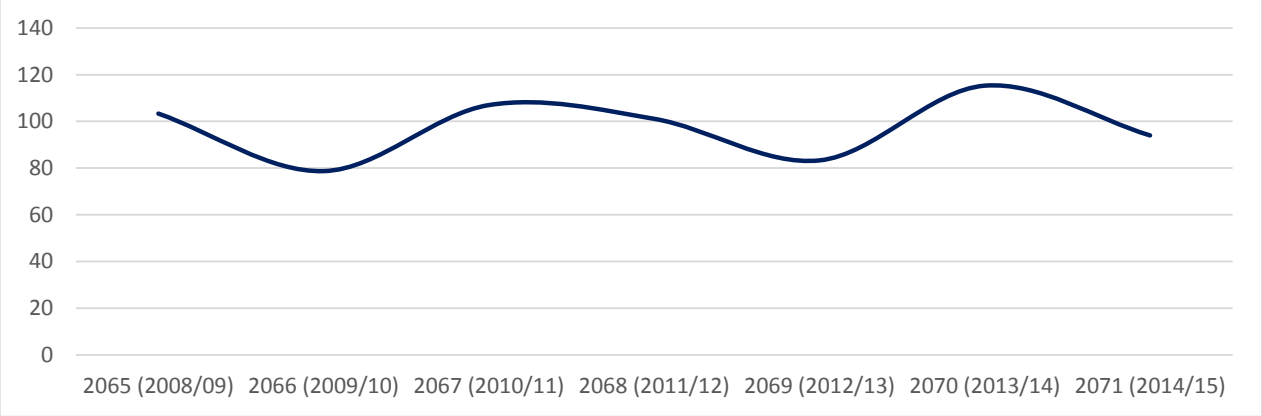


Figure 7: Average rainfall (as a percent of the normal level) from June-September 2008 to 2014. Source: DHM

Overall, rainfall for summer crops was reported below normal. **Figure 7** shows the average rainfall during June to September 2008 to 2014. As mentioned above, the monsoon was delayed and was weak at the onset; average rainfall (during June to September) was 94 percent of the normal level.

Figure 8 shows the monthly rainfall (as a percentage of the normal level) from June to September 2008 to 2014. In 2014, rainfall in June, July and August was below the normal level. It was only in September that rainfall was marginally above the normal level.

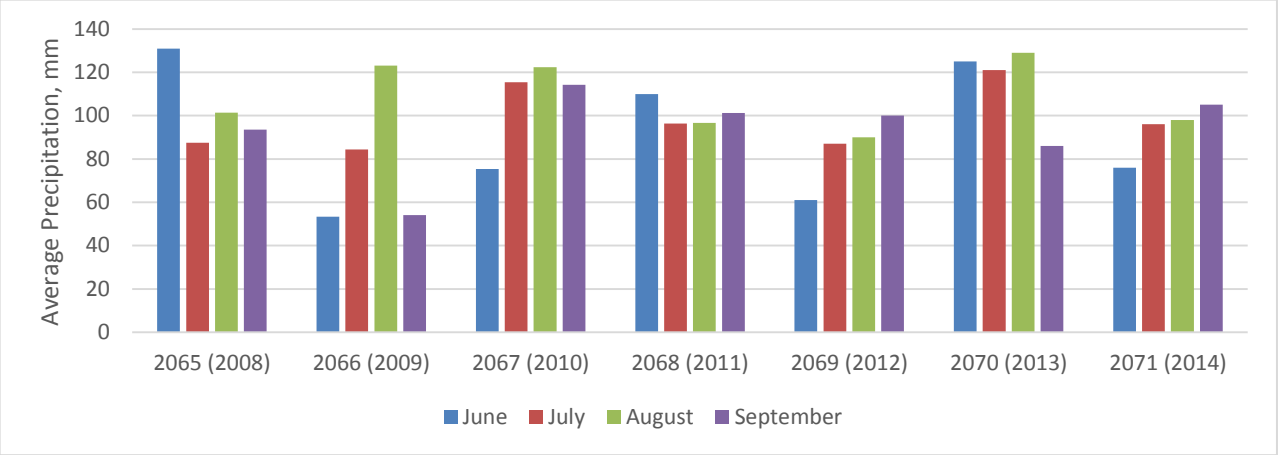


Figure 8: Monthly rainfall (as a percent of the normal level) from June to September 2008-2014. Source: DHM

Nevertheless, some districts of the mid-western region received heavy rainfall in mid-August. According to the DHM, Birendranagar, Dang, Nepalganj, Pokhara, Bhairahawa and Okhaldhunga received a normal to above normal amount of rainfall in August and the rest of the 9 stations received a below normal amount of rainfall. Dang and Birendranagar (Surkhet) received a record level of rainfall, recorded at 298 mm and 423 mm respectively, on 15 August.

Floods during 13-15 August affected large tracts of paddy fields in Dang, Banke, Bardiya, Surkhet and Kailali districts. Roughly 15,395 ha of paddy area was affected by inundation, bank cutting and siltation. In aggregate, 10 percent of paddy area was affected by floods in those districts. The largest flood impact on paddy was in Dang and Surkhet where floods affected 28 percent and 20 percent of the paddy fields respectively. In most areas paddy fields recovered and it was only in Banke and Surkhet where production losses were recorded: 25 percent in Banke and 18 percent in Surkhet. See **Map 5** in Annex B for the extent of flood inundated areas.

Input supply

Use of inputs is important to increasing production and productivity of the agricultural sector. Machinery, irrigation, fertilizers and seeds are the main inputs used in Nepal. However, there is no exact data on machinery use in the country. Nevertheless, the increasing use of tractors, sowing machines, combined harvesters and reapers indicate progressive agricultural mechanization, especially in the Terai.

With only 50.41 percent of the cultivable area (2,641,000 ha) being irrigated during 2012/13, rain fed agriculture is the most common practice in Nepal[1]. Hence, summer crops also largely depend on the monsoon for sowing and other critical crop growth stages.

The use of fertilizer has increased as the Government has increased the supply of subsidized fertilizer. Last year, a total 232,880 mt of chemical fertilizer was distributed by Agricultural Input Corporation Limited (AICL) and Salt Trading Company Limited (STCL), of which 146,117 mt was urea, 81,738 mt was diammonium phosphate (DAP) and 5,024 mt was muriate of potash (MoP). As a result, per hectare chemical fertilizer use has increased to 75 kg, although this is still low compared to neighboring countries[2]. Likewise, the distribution of chemical fertilizers in the first trimester of this year also increased. A total 98,174 mt of chemical fertilizer was supplied by the government, of which 66,581 mt was urea, 28,900 mt

[1] http://moad.gov.np/uploads/files/YearBook%202013.pdf
[2] For instance, in India fertilizer consumption during 2009-10 was 135.25 kg/ha.
(Source: http://ijset.com/ijset/publication/v1s6/285-291%20IJSET_PK%20JAGA.pdf)

was DAP, and 2,692 mt was MoP. The use of vermicompost fertilizer is growing and 149 mt was supplied in the first trimester of this fiscal year.

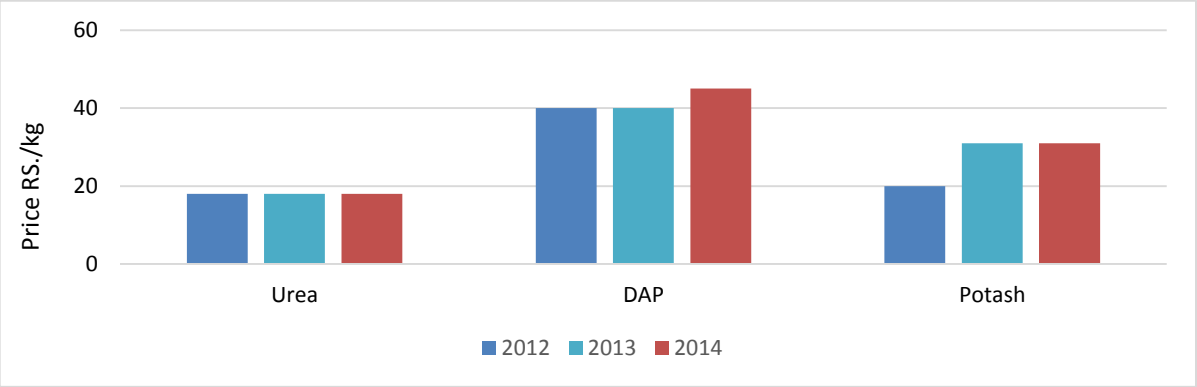


Figure 9: Price of Urea, DAP and MoP (2012-2014). Source: MoAD

Figure 9 shows the price trends for three fertilizer inputs (urea, DAP and potash) from 2012 to 2014. Prices of all fertilizers showed an upward trend over this period with the exception of urea which remained the same. The price of DAP increased by 12.5 percent in 2014 compared to 2013, while the price of potash remained the same compared to 2013.

Use of improved and recommended seed varieties is gradually increasing in Nepal. The supply of improved seeds from the National Seed Company (NSC), a government entity, is unable to meet the demand from farmers. This year, a total of 1,781 mt of improved paddy seeds was supplied by NSC. Use of composite varieties released from the Nepal Agriculture Research Council (NARC) and hybrid varieties available in the market are popular among farmers. The crop assessment team observed the wide use of Indian rice varieties, including Sona Masuli (locally known as Bangalia in Siraha and Mohania in Sarlahi) and Ranjeet in Siraha and Sarlahi. According to interviewed farmers, Sona Masuli, an Indian variety of rice seed, is popular because of its high yield potential and wide adaptability. In addition, farmers felt that in the case of delayed transplanting, old seedlings of this variety perform better than other varieties because it has high-stress tolerance, particularly against drought, and it performs well in both irrigated and rain fed areas.

Farmers travel to border markets in India to buy Indian rice seed varieties. On one hand, farmers complain about the unavailability of seeds at the right time, right place and in sufficient quantity, while on the other, they are reluctant to grow Nepali rice seed varieties promoted by the District Agricultural Development Office (DADO). Current norms do not allow DADOs to promote Indian varieties (including multiplication and distribution of seed to farmers), unless the Indian varieties are registered and recommended for general production by the Government of Nepal. In this context, clarification of a number of issues are recommended, including: whether it is appropriate for DADOs to produce and distribute Indian seed varieties; whether Indian seed varieties preferred by farmers can be registered in Nepal; and whether the capacity of the Nepal Agricultural Research Council (NARC) can be enhanced to be able to develop seed varieties as good as or better than Indian varieties that farmers are currently using.

Food market situation

Figure 10 shows the trend of wholesale prices for paddy and maize from 2011 to 2014[3]. Wholesale prices of both crops showed an upward trend over this period. The price of paddy increased by 2 percent year-

[3] Wholesale prices collected in December (following the harvest) are the average of nine market centres in the Terai and hills (Kathmandu and Pokhara).

on-year in 2014 compared to an increase of 4 percent year-on-year in 2013, while the price of maize increased by 5.1 percent year-on-year in 2014 compared to an increase of 6.4 percent year-on-year in 2013. These gradual increases are likely attributable to increasing demand among consumers and the decrease in production and area.

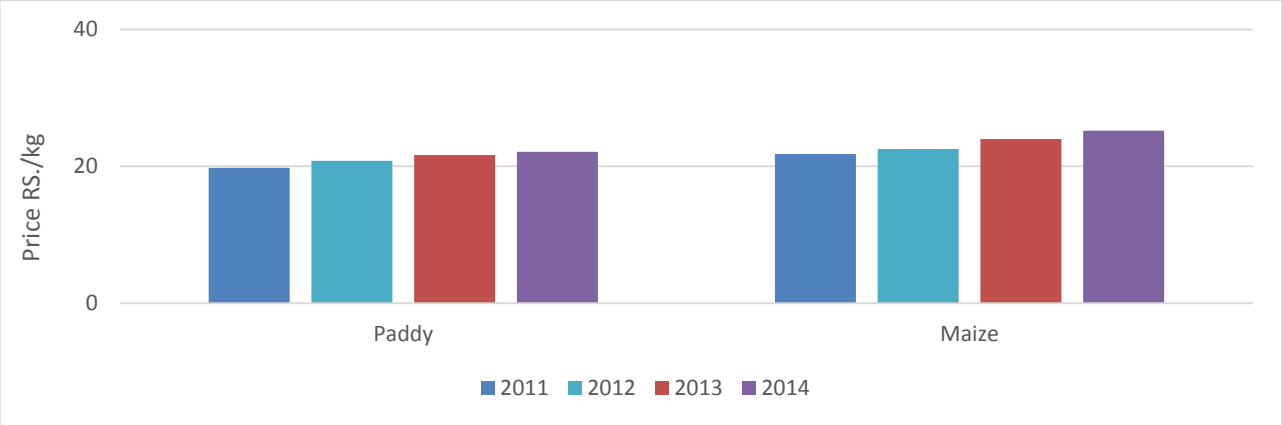


Figure 10: Wholesale price of paddy and maize, Dec-2011 to Dec-2014. Source: ABPMDD

Figure 11 presents the wholesale price index (WPI) in December 2012, 2013, and 2014. The overall year-on-year WPI increased by 6.6 percent in December 2014 as compared to an increase of 9.2 percent over the same period in 2013. The WPI of agricultural commodities in December 2014 increased by 8.2 percent, which was 14.1 percent over the same period last year. The WPI of food grains showed an increase of 11.0 percent in December 2014 as compared to an increase of 5.7 percent in December 2013. Likewise, the WPI of pulses increased by 8.6 percent as compared to a decline of 2.2 percent in December 2013. This may be due to a reduction in the supply because of a decrease in pulse production in 2014 compared to 2013.

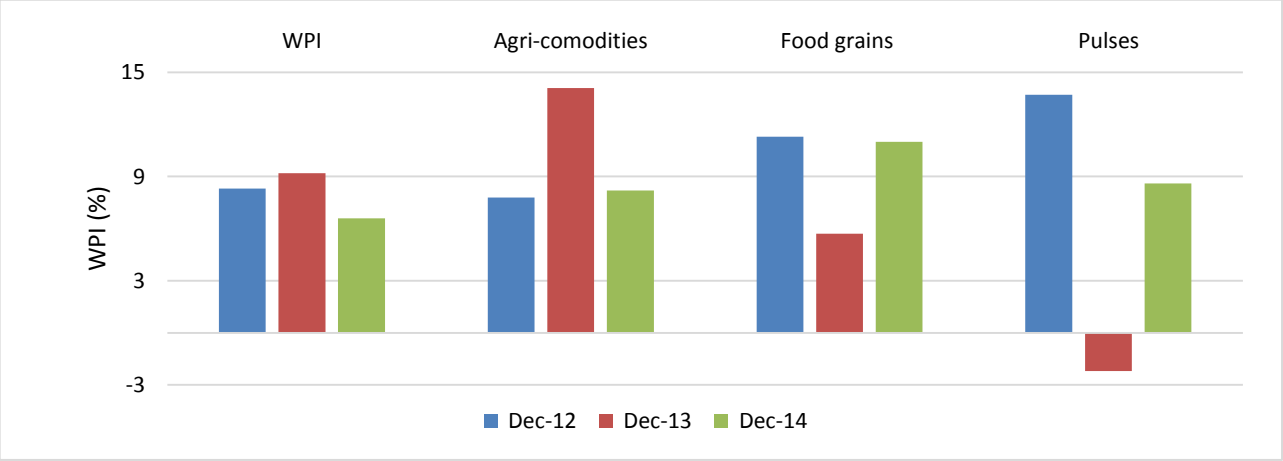


Figure 11: Wholesale Price Index, December 2012-2014. Source: ABPMDD

Figure 12 presents the year-on-year wage rate index (WRI) in December 2012, 2013, and 2014. The overall WRI increased by 11.1 percent in December 2014 compared to an increase of 8.5 percent over the same period in 2013. The WRI of agricultural labour increased by 9.5 percent in December 2014 compared to an increase of 7.5 percent over the same period in 2013. The WRI of agricultural male and female wages increased by 11.7 percent and 7.2 percent respectively. The increase in WRI of agricultural male wages could be a result of increased demand for male agriculture labour due to an increasing trend of labour migration, especially from rural to urban areas and abroad.

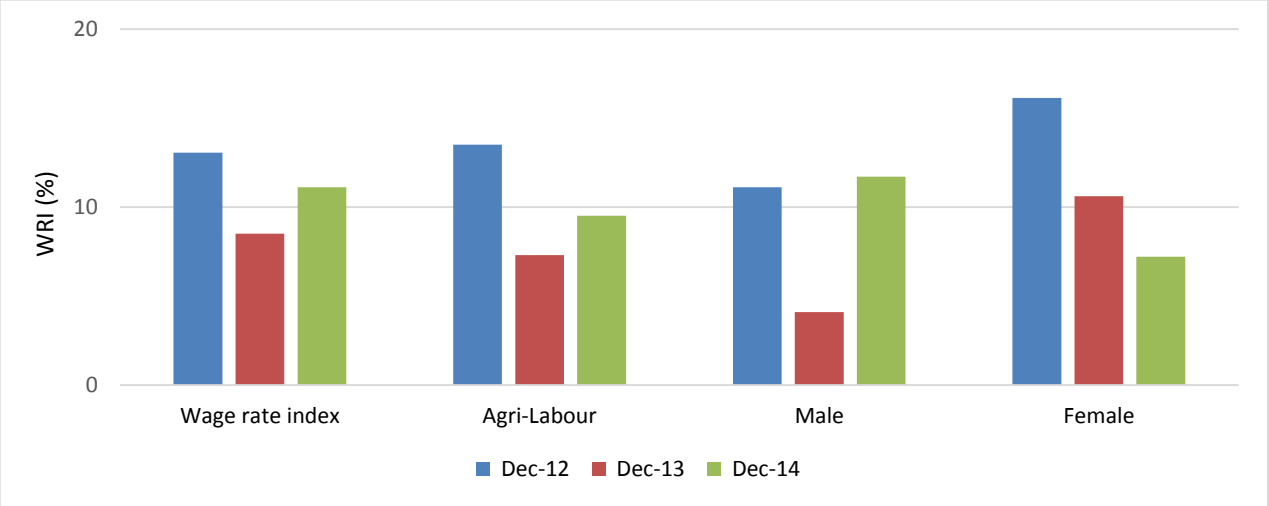


Figure 12: Wage Rate Index, December 2012-2014. Source: ABPMDD

2070/71 cereal trade overview

According to the Trade and Export Promotion Centre (TEPC), the value of foreign trade during fiscal year 2070/71 stood at 814.14 billion NPR, which is an increase of 19.98 percent compared to the same period last year (2069/70). The share of exports and imports stood at 11.2 percent (91.36 billion NPR) and 88.8 percent (722.78 billion NPR) respectively. During this period, the share of cereals in total imports was recorded at 4 percent (28.6 billion NPR), which over the same period last year was recorded at 3 percent (20.9 billion NPR)[4].

Table 1 compares the import of key food commodities (rice, wheat, maize and lentils) during January-December 2012 and 2013. Overall, the value of imports has increased despite marginal decreases in the volume of rice and maize imports. Wheat imports have increased significantly in both volume and value: the volume of wheat imports increased from 4,848 mt in 2012 to 89,221 mt in 2013 while the value of wheat imports increased from 78 million NPR in 2012 to 2,171 million NPR in 2013. Similarly, the import of lentils has also increased in both volume and value.

Table 1: Import volume and value of rice, wheat, maize and lentils, January-December 2013 and 2014. Source: TEPC

Commodity	January-December 2012		January-December 2013	
	Volume (mt)	Value (mn NPR)	Volume (mt)	Value (mn NPR)
Rice	493,409	12,836	487,458	14,246
Wheat	4,848	78	89,221	2,171
Maize	223,603	4,610	208,605	5,153
Lentils	6,948	325	16,457	1,016

Lentils, cardamom, tea and ginger are the four primary agricultural commodities contributing the most to the national coffer via exports in 2070/71 with their combined export value estimated at 8.79 billion NPR. The export value of cardamom, tea, lentils and ginger in 2070/71 was 4.2 billion, 2.09 billion, 2.04 billion and 449 million respectively.

[4] http://www.tepc.gov.np/news-events/details.php?id=23

Global and regional production overview

FAO's December 2014 estimate for world cereal production was a record 2,532 million mt, including rice in milled terms. This is higher than 2013 and is expected to boost stocks to a 15-year high. In India, the first advance estimate (as of 19 Sept 2014) of major Kharif (monsoon) crop production for 2014-15 is 120.27 million mt, which is 8.97 mt lower compared to the record production of 129.24 million mt of food grains achieved in 2013-14[5]. Also, the area under the Kharif season declined due to delayed and deficient rainfall. Erratic rainfall and dry spells in some parts of the country also impacted crop productivity. Due to lower area coverage and productivity, production of most crops was expected to be lower than their record production levels achieved last year. Since the advance estimate did not take into account the potential positive impacts of rainfall in September, production estimates may be revised upward. At 120.27 million mt, production of Kharif rice was estimated at 88.02 million mt, which is 3.67 million mt lower than last year's record production of 91.69 million mt but 1.34 million mt higher than its five-year average.

Conclusion and winter crop outlook

MoAD estimated the production of 2014/15 summer crops (paddy, maize, millet and buckwheat) at 7.2 million mt, an increase of 3.45 percent compared to the preceding five-year average and a decrease of 5.12 percent compared to 2013/14. At 7.2 million mt, production of paddy, maize, millet and buckwheat was estimated at 4.7 million mt, 2.1 million mt, 308,000 mt and 10,870 mt respectively. Summer crop production is traditionally dominated by paddy, accounting for 68 percent of total summer crop production this year. With 1,318,324 mt of paddy production, the central region claims the largest share in paddy production (28 percent). At the district level, Jhapa, Rupandehi, Morang, Kailali and Kapilvastu are the top five paddy producing districts in 2014/15.

Monsoon withdrawal was delayed by two weeks, which is believed to have created favorable conditions for winter crops, especially wheat and barley. Moreover, cyclone *Hudhud* in mid-October also brought rain and snow deposits, which provided moisture for winter crop germination and growth. The third monsoon forum, held by DHM in Kathmandu on 11 December 2014, also projected normal to above normal winter rain in Nepal. These facts allow us to make a positive production outlook for 2015 winter crops.

Based on TERRA/AQUA MODIS satellite-based fortnightly Normalized Difference Vegetation Index (NDVI) data, ICIMOD has mapped the wheat area for 2015. When assessed with satellite imagery the crop sown area in 2014/15 has increased by 10 percent compared to the 2013/14 wheat crop season. Districts of the eastern and central Terai show an increase in crop area (See **Map 6** in Annex B). Overall, crop growth conditions are also better than average (2008-2013) and last year's conditions.

Preliminary wheat outlook for 2014/15

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) Regional Agriculture Forecasting Toolbox (CRAFT) has generated a preliminary wheat outlook for 2014/15. The toolbox incorporates a crop simulation model (DSSAT), weather and seasonal forecast module (CPT) and a GIS mapping module (Map Win GIS).

Figure 13 shows observed and simulated wheat production from 1982 to 2013 and forecasts preliminary production for 2014/15. As shown in the figure, the preliminary forecast suggests an estimated production

[5] http://pib.nic.in/newsite/PrintRelease.aspx?relid=109839

of 2,230,660 mt (within a range of 1,896,061 to 2,565,259 mt)[6], an increase of 27 and 18 percent compared to the five-year average and last year.

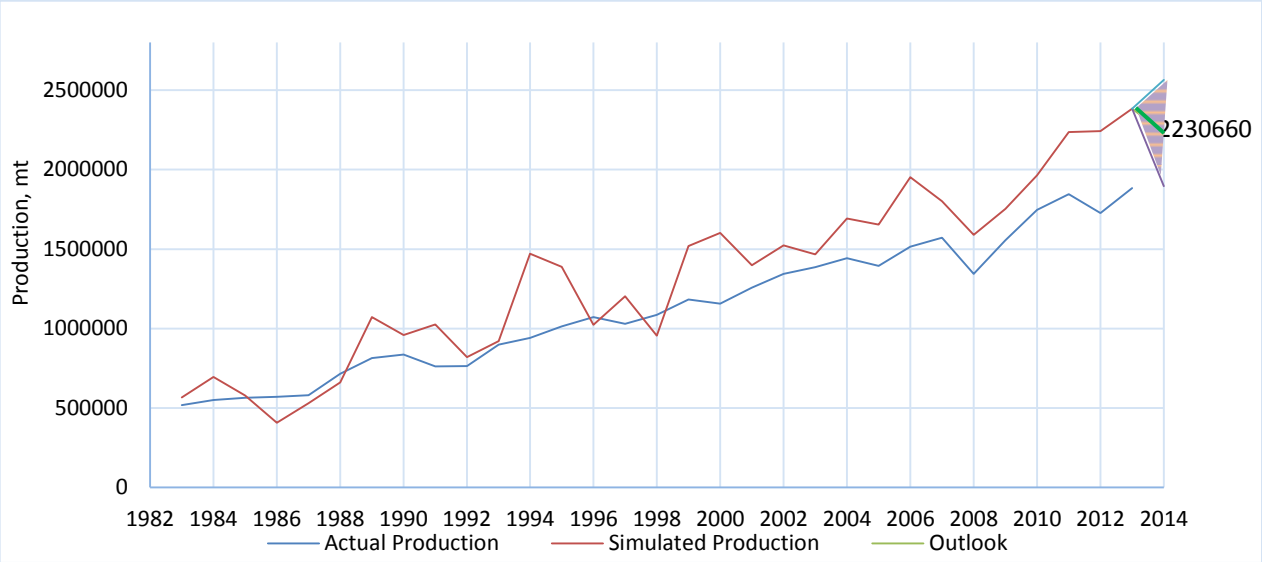


Figure 13: Observed, simulated and forecasted wheat production in mt, 1982-2014

Prior to the forecast, the model was run to simulate the yields for each year from 1983 to 2013 and the simulated values were compared against the reported yields from MoAD. The preliminary model run shows a strong correlation between the observed and the simulated yields in Nepal. **Figure 14** shows the correlation between observed and simulated yields. As shown in the figure, the correlation coefficient (r^2) value of 92.04 shows a very good predictive capability of the model. However, a closer look into the model prediction shows overestimation of the production in most of the years. Apart from 1989, 1994 and 2000, the differences in production are well within 30 percent, with the lowest being 2 percent in 1993.

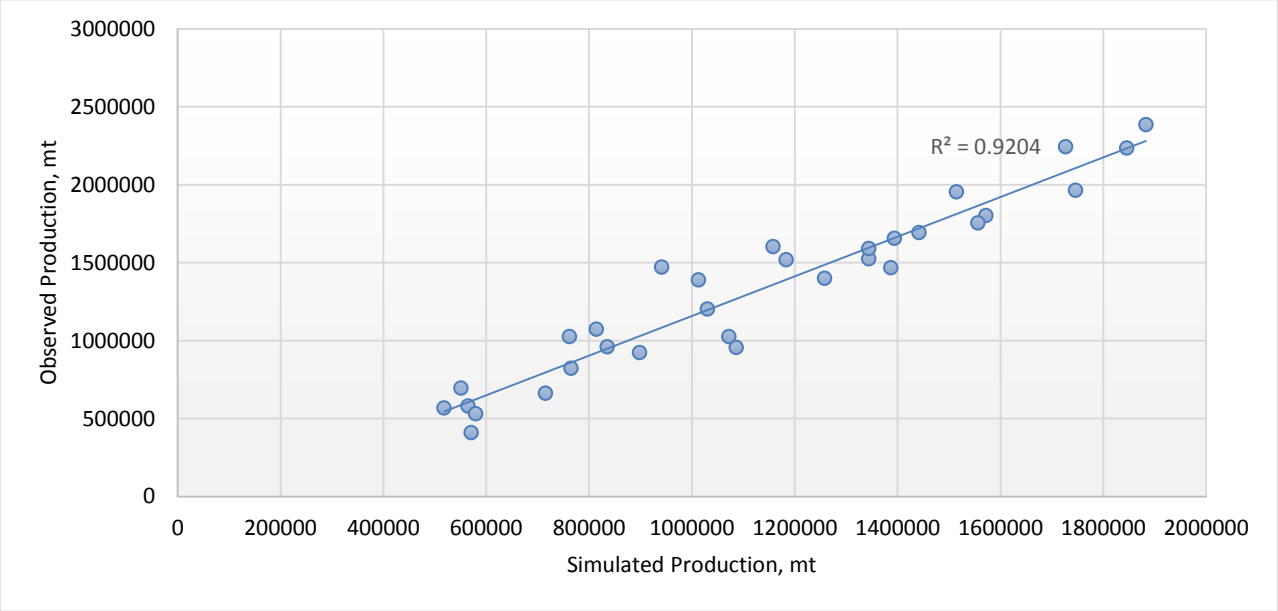


Figure 14: Correlation between observed and simulated wheat production (1985- 2013)

[6] Production forecasts for 2015 wheat crop will be updated every fortnightly and will be available at: www.neksap.org.np

The crop yield forecasting model used meteorological data, cultivar specific genotype data, soil properties, as well as various management practice data to simulate plant-weather-soil interactions in quantitative terms and predict the crop yield over a given area, prior to the harvest, provided no extreme (statistically infrequent) conditions occur. The following data sets were used:

- **Weather:** DHM ground station data for precipitation and temperature for a time period of 1981 to 2009 were considered in the preliminary model run. The precipitation data was taken from 163 stations and temperature from 45 stations across Nepal. The stations were selected based on the availability of the weather parameters. These data were interpolated in the 5' x 5' schema grids using the nearest neighborhood method. Beyond 2009, the weather data was supplemented using other satellite precipitation and temperature estimates till 10 February 2015.
- **Wheat crop mask:** The wheat mask was created for Nepal using MoAD's national statistics on wheat grown area for the year 2013/14. Since the DHM's weather outlook predicts normal or above normal rain this winter season, it was assumed that the wheat grown area will remain more or less the same. The ratio of wheat grown area to the total area for each district was calculated and this proportion was uniformly distributed to each grid within a district to get a distributed wheat mask for Nepal.
- **Irrigated area mask:** MoAD statistics on the irrigated area were used and distributed to grids in each district. It was also assumed that the irrigated areas will not change from 2013/14.
- **Soil Data:** Nepal SOTER 2009 was used as the soil source and the respective properties were added to the CRAFT database and used for modeling.
- **Crop Varieties:** Varieties RR-21 (hills) and NL-297 (Terai) were selected as the popular wheat cultivars. Calibrated genotypes obtained from NARC were used as the cultivar coefficients.
- **Crop Management:** Planting dates for the hills were assumed to be 1 December and for the Terai to be 22 November. Similarly, it was also assumed that nitrogen use was 60 kg/ha for both the hills and Terai. Total irrigation application was assumed to be 600 mm for the hills and 800 mm for the Terai.

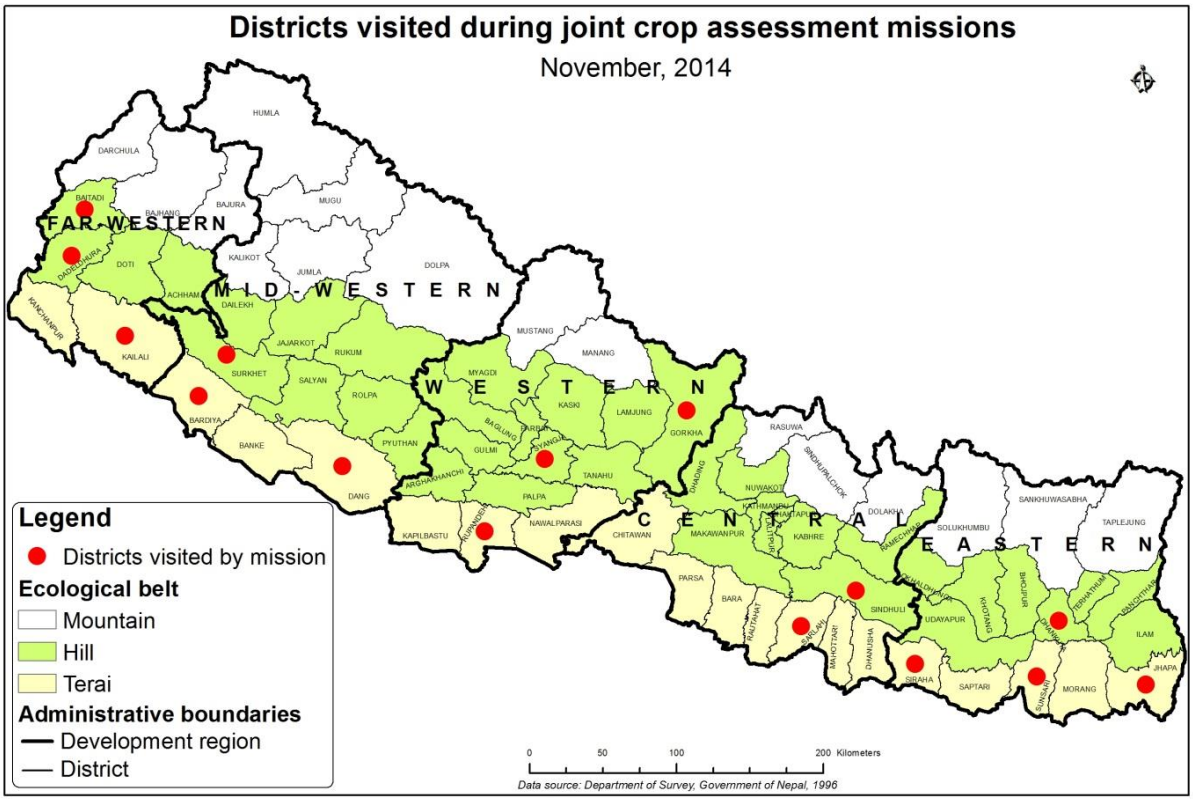
Annex A

2014/15 summer crop production at district level [Area in ha, production in mt and yield in kg/ha]

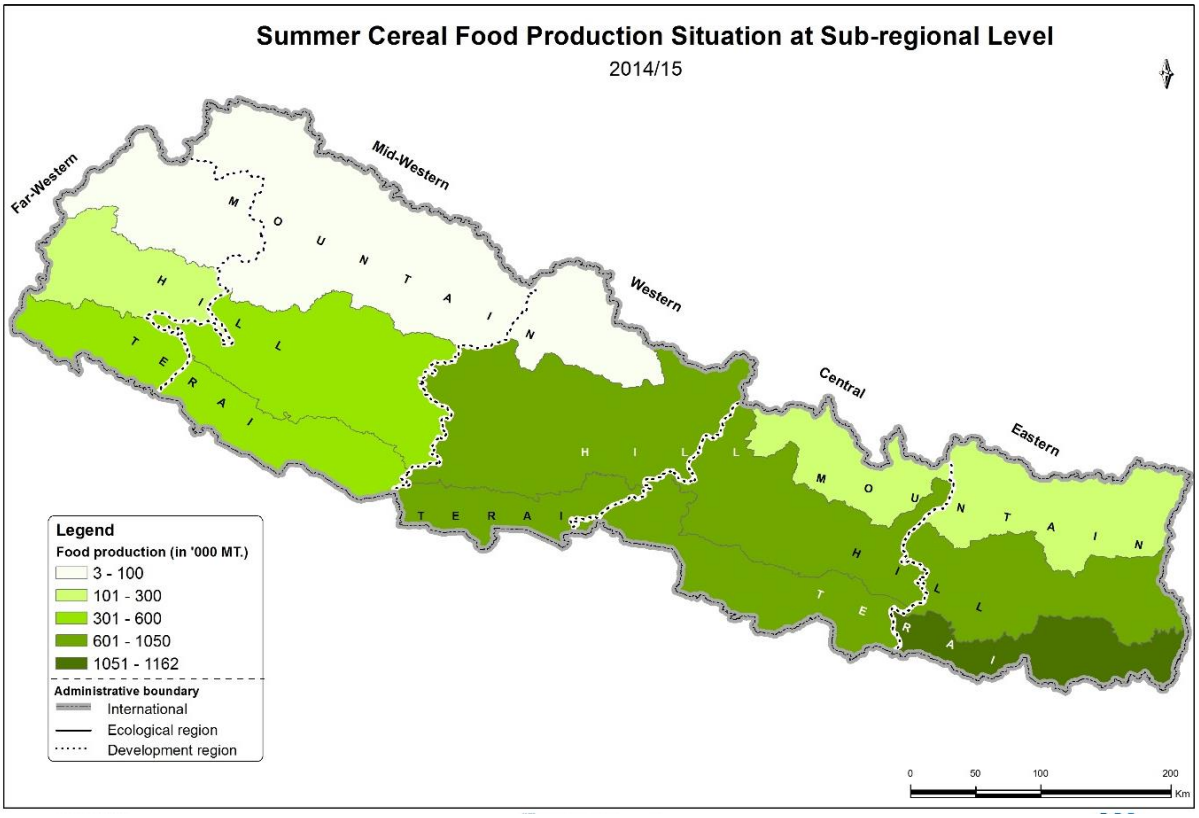
District	Paddy			Maize			Millet			Buckwheat			Total
	Area	Prod	Yield	Area	Prod	Yield	Area	Prod	Yield	Area	Prod	Yield	
Taplejung	4074	8637	2120	9150	30770	3363	3350	4718	1408	118	165	1398	44290
Sankhuwashava	13650	32660	2393	12000	15000	1250	7171	7514	1048	18	18	1000	55192
Solukhumbu	1525	3564	2337	12955	32517	2510	2100	2688	1280	320	192	600	38961
E. mountain	19249	44861	2331	34105	78287	2295	12621	14920	1182	456	375	822	138443
Panchthar	9200	20240	2200	18432	30412	1650	4750	8980	1891	56	36	643	59668
Illam	12593	31230	2480	31395	111452	3550	1700	1700	1000	25	20	800	144402
Terhathum	7606	17494	2300	12350	30875	2500	2700	2969	1100	35	28	800	51366
Dhankuta	7820	22434	2869	6785	15500	2284	7800	7800	1000	-	-	-	45734
Bhojpur	16093	35893	2230	36360	83735	2303	5505	4404	800	35	25	714	124057
Khotang	12161	26755	2200	41060	75550	1840	21315	23455	1100	650	350	538	126110
Okhaldhunga	4355	10310	2367	12400	28520	2300	7751	12626	1629	105	89	848	51545
Udayapur	12100	47945	3962	9310	22344	2400	2200	2370	1077	19	17	895	72676
E. hills	81928	212301	2591	168092	398388	2370	53721	64304	1197	925	565	611	675558
Jhapa	83200	337792	4060	35500	92000	2592	1780	2136	1200	1270	1270	1000	433198
Morang	82550	288925	3500	14200	48220	3396	1510	1661	1100	70	70	1000	338876
Sunsari	44940	161784	3600	8350	25050	3000	680	714	1050	400	400	1000	187948
Saptari	35000	95000	2714	3000	7000	2333	200	260	1300	-	-	-	102260
Siraha	36000	95300	2647	1730	3460	2000	640	640	1000	-	-	-	99400
E. Terai	281690	978801	3475	62780	175730	2799	4810	5411	1125	1740	1740	1000	1161682
E. region	**382867**	**1235963**	**3228**	**264977**	**652405**	**2462**	**71152**	**84635**	**1189**	**3121**	**2680**	**859**	**1975683**
Dolakha	3180	6996	2200	5700	12825	2250	3600	4250	1181	435	400	920	24471
Sindhupalchok	12200	28217	2313	24900	53301	2141	19320	22252	1152	-	-	-	103770
Rasuwa	1300	3510	2700	2430	4033	1660	895	902	1008	-	-	-	8445
C. mountain	16680	38723	2322	33030	70159	2124	23815	27404	1151	435	400	920	136686
Ramechap	9408	26164	2781	21398	53922	2520	5060	4550	899	19	19	1000	84655
Sindhuli	13000	41600	3200	23620	58500	2477	11800	9350	792	530	570	1075	110020
Kavre	11310	37009	3272	25354	60849	2400	3515	4042	1150	671	669	997	102569
Bhaktapur	4348	26523	6100	1965	8071	4107	110	156	1418	-	-	-	34750
Lalitpur	4680	24804	5300	8589	26626	3100	570	570	1000	50	48	960	52048
Kathmandu	7930	45245	5706	9923	33450	3371	852	852	1000	5	5	1000	79552
Nuwakot	15692	73762	4701	20450	63435	3102	5125	9950	1941	200	245	1225	147392
Dhading	12545	50369	4015	19445	37538	1930	6930	6594	952	-	-	-	94501
Makwanpur	11130	38995	3504	23650	70950	3000	2645	3280	1240	185	205	1108	113430
C. hills	90043	364471	4048	154394	413341	2677	36607	39344	1075	1660	1761	1061	818917
Dhanusha	44200	141440	3200	2465	7700	3124	300	300	1000	-	-	-	149440
Mahottari	29400	90500	3078	800	2100	2625	0	0	0	-	-	-	92600
Sarlahi	45500	127400	2800	5500	15000	2727	950	817	860	-	-	-	143217
Rautahat	30355	112994	3722	1800	5800	3222	62	53	855	-	-	-	118847
Bara	60446	156896	2596	4750	13500	2842	79	103	1304	-	-	-	170499
Parsa	45600	182400	4000	4075	14262	3500	0	0	0	-	-	-	196662
Chitwan	29400	103500	3520	9200	26700	2902	1550	1550	1000	-	-	-	131750
C. Terai	284901	915130	3212	28590	85062	2975	2941	2823	960	-	-	-	1003015
C. region	**391624**	**1318324**	**3366**	**216014**	**568562**	**2632**	**63363**	**69571**	**1098**	**2095**	**2161**	**1032**	**1958618**

District	Paddy			Maize			Millet			Buckwheat			
	Area	Prod	Yield	Area	Prod	Yield	Area	Prod	Yield	Area	Prod	Yield	Total
Manang	-	-	-	176	350	1989	-	-	-	300	555	1850	905
Mustang	-	-	-	516	774	1500	-	-	-	582	998	1715	1772
W. mountain	-	-	-	692	1124	1624	-	-	-	882	1553	1761	2677
Gorkha	12192	38587	3165	17033	45480	2670	11605	15929	1373	393	396	1008	100392
Lamjung	14930	37327	2500	15975	31950	2000	7919	8523	1076	15	12	800	77812
Tanahu	12540	45144	3600	22000	64300	2923	6360	5850	920	193	187	969	115481
Kaski	22025	83364	3785	13773	31678	2300	14767	18720	1268	14	16	1143	133778
Parbat	8835	24738	2800	13925	29938	2150	8750	7498	857	38	37	974	62211
Syangja	16800	60137	3580	26500	79572	3003	16505	19350	1172	230	172	748	159231
Palpa	8620	33100	3840	20210	42386	2097	2573	2587	1005	448	418	933	78491
Myagdi	3895	12464	3200	9135	29414	3220	2740	3493	1275	148	112	757	45483
Baglung	5782	17715	3064	19942	58808	2949	18559	21785	1174	84	121	1440	98429
Gulmi	10042	27950	2783	24014	52900	2203	2905	2915	1003	212	271	1278	84036
Arghakhanchi	8189	25386	3100	16500	49500	3000	505	656	1299	275	240	873	75782
W. hills	123850	405912	3277	199007	515926	2593	93188	107306	1152	2050	1982	967	1031126
Nawalparasi	44800	180300	4025	8400	14940	1779	500	520	1040	200	127	635	195887
Rupandehi	69600	313200	4500	2550	10500	4118	50	55	1100	-	-	-	323755
Kapilbastu	69840	209520	3000	3120	9500	3045	-	-	-	-	-	-	219020
W. Terai	184240	703020	3816	14070	34940	2483	550	575	1045	200	127	635	738662
W. region	**308090**	**1108932**	**3599**	**213769**	**551990**	**2582**	**93738**	**107881**	**1151**	**3132**	**3662**	**1169**	**1772465**
Dolpa	276	590	2138	255	276	1082	291	298	1024	682	678	994	1842
Mugu	1350	2551	1890	621	1092	1758	4275	4916	1150	485	500	1031	9059
Humla	574	880	1533	118	182	1542	1270	1312	1033	670	512	764	2886
Jumla	2950	7375	2500	4500	7200	1600	3840	4379	1140	85	85	1000	19039
Kalikot	2563	6671	2603	2573	6026	2342	1263	1983	1570	123	179	1455	14859
MW mountain	7713	18067	2342	8067	14776	1832	10939	12888	1178	2045	1954	956	47685
Rukum	3562	9795	2750	16289	32578	2000	915	1601	1750	-	-	-	43974
Rolpa	4715	12259	2600	11880	27342	2302	1065	1320	1239	122	122	1000	41043
Pyuthan	6525	21902	3357	12058	21108	1751	1995	2290	1148	15	15	1000	45315
Salyan	7024	24942	3551	19370	40059	2068	2235	2335	1045	63	69	1095	67405
Jajarkot	4042	10812	2675	9366	14539	1552	1935	2297	1187	28	29	1036	27677
Dailekh	8307	26161	3149	20150	39292	1950	2425	2645	1091	27	20	741	68118
Surkhet	13252	50371	3801	15281	39730	2600	2100	2950	1405	-	-	-	93051
MW hills	47427	156242	3294	104394	214648	2056	12670	15438	1218	255	255	1000	386583
Dang	36508	156984	4300	23200	46168	1990	20	20	1000	20	20	-	203192
Banke	32500	102375	3150	8990	19328	2150	-	-	-	-	-	-	121703
Bardiya	48500	205000	4227	1200	3000	7500	-	-	-	-	-	-	208000
MW Terai	117508	464359	3952	33390	68496	2051	20	20	1000	20	20	-	532895
MW region	**172648**	**638668**	**3699**	**145851**	**297920**	**2043**	**23629**	**28346**	**1200**	**2320**	**2229**	**961**	**967163**
Bajura	3310	7993	2415	790	1848	2339	2610	2750	2662	7	12	1714	12603
Bajhang	7006	22769	3250	3652	3871	1060	2286	2300	1006	7	7	1000	28947
Darchula	4480	10631	2373	3558	6404	1800	1310	1155	882	100	82	820	18272
FW mountain	14796	41393	2798	8000	12123	1515	6206	6205	1000	114	101	886	59822
Achham	16500	34795	2109	3652	10163	2783	3420	3550	1038	-	-	-	48508
Doti	10600	22396	2113	2748	5221	1900	5150	6500	1262	12	12	1000	34129
Baitadi	7000	15680	2240	14500	23417	1615	710	1110	1563	-	-	-	40207
Dadeldhura	5221	19000	3639	3744	10895	2910	305	310	1016	-	-	-	30205
FW hills	39321	91871	2336	24644	49696	2017	9585	11470	1197	12	12	1000	153049
Kailali	70400	209757	2980	5540	5755	1039	377	380	1008	25	25	1000	215917
Kanchanpur	45600	143704	3151	3600	6840	1900	-	-	-	-	-	-	150544
FW Terai	116000	353461	3047	9140	12595	1378	377	380	1008	25	25	1000	366461
FW region	170117	486725	2861	41784	74414	1781	16168	18055	1117	151	138	914	579332
N e p a l	1425346	4788612	3360	882395	2145291	2431	268050	308488	1151	10819	10870	1005	7253261

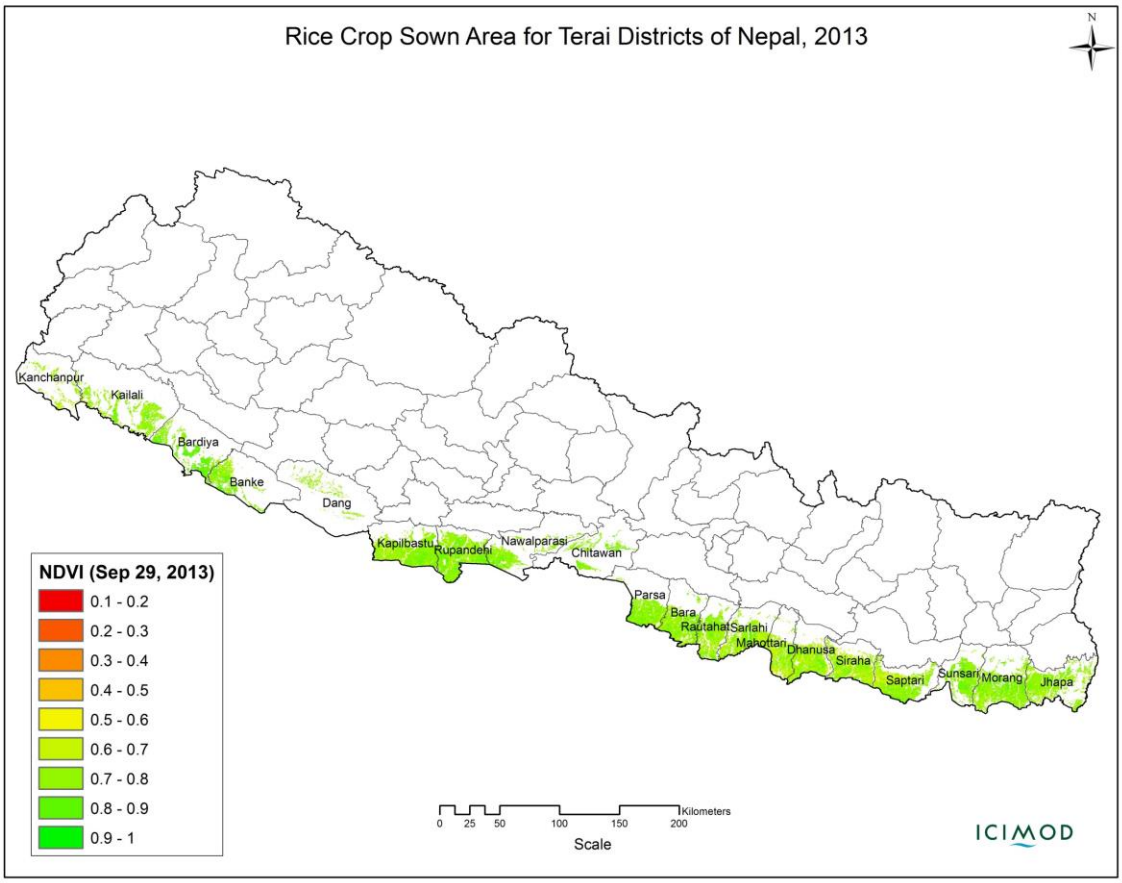
Annex B

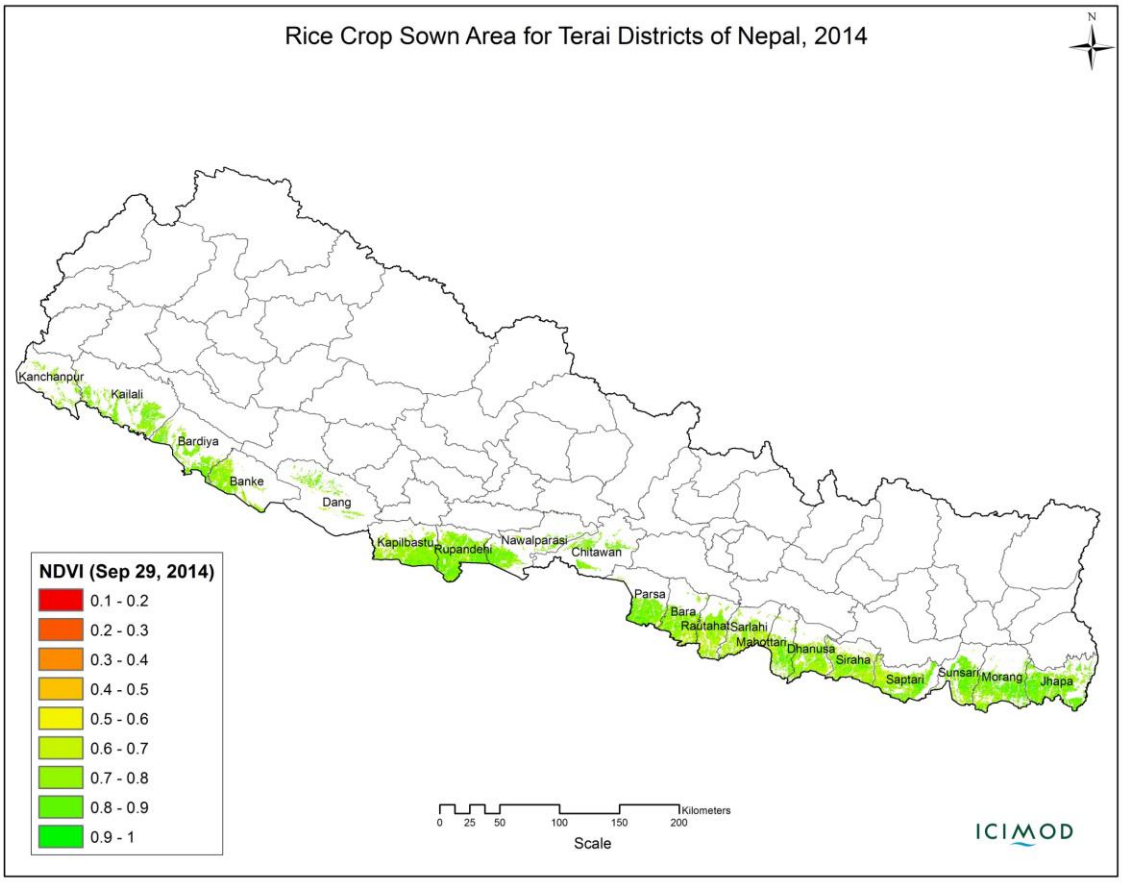


Map 1: Districts visited by the joint crop assessment field missions, November 2014.

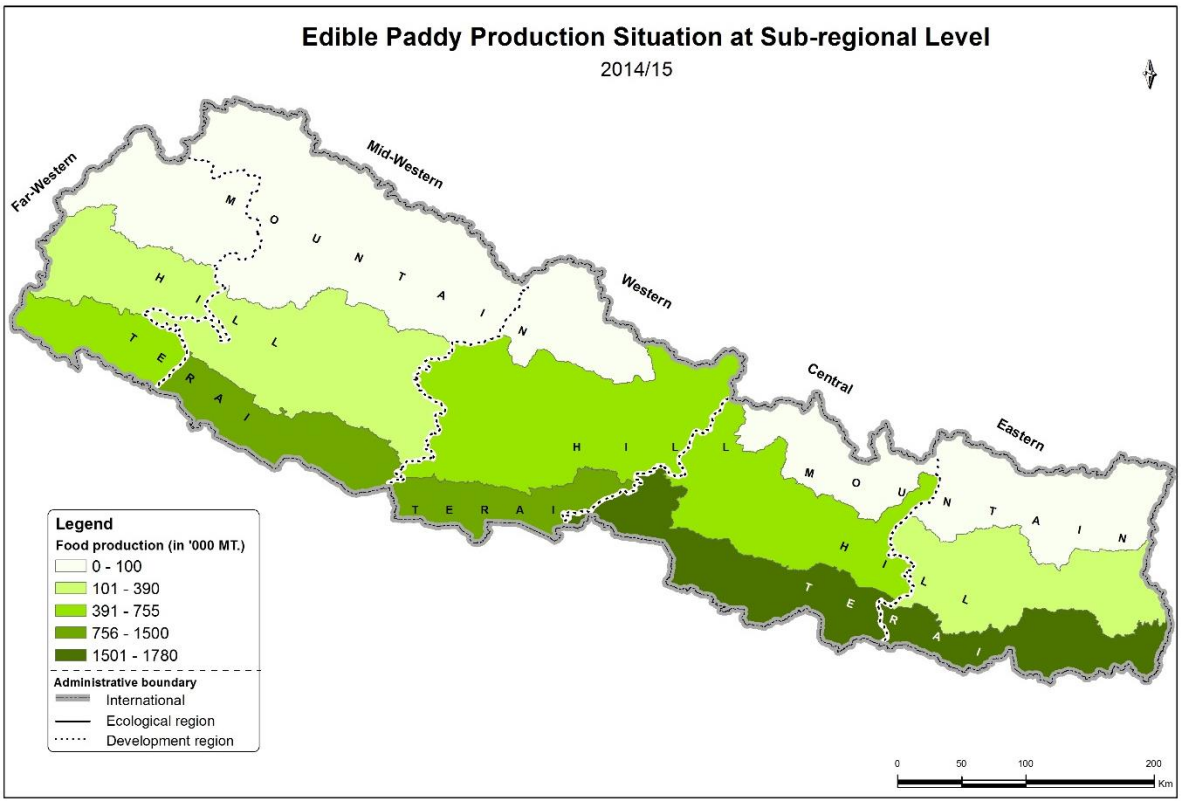


Map 2: Summer cereal production at the sub-regional level. Source: MoAD

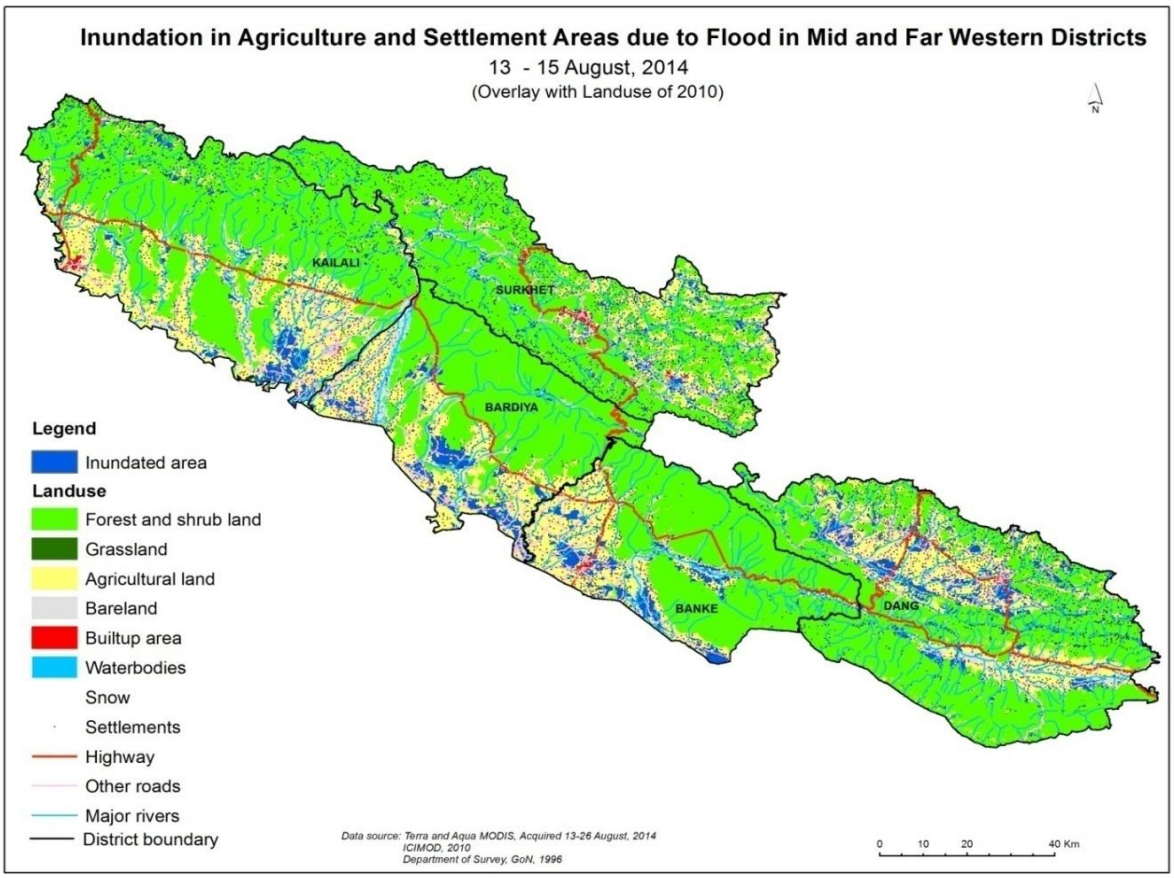




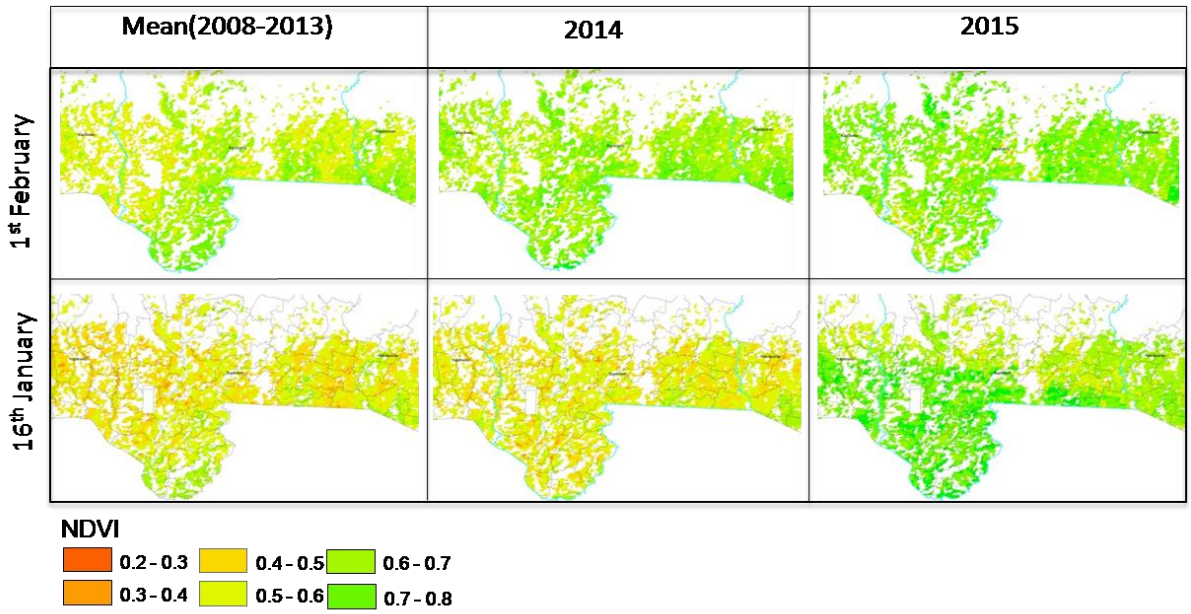
Map 3: Rice crop sown area for Terai districts in 2013 and 2014. Source: ICIMOD



Map 3: Edible paddy production at the sub-regional level. Source: MoAD



Map 5: Inundation in agricultural and settlement areas due to floods in mid- and far-western regions. Source: ICIMOD



Map 6: MODIS Image NDVI based comparison of current crop growth patterns with reference to previous years in Rupandehi district, Nepal. Source: ICIMOD