

INDEX

Note: Page numbers followed by “n” refer to Notes

A

- Abra River, 147
 - adaptation and mitigation strategies, 278, 549, 553, 557–58
 - agricultural finance, 305–10
 - Agriculture and Fisheries Modernization Plan (2011–17), 292
 - best practices in farming, 301
 - capacity needs assessments, 298–99
 - Climate Change Act, 284, 286, 288
 - climate-proof livelihood options, 301, 303
 - conservation farming villages, 299
 - Disaster Risk Reduction Management Act (2010), 288, 290
 - effectiveness of climate change, 304–5
 - financial risk management schemes, 303–4
 - fisheries, vulnerability of, 296–97
 - government framework in support, 284
 - gross domestic product, 307
 - information dissemination, 301
 - institutional capacity, 293–95
 - low-emission capacity building, 297–98
 - monitoring and evaluation, 314
 - national and local action plans, 292–93
 - National Climate Change Action Plan, 295
 - People’s Survival Fund Act (2012), 290
 - Philippine Development Plan (2011–16), 290–91
 - private-sector participation, 313–14
 - smart agricultural approaches, 300
 - systemwide climate change programme, 297
 - vulnerability assessments, 311
- adaptation strategies, potential impact of, 462–65
- changes in welfare, 486
 - changing seed variety, 467
 - countering, 485–88
 - effectiveness of, 485–88
 - existing technologies, 466–71
 - fertilizer, 466, 467
 - food security, 483, 484
 - innovative agricultural technologies, 471–73
 - irrigation development.
See irrigation development
 - planting date, 466–67
 - prices and consumption, 482

- producers and consumers, 483–85
 production and yields, 478–81
 rice and corn productivity (2050),
 470–71
 social welfare, 464
 technologies and investment
 policies, 465–66
 yield improvement, 475–78
 ADB. *See* Asian Development Bank
 (ADB)
 additional fertilizer, 478
 additional training modules, 202
 adjusting planting time, 551
 Administrative Order No. 1, 335
 AFMA. *See* Agriculture and Fisheries
 Modernization Act (AFMA)
 AFMP. *See* Agricultural and Fisheries
 Modernization Plan (AFMP)
 Agno River water, 148
 agrarian reform communities (ARCs),
 55
 Agrarian Reform Funds, 143
 Agricultural and Fisheries
 Modernization Plan (AFMP), 40
 actual *vs.* mandated budget
 (2000–05), 41
 budget, 40–41
 agricultural commodities, 457, 497
 resilience of, 286
 supply and demand, 503
 agricultural damage, 462
 agricultural extension, 312–13
 agricultural households, 266, 268
 agricultural intensification, 74–76
 agricultural lands, 72
 Agricultural Multi-Market Model for
 Policy Evaluation (AMPLE), 332
 agricultural policy, 113, 240, 288
 agricultural producers and
 consumers, 456–59
 agricultural productivity, 492
 agricultural programmes,
 performance, 47
 agricultural research, 274
 agricultural resilience, 309, 311
 agricultural sector, 538
 technologies, 437, 441
 water supply, 221
 weather-related shocks, 57–58
 Agricultural Training Institute (ATI),
 200–202
 agricultural value-added, 220
 agricultural workers
 characteristics, 11
 male to female ratio, 10
 Agriculture and Fisheries
 Modernization Act (AFMA),
 40–41, 113–14, 212
 National Banner Programmes,
 41–43
 Agriculture and Fisheries
 Modernization Plan (2011–17),
 292
 agriculture, change impacts on,
 279–82
 agri-environmental indicators, 241
 agrifuels, 85
 agri-insurance coverage, 198, 203
 agrobiodiversity, 230–36, 244
 agroecosystems, 72
 agroforestry, 83
 Ahmed, Sara, 263
 alienable and disposable lands, 78
 Alston, J., 456
 Altoveros, Nestor C., 230
 AMPLE. *See* Agricultural Multi-
 Market Model for Policy
 Evaluation (AMPLE)
 AMRIS. *See* Angat-Maasim Rivers
 Irrigation System (AMRIS)
 Anderson, Kym, 4, 25
 Angat-Maasim River Irrigation

- System (AMRIS), 137, 151–53, 161
- Angat-Magat Integrated Agricultural Development Project, 159
- Angat Reservoir, 152
- Annual Poverty Indicators Survey, 33
- aquaculture production, 22
- Aquino administration, 3, 54
- ARCs. *See* agrarian reform communities (ARCs)
- AR4 GCMs, 445
- ASEAN Economic Community, 60
- Asia, forest cover in, 73
- Asian Development Bank (ADB), 153, 307
- Association of Southeast Asian Nations (ASEAN), 13, 498
- Ateneo de Manila University, 63
- ATI. *See* Agricultural Training Institute (ATI)
- Autonomous Region in Muslim Mindanao, 545
- B**
- Balisacan, Arsenio, 33, 37
- Ball, V., 239
- bananas, 396, 402, 437, 440
- banner programmes, 44
- baseline scenario, 496, 498–502
 - of agricultural GDP (2011–50), 499
 - domestic production growth, 501
 - exports, food commodity, 501
 - GDP growth rate, 498, 499
 - imports, food commodity, 502
 - production shares (2011), 500
 - sectoral shares of labour force, 501
 - structural change, 500
- Batjes, N., 398
- Beltran, J., 233
- benefit–cost analysis, 494, 517–21
- Bicol Region, 324
- biodiversity, 108–9, 231
- biological oxygen demand (BOD), 227, 253n6
- biophysical models, 377
- Blonigen, B., 509
- Boncodin, Raul, 261
- Bordey, Flordeliza H., 45, 272
- Borlaug hypothesis, 75–76
- Borras, Saturnino, 114
- Borromeo, Teresita H., 230
- Bresciani, Fabrizio, 37
- Briones, Roehlano M., 216, 220, 221, 238, 332
- Bruntland Commission, 212
- budget, 62
 - Agricultural and Fisheries Modernization Plan, 40–41
 - constraint, 343
 - Department of Agriculture (1998–2015), 40, 41–42
 - irrigation, 63n2
- Buenaventura, E., 154, 155
- Bureau of Soils and Water Management, 141
- “buy high, sell low” policy, 59
- C**
- Cagayan Valley, 238, 424, 426
- capacity needs assessments, 298–99
- capital accumulation, 5
- Capule, C., 232
- CAR. *See* Cordillera Administrative Region (CAR)
- carabao production, 22
- carbon dioxide (CO₂), 236, 238
- carbon dynamics, 108
- CARP. *See* Comprehensive Agrarian Reform Program (CARP)
- CARP Extension with Reforms (CARPer), 55, 57, 114–15

- Casecnan Irrigation Component Project, 153
- cash crops, 92
- CCC. *See* Climate Change Commission (CCC)
- Centre for Research on the Epidemiology of Disasters (CREd), 327
- Centre National de Recherches Météorologiques (CNRM) model, 392
- cereal crops, 90, 92, 97
prices, 455
production, 455, 465–66, 546
- certified seeds production, 235
- charcoal, 86–87
- Charveriat, Celine, 346
- Chenery, Hollis, 4
- Chetty, Raj, 344, 358
- child malnutrition, 456, 485, 488, 547–48
- China
forest cover, 72
poverty-reducing effects, 36
- Cinco, T., 175
- CIS. *See* communal irrigation system (CIS)
- CISPER database. *See* Communal Irrigation System Performance (CISPER) database
- Civilian Emergency Administration, 332
- Clark, Colin, 4
- Clean Development Mechanism programme, 304
- climate change, 57–59, 121, 227, 236–39, 544–45
action, gender issues, 555
adaptation and mitigation strategies, 517, 549, 553, 557–58
adverse impacts, 496, 549
on agricultural production, 506
biodiversity and site-species suitability, 108–9
childhood malnutrition and hunger, 547–48
cost estimation, 507
cross-cutting land-use and, 115–18
demand for agricultural labour, 505
direct impacts, 545–46
economic cost, 549
economy contracts, 509
economywide consequences, 548–50
environmental and climate data, 556
extension systems, 562–63
financing scheme, 559
on food commodity production, 546–47
food security, 547–48
GDP growth rates, 498, 502
gendered adaptation to, 551–53
high-quality databases, 563
on household welfare, 511, 518
on income distribution, 506
indirect economic cost, 547
institutional capacity, 554–55
investment in irrigation, 560–61
long-term impacts, 550
National Climate Change Action Plan, 553, 554
negative impact, 546, 549
net benefit of, 520
policy recommendations, 559–60
and policy scenarios, 495
prices and economic welfare, 546–47
private sector participation, 564
on real household incomes, 509
on real value-added, 503
research and development investment, 556, 562–63

- returns to factor inputs, 508
- scenarios, 102
- technical skills, 554–55
- on total absorption, 510
- transportation network, 561
- wage rates, 507
- weak alignment, 554
- welfare cost, 509
- Climate Change Act, 140, 284, 286, 288, 290, 292, 298, 332
- climate change adaptation, 270–72, 274, 293, 298–301
- Climate Change Adaptation Support Program, 304
- climate change–adaptive infrastructure, 292
- Climate Change Commission (CCC), 286, 290, 294, 332
- Climate Change Council, 293, 294, 298, 320n3
- climate change risks, 286
- climate-forecasting options, 196
- climate hazards, 238, 302
- climate information system, 292
- climate models. *See* general
 - circulation models (GCMs)
- climate-proof infrastructure, 286
- climate-resilient systems, 291, 472
- climate-responsive agricultural sector, 286
- climate-sensitive agriculture policies, 297–98
- climate-sensitive farming
 - technologies, 291, 312–13
- climate shock, cost of, 509, 517
- climate-smart agriculture, 192
- Climate Twin Phoenix project, 296
- climate variability, changes in
 - agricultural extension services, 200–1
 - agri-insurance coverage, 198
 - climate forecasting options, 196
 - climate-related indicators, 181
 - climate-smart agriculture, 192
 - crop management options, 194, 195
 - on crops. *See* crop production,
 - climate variability on
 - disaster funds and subsidies, 198–201
 - extreme weather events, 181–85
 - good agricultural practices, 192, 193
 - increased seasonal, 184–85
 - institutionalized strategies, 196
 - intense rainfall-related events, 183
 - knowledge-based crop-forecasting system, 197
 - land-cover change and, 101–3
 - Legazpi mean temperature, 180
 - mean temperature anomalies (1951–2010), 176
 - meteorological rainy days in Legazpi, 182
 - Muñoz, Nueva Ecija mean temperature, 179
 - nutrient management options, 196
 - overview, 174–75
 - probability distribution, 178
 - risk transfer mechanism, 203
 - sea level rises, 181
 - sea surface temperatures, 181
 - seasonal climate and crop forecasts, 204
 - temperature and precipitation, 175–78
 - temperature-related events, 184
 - water management options, 194, 196
 - weather gauging stations (1951–2008), 177, 178, 201–2
 - weather index-based insurance products, 198, 203
 - wet and dry days sequence, 178–81
 - worst dry episode, 184

- CNRM model. *See* Centre National de Recherches Météorologiques (CNRM) model
- coconuts, 401, 431. *See also* rain-fed coconuts
 cultivation, 429
 harvested hectares of, 435
- Combalicer, Edwin, 107
- commercial agricultural expansion, 85–86
- commercial fishing, 25
- commodities, 44
- Commonwealth Scientific and Industrial Research Organisation (CSIRO) model, 392
- communal irrigation system (CIS), 137, 542
 expansion and rehabilitation, 141
 expenditures on, 148
 rehabilitation projects, 148
 share of irrigation investments, 143
- Communal Irrigation System Performance (CISPER) database, 135
- community-based adaptation strategies, 312
- Comprehensive Agrarian Reform Program (CARP), 55–57, 114–15, 119, 143, 269
- conditional cash transfer programme, 52
- Cong Dadong dam, 162
- conservation farming villages, 299
- Consumer Price Index (CPI), 28, 31
- coping strategies, 341–45
ex post, 341
 for farm households, 550–51
 important, 355
- Cordillera Administrative Region (CAR), 145, 324, 382
- corn
 prices, 455, 482
 production, 25, 452, 473, 546
- cost–benefit analyses, 550
- Cotabato, 424, 425
- Coxhead, Ian A., 221
- CPI. *See* Consumer Price Index (CPI)
- CRED. *See* Centre for Research on the Epidemiology of Disasters (CRED)
- credit policy reforms, 45–46
- crop biodiversity, 543
- crop insurance programmes, 45–46, 286, 360
- crop management options, 194, 195, 300
- crop modelling, 300, 445, 446
 bananas, 437
 coconuts. *See* coconuts
 Decision Support System for Agrotechnology Transfer, 398, 401
 irrigated rice. *See* irrigated rice
 maize. *See* rain-fed maize
 software, 378
 sugarcane, 426–29
 Water, Nutrient and Light Capture in Agroforestry Systems, 401–2
- crop production, climate variability on, 16, 17–18, 492
 export, 504
 growth and development, 185–90
 impacts, 185
 imports, 238
 natural disasters, crop losses due to, 190
 output, 238
 practices and strategies, 204–5
 process-based crop model, 187
 rice production (1987–2014), 186

- technologies, 466
 watersheds, 190–91
 and yields, 452–55, 462, 473
 crop protection, 472, 488, 489
 Crop Science Cluster of the
 University of the Philippines, 231
 crop yields, 473
 cropland, 395, 396
 cropping intensity, 490n2
 cross-cutting land-use, policies and,
 115–18
 CSIRO model. *See* Commonwealth
 Scientific and Industrial Research
 Organisation (CSIRO) model
 cultivars, 232
 cytoplasm, 233
- D**
- DAR. *See* Department of Agrarian
 Reform (DAR)
 Datt, Gaurav, 355
 David, C., 161, 162
 DCGE model. *See* dynamic
 computable general equilibrium
 (DCGE) model
 de Guzman, R., 175
 de Los Angeles, Marian S., 220
 decision-making theory, 337
 Decision Support System for Agro-
 technology Transfer (DSSAT),
 398, 401, 423, 437, 451, 452, 493,
 494, 523–24, 545, 546, 548
 Dedeurwaerdere, Ann, 337
 deforestation, 83–84
 agricultural land-cover change,
 89–97
 commercial agricultural expansion,
 85–86
 demand for timber, 84–85
 direct drivers, 84–87
 fuelwood and charcoal, 86–87
 increasing population and upland
 migration, 89
 indirect drivers, 87–101
 land-use transition, 97–101
 mining and infrastructure projects,
 86
 policies, governance, and
 institutions, 87–88
 shifting cultivation, 85
 trend, 541
 urbanization, 87
 degradation, 83–84, 543
 commercial agricultural expansion,
 85–86
 demand for timber, 84–85
 fuelwood and charcoal, 86–87
 mining and infrastructure projects,
 86
 shifting cultivation, 85
 urbanization, 87
 “degree day” concept, 423
 “deindustrialization”, 5
 DENR. *See* Department of
 Environment and Natural
 Resources (DENR)
 Department of Agrarian Reform
 (DAR), 269, 270
 Department of Agriculture, 114, 185,
 241, 246, 294, 301, 318–19, 563
 Agricultural Training Institute,
 200–2
 budget, 40, 41–42, 62
 collaboration with, 202
 for commodity programmes, 43
 and International Rice Research
 Institute, 204
 and local government agencies,
 202
 Department of Environment and
 Natural Resources (DENR), 114,
 241, 269, 270

- Department of the Interior and Local Government, 311
- Department of Trade and Industry, 303
- Diao, X., 523
- Dimes, J., 398
- disaggregates agricultural activities, 493
- disaster Kuznets curve, 329
- Disaster Risk Reduction (DRR), 335
- disaster risk reduction management (DRRM), 286, 288, 291, 293, 332–37, 340
- capacity for, 298–301
- Disaster Risk Reduction Management Act (2010), 288, 290, 298
- downscaling vulnerability, 555
- drip irrigation/sprinklers, 135
- “Driving Force–State–Response” framework, 212, 213
- droughts, 238, 459–61
- drought-tolerant corn, 479
- Dumagan, Jesus, 25
- dynamic computable general equilibrium (DCGE) model, 451, 493, 494, 523–25
- E**
- East Asia, 36
- ECHAM model. *See* European Centre Hamburg (ECHAM) model
- economic internal rate of return (EIRR), 159
- economic welfare, 546–47
- ecosystem-based management, 286, 291
- ecosystems, 288
- agriculture, 230
- terrestrial, 108
- ecosystem services, land cover and climate change, 105
- biodiversity and site-species, 108–9
- carbon dynamics, 108
- soil quality and stability, 105–6
- water quantity, 107
- Ecotown projects, 554
- El Niño events, 107, 460
- El Niño–induced drought, 115
- El Niño Southern Oscillation (ENSO) episodes, 184, 544
- elevation, 381
- Emergency Events Database (EM-DAT), 327
- employment
- agricultural, 5–6
- composition (2000–15), 9
- by gender, 264
- opportunities for productive, 10
- structural transformation in, 8–12
- “Engel value”, 28
- enhanced vulnerability, 286
- ENSO episodes. *See* El Niño Southern Oscillation (ENSO) episodes
- environment-adjusted Malmquist index, 248–52
- environmental degradation, 240
- environmental Kuznet’s curve. *See* forest transition theory
- environmental policy, 241
- environmental services, 122n4
- environmental stability, 288
- equity modifiers, 211
- equivalent variation (EV), 510
- eroded soil, 221
- European Centre Hamburg (ECHAM) model, 392
- evapotranspiration, 181
- event risk, 339
- ex ante* risk management, 341, 345
- ex post* coping strategy, 341, 345
- Executive Order (EO) 355, 332
- Executive Order (EO) 888, 332, 335

- expenditure levels, female
 - agricultural workers, 268–69
- exports, 13
 - agricultural products, 5
 - value of major (2001–14), 15, 16
- extreme intensity, natural events of, 346
- extreme weather events, 459–62, 544–45
- F**
- Fajber, Elizabeth, 263
- family food basket, 271
- Family Income and Expenditure Survey, 28, 33, 49
- FAO. *See* Food and Agriculture Organization (FAO)
- farm-household risk management, 340–45
 - assistance incidence, 366
 - coping strategies for, 550–51
 - damages, 357
 - definition, 346
 - economic profile, 346
 - extreme intensity, natural events of, 346
 - family's well-being, 351
 - farm-related damages experienced, 350
 - financial coping mechanisms, 354
 - precautionary measures, 356
 - recovery, 347, 358–59
 - reducing consumption, 364, 365
 - resorting to coping strategies, 362
 - selling goods, incidence of, 363
 - shocks experienced, impact of, 349
 - “top-five most-severe” shocks, 347, 348
- farm inputs, 44
- farm management technologies, 472, 479
- farm rehabilitation programme, 198
- farmers' awareness of climate risks, 312–13
- farming, social protection for
 - climate-proof livelihood options, 301–3
 - financial risk management schemes, 303–4
- female-led food consumption, 271
- female participation
 - in agriculture, 265–68
 - in labour force, 263, 265
- fertilizer, 445, 466
 - irrigated rice, 406–10
 - rain-fed maize, 417–21
 - rain-fed rice, 411–14
- Fifth Assessment Report (AR5), 378, 386
- Filipinos
 - household expenditures, 48
 - workforce, 10
- finance, of agriculture, 305–10
- financial risk management schemes, 303–4
- fiscal reform, 39
- fishery, 16
 - aquaculture, 22
 - change impacts on, 279–82
 - commercial fishing, 25
 - municipal fishing, 22, 25
 - policies, 297–98
 - production trends (2000–15), 24
 - products, 331
 - resilience, 286
- fishing communities, social protection for
 - climate-proof livelihood options, 301–3
 - financial risk management schemes, 303–4
- flood, 238, 324, 329, 459–61
 - hazard maps, 296
 - management, 291

- “flying geese” metaphor, 4
- Flynn, J., 509
- Food and Agriculture Organization (FAO), 105–6, 459
- 2010 Global Forest Resource Assessment for 1990–2000, 79
- of United Nations, 78, 227
- food and consumption patterns, 25
- food expenditures, 28
- household preferences, 25, 28
- per capita income *vs.* household expenditures share, 30
- shares of household expenditures, 29
- food security, 291, 547–48
- NCCAP’s outcome on, 304
- policy, 59–60
- strategic actions on, 289
- food systems, 260
- commodity production, 546–47
- consumption, 455–56
- prices, 48–49, 455–56
- security, 456, 483, 484
- self-sufficiency, 493, 494, 496
- sufficiency policy, 47–50
- foreign-assisted projects, 143
- economic performance, 155–59, 168–70
- irrigation projects, 164–67
- forest, 72, 395–98
- agroforestry, 83
- fallows and shifting cultivation, 83
- grasslands, 82
- industrial tree plantations, 82–83
- land policies and programmes, 109–13
- net loss, 72
- old-growth, 82
- secondary, 82
- shrublands, 82
- typologies, 80–83
- forest cover
- agricultural land and, 99
- in Asia, 73
- changes in, 79–80
- in China, 72
- definition, 79
- global net loss, 72
- remote-sensing data, 80
- forest transition indicators (1961–2011), 101, 102
- forest transition theory, 97
- forestlands, 78
- forestry, change impacts on, 279–82
- Forestry Management Bureau of the Department for Environment and Natural Resources (DENR-FMB), 78, 80
- forestry policies, 109, 111–12
- agricultural policies, 113
- land policies and programmes, 109–13
- forestry subsector, 16
- Fourth Assessment Report (AR4), 378, 385
- Francisco, Herminia A., 220, 236
- Francisco, Sergio, 45
- Franklin, Benjamin, 360
- freshwater ecosystems, 133
- fruits and vegetables
- prices, 455
- production, 455
- fuelwood, 86–87
- Fukushima earthquake, 361
- Fuwa, Nobuhiko, 37
- G**
- GCMs. *See* general circulation models (GCMs)
- GDFL model. *See* General Fluid Dynamics Laboratory (GFDL) model

- GDP. *See* gross domestic product (GDP)
- gender-disaggregated labour data, 265
- gender issues, 263
- gender-sensitive decisions, 261
- gendered adaptations to climate change, 271–72, 551–53
- gendered impacts of climate change, 260
- division of labour, 266
- female participation. *See* female participation
- gender-differentiated responses, 270–71
- gendered adaptations, 271–72, 551–53
- income and expenditure levels, 268–69
- multidimensional nature of gender equality, 261–63
- General Appropriation Act, 155, 290
- general circulation models (GCMs), 385, 390, 402, 546
- General Fluid Dynamics Laboratory (GFDL) model, 388, 390, 431, 437, 451, 458
- genetic diversity of papaya, 231
- genetic erosion, 231, 232
- geophysical events, 324, 329
- germplasm, 230
- GFDL-ESM2M, 386
- GFDL model. *See* General Fluid Dynamics Laboratory (GFDL) model
- GHG emissions. *See* greenhouse gas (GHG) emissions
- global gender inequality index, 265
- Global Risk Index, 238
- Goh, Amelia H.X., 268
- Government of India (GOI), 120
- government policies
- mitigation, 274
 - and strategies, climate change, 285
- grasslands, 82
- Green Revolution, 90
- greenhouse gas (GHG) emissions, 71, 74, 214, 236, 245, 284, 385, 553
- from forestry / agriculture sector, 104
 - land-cover change and, 103–4
 - levels of, 240
 - from rice cultivation, 237
- Greenpeace, 227
- gross domestic product (GDP), 6, 7, 39, 97, 101, 215, 220, 239, 307, 537
- composition of (1960–2015), 7
 - growth rate, 498
- gross value-added (GVA), 253n4
- groundwater, 133, 222
- nitrate pollution of, 230
 - overextraction of, 226
 - pollution, 221, 230, 543
 - stock, 222, 225, 226
- GVA. *See* gross value-added (GVA)
- ## H
- HadGEM2-ES, 386
- Hadley Centre Global Environmental Model (HadGEM) model, 388–90, 424, 431, 437, 451, 458
- Haiyan (Yolanda) typhoon, 57, 76, 102
- Harmonized World Soil Data Base, 398
- harvested area, 395, 397–99
- Hazell, Peter R., 211
- heat-tolerant corn, 479
- Herd, R., 232
- high-value crops, 42
- high-yielding varieties production, 235
- Hilario, F., 175

- Hislop, L., 261
- hog production, 22
- Holdridge Lifezones model, 109
- Hoogeveen, Hans, 355
- Housing and Land Use Regulatory Board, 311
- human agricultural activity, 212
- human productivity, 462
- human resource capacity, 212
- human security, 288
- hunger, 456, 485
- hurricanes, 459
- hybrid rice, 233, 236
- Hybrid Rice Commercialization Project, 233
- hydropower generation, for water, 151
- I**
- ICI. *See* Interdepartmental Convergence Initiative (ICI)
- IFPRI–NEDA project, 63, 370
- Ilocos Norte Irrigation Project I, 159
- Ilocos provinces, 37, 52
- IMPACT model. *See* International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) model
- imports, 5, 13, 47, 500
- crop production, 238
- food commodity, 502
- rice, 238, 467, 496
- value of agricultural imports (2001–14), 17
- volume of major imports (2001–14), 18
- Im, Sangjun, 107
- incentive schemes, 38, 120
- income-based poverty, 33, 35
- income levels, female agricultural workers, 268–69
- industrial capital, accumulation of, 5
- industrial tree plantations, 82–83
- inequity, access to social services, 52
- inflation rate, 31, 39, 49
- information, climate change, 313
- information dissemination, 301
- infrastructure, 50–51
- development, 37
- investment, 466
- projects, 86
- public investment in, 51
- transport, 51–52
- innovative agricultural technologies, 471–72
- crop protection, 472
- farm management, 472
- varietal trait/seed technologies, 472
- institutional capacity, climate change risks, 293–95
- institutionalized strategies, climate variability on, 196
- Institute Pierre-Simon Laplace (IPSL) model, 390, 423, 431, 437, 451, 459
- insurance coverage, 46, 198, 203, 561
- insurance programme, agriculture, 46
- integrated soil fertility management (ISFM), 437, 441, 447, 472, 475, 477, 479, 482, 489
- Inter-Agency Committee on Climate Change, 284, 553
- Interdepartmental Convergence Initiative (ICI), 110
- Intergovernmental Panel on Climate Change (IPCC), 101, 261, 326, 378, 385, 556
- Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC-AR5), 71, 109
- interlinked modelling system, 525

- International Food Policy Research Institute (IFPRI), 450, 546
- International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) model, 450, 452, 490n2, 493, 494, 497, 502, 523–24, 546, 548
- International Rice Research Institute (IRRI), 204, 231, 233
- investment credit, 46
- IPSL-CM5A-LR, 386
- irrigated agriculture, 134, 220, 233
- irrigated rice, 402
- area, 251–52
 - harvested hectares, 405
 - high fertilizer use, 409, 410
 - intensity and productivity, 403
 - low fertilizer use, 406–8
 - projected improvements in, 443
- irrigated sugarcane, 426
- climate impacts on (2000–50), 431
 - harvested hectares, 429
 - intensity and productivity, 427
 - median percentage change in, 430
- irrigation development, 468–69, 473, 475, 482–83, 489
- budget, 63n2
 - government and private funding, 477
 - infrastructure investments, 232
 - investment in, 473–75
 - programme, 44–45
- irrigation systems, 475.
- See also* National Irrigation Administration (NIA)
 - climate change adaptation in, 134–36
 - design, 161
 - distribution of, 149–50
 - for domestic water supply, 153
 - firmed-up service area, 143, 144
 - investments by use (1965–2015), 142, 147
 - operation, 137
 - as policy instrument, 139
 - in public agricultural spending, 139–40, 143
 - public investments in, 134, 135, 141
 - rehabilitation projects, 148
 - repair and improvement of, 292
 - and water management, 136, 226
- Israel, Danilo, 332
- J**
- Japan, 13
- rehabilitation projects, 148
 - structural transformation, 4
- Japanese International Cooperation Agency (JICA), 244
- K**
- Kastner, Thomas, 90
- knowledge-based crop-forecasting system, 196, 197
- Koo, J., 398
- Korean International Cooperation Agency, 138
- Kuznets, Simon, 4
- Kyoto Protocol (2003), 284, 553
- L**
- labour force
- expansion of, 11
 - female participation in, 263, 265
- labour-intensive manufacturing industries, 5
- labour migration, 272, 552
- labour productivity (1987–2015), 8, 10
- labour trends (1990–2014), 12
- Lambin, Eric, 99
- Land Bank, 63n8, 304

- land classification, 78
 - alienable and disposable lands, 78
 - conflicting forest classification, 78–79
 - forestlands, 78
 - land-cover changes, 71, 89, 378, 380
 - by cash crops, 95
 - cereal crops, 90, 97
 - changes in forest cover, 79–80
 - climate variability and, 101–3
 - drivers of forest cover change, 83–84
 - forest cover and, 99
 - forest typologies, 80–83
 - global, regional, and national level, 73
 - greenhouse gas dynamics, 103–4
 - harvested area of primary crops, 91
 - land classification, 78–79
 - by major product, 94
 - remote-sensing, 81
 - selected regions, 90
 - share of agricultural land (1990–2011), 93
 - transformations, 85
 - tree and shrub-based products, 96
 - by type, 80
 - land degradation, 215–21, 253n2
 - land expansion, agricultural production, 538, 541–42
 - land ownership, 57, 269–70
 - land productivity, crops (2000–15), 26
 - land-reform policies, 55, 361
 - “land sharing”, multifunctionality and, 76–77
 - land suitability, climate extremes on, 102–3
 - land use, 395
 - current discourse on, 74–75
 - impact of climate change, 395–98
 - policy recommendations, 118–21
 - land-use transition, 74, 97
 - forest transition indicators, 101, 102
 - forest transition theory, 97
 - indicators (1961–2011), 100
 - pathways, 99
 - phases, 98
 - Lansigan, Felino P., 238
 - Lantican, F., 271
 - Launio, C., 233
 - Levine, G., 155
 - livestock subsector, 16, 18
 - chicken production, 22
 - gross value-added (2001–15), 21
 - hog and carabao production, 22
 - production trends (2000–15), 23
 - Local Climate Change Action Plans, 335
 - Local Disaster Risk Reduction Management Plans, 335
 - logging activities, 84–85
 - long-term risk management, 355, 367
 - Looney, Adam, 344, 358
 - low-emission capacity building, 297–98
 - Low, Pak S., 220
 - Lucas, Robert, 8
- M**
- macroeconomic constraints, 38–40
 - Magat River Integrated Irrigation System (MRIIS), 137
 - Magna Carta of Women, 270
 - maize, 92, 396, 423. *See also* rain-fed maize
 - adaptation strategies for, 445
 - heat-resilient, 424
 - Malmquist productivity indexes, 248–50
 - malnutrition, 456, 459, 460, 462, 483
 - Manasan, Rosario, 54
 - Manila Water Company (MWC), 151

- manufacturing sector, 8, 500
MapSPAM datasets, 401
Mather, A., 97
Maynilad Water Services (MWS), 151
McKay, Deirdre, 266
mean daily maximum temperature
 from AR5 general circulation
 models, 393, 394
 in warmest month, 389, 390
Mendelsohn, R., 103
Mendoza, Maria Emilinda T., 272
methane (CH₄), 236, 242, 246
Metropolitan Waterworks and
 Sewerage System (MWSS),
 151–53
Meyfroidt, Patrick, 99
microfinance, for farmers, 198–200
micro-level agricultural activity, 212
migration of women, 265, 272, 552
Millennium Development Goal Funds
 1656 Joint Programme, 311
Millennium Development Goals, 48,
 293, 298
mining projects, 86
MIROC-ESM-CHEM (MIROC), 386
Model for Interdisciplinary Research
 on Climate (MIROC) model, 392,
 424, 431, 437, 451, 490n2
model simulations
 baseline scenario, 496, 498–502
 commodities, 527
 computable general equilibrium
 model, 493
 Decision Support System for Agro-
 technology Transfer, 493, 494,
 523–24
 dynamic computable general
 equilibrium model, 493, 494,
 523–25
 experimental, 494–98
 import tariff rates, 530
 International Model for Policy
 Analysis of Agricultural
 Commodities and Trade
 model, 493, 494, 497, 502,
 523–24
 productivity shock in, 528
 world price shock in, 529
monoculture production, 76–77
Moya, T., 160
multidimensional nature of gender
 equality, 261–63
multidimensional poverty, 33, 35
multifunctional landscapes, 77
municipal fishing, 22, 25
- N**
national and local action plans,
 292–93
National Climate Change Action Plan
 (NCCAP), 272, 284, 289, 295,
 553–55, 559
National Demographic and Health
 Survey, 33
National Disaster Coordinating
 Council (NDCC), 332, 335
National Disaster Risk Reduction
 and Management Council
 (NDRRMC), 335, 336
National Disaster Risk Reduction and
 Management Framework, 288,
 294
National Economic and Development
 Authority (NEDA), 63, 138, 335
National Emergency Commission,
 332
National Food Authority (NFA), 47,
 63n5, 361, 495, 549
 accumulated debt, 50
 operations, 49
 rice subsidy policy, 494, 496, 511,
 512, 517

- National Framework Strategy and Program, 332
- National Framework Strategy on Climate Change (NFSCC), 286, 287, 294
- national government borrowing programme, 39
- National Greening Program (NGP), 110, 113
- National Integrated Protected Area System, 82
- National Irrigation Administration (NIA), 134, 135, 497, 519, 531
 climate change strategy, 136–39
 corporate structure, 153
 five-year rationalization programme, 143
 irrigation water, 152
 Management Information Division, 135
 master irrigation plan (2014–28), 136, 138–39
 and Metropolitan Waterworks and Sewerage System (1968–2015), 151–53
 recalculated service area, 143
 short- to medium-term strategy, 139
 Systems Management Division, 135
 water rights for AMRIS, 151
- National Irrigation System Performance (NISPER)
 databases, 135
- national irrigation systems (NIS), 137, 541–42
 diversion schemes, 145
 expenditures on during (1965–2015), 148
 operation and maintenance, 153–58
 pump irrigation schemes, 145
 with recorded information (1965–2008), 154
 rehabilitation projects, 148
 reservoir schemes, 145
 service area of, 146
 share of irrigation investments, 143
 storage schemes, 145
- National Land Use Act, 320n1
- National Land-Use and Management Act, 115, 120–21
- National Plant Genetic Resources Laboratory, 231
- national policy on climate change, 270
- National Power Corporation (NPC), 151
- National Seed Industry Council, 231
- National Statistical Coordination Board and United Nations Development Programme (NSCB-UNDP), 222
- National Water and Resources Board (NWRB), 241, 244
 national water reserves, 222
- Nationwide Operational Assessment of Hazards project, 296
- natural disasters, risk management, 57–59, 327
 climate change and, 327
 database, 327
 direct impacts, 329
 framework for, 337–41
 frequency of, 328
 incidence, 325
 indirect impacts, 329
 objective, 337
 potential exposure, 339
 preparedness, 337
 provinces exposed to multiple, 336
 rainfall concentrations, 326

- NEDA. *See* National Economic and Development Authority (NEDA)
- Nellemann, C., 261
- Network of Protected Areas for Agricultural and Agro-industrial Development (NPAAAD), 113
- NISPER databases. *See* National Irrigation System Performance (NISPER) databases
- nitrate pollution, of groundwater, 230
- nitrogen fertilizers, 227, 466
- nitrous oxide (N₂O), 236
- nonagricultural income, agricultural *vs.*, 61
- nonagricultural sectors, 37, 493, 503
 absorption level of labour, 549
 labour markets in, 548
- nongovernmental organizations (NGOs), 79, 230
- Nonhebel, Sanderine, 90
- Norton, G., 456
- no-till farming, 472, 479
- nutrient-management options, 196
- nutrient-use efficient
 corn, 479
 varieties, 475, 477, 479, 482, 489
- O**
- OECD. *See* Organization for Economic Co-operation and Development (OECD)
- off-farm capital investments, 342
- Office of the Presidential Assistant for Food Security and Agricultural Modernization (OPAFSAM), 63
- oil palm plantations, 85
- old-growth forests, 82
- on-farm capital investments, 342
- Ongley, E., 212
- online knowledge portal, 300
- operations and management (O&M), 44, 135, 137, 141, 143, 154–57, 160
- Organic Agriculture Act (2010), 320n6
- Organization for Economic Co-operation and Development (OECD), 212, 231
- out-migration, rural and agricultural communities, 263
- output
 growth, 15–17
 structural transformation in, 6–8
- overseas workers, 265
- ownership, land, 269–70
- ownership transfer, 56
- P**
- paddy irrigation, 226
- PAGASA. *See* Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA)
- Palawan Integrated Area Development I, 159
- palay* (unmilled rice grain), 17, 18, 25, 315–16
- Pampanga Delta irrigation system, 162
- Pantawid Kuryente* programme, 54
- Pantawid Pamilya* programme, 52, 54
- Pardey, P., 456
- partial equilibrium approach
 agricultural producers and consumers, 456–59
 crop production and yields, 452–55
 extreme weather events, 459–62
 food prices and consumption, 455–56
 food security, 456
 healthcare costs, 459
 productivity losses, 459
- Participatory Irrigation Development Program (PIDP), 136

- Payment for Ecosystem Services (PES) schemes, 119, 120
- People's Survival Fund Act (2012), 290, 294
- Pepeng (Parma), 331
- perennials, 455
- PES schemes. *See* Payment for Ecosystem Services (PES) schemes
- Phil-DCGE model. *See* Philippine Dynamic Computable General Equilibrium (Phil-DCGE) model
- Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA), 174, 183, 200, 204, 301, 563
- Philippine Bureau of Soils and Water Management, 215
- Philippine Center for Economic Development (PCED)
Social Protection Survey, 326, 327, 341, 345, 359
- Philippine Climate Change Adaptation Project, 204
- Philippine Competition Commission, 63
- Philippine Council for Agriculture and Aquatic Resources and Development (PCAARD), 244
- Philippine Crop Insurance Corporation (PCIC), 46, 198, 561
- Philippine Department of Agriculture, 284
- Philippine Development Plan (2011–16), 47, 284, 290–91, 295, 310, 312–13, 320n4, 335, 553
- Philippine Dynamic Computable General Equilibrium (Phil-DCGE) model, 548
- Philippine irrigation systems, 137
- Philippine National REDD-Plus Strategy (PNRPS), 18
- Philippine Statistics Authority (PSA), 11, 241, 244
- phosphate fertilizers, 227
- plans and programmes, agriculture, 538–40
- planting date, 466–67, 475
- policy options, impact of, 510–17
agricultural production, 514
government revenues, 515
irrigation expansion, 520, 521
macroeconomic variables, 513
total absorption, 516
- policy recommendations, 118
forestry and agriculture policies and programmes, 118–19
governance, and institutions, 87–88
incentivizing multifunctional agriculture, 119–20
National Land Use and Management Act, 120–21
- population
density, 92
growth, 5
increasing, deforestation and, 89
share of urban, rural, and agricultural, 32
- post-disaster needs assessment (PDNA), 337
- poultry subsector
growth in, 18
production trends, 23
- poverty, 30, 33, 49, 260, 302
health deprivation indicators and, 52
incidence of, 34, 61
multidimensional *vs.* income-based, 33, 35
trends, 30–32
- poverty reduction, 6, 33, 61, 538
agricultural growth as engine, 35–37

- China as contributor to, 36
 income growth and, 36–37
 programmes, 54
 precipitation, 222
 precision agriculture, 472, 475, 477,
 479, 489
 private irrigation systems (PIS), 137
 private lands, redistribution of, 55–56
 process-based crop model, 187
 producers lose, 485
 productivity growth, agriculture, 25,
 538, 542–44
 budget, 40
 climate change, 57–59
 crops, 17–18
 elasticity, 37
 fisheries, 22–25
 food and consumption patterns,
 25–30
 food sufficiency policy, 47–50
 gross value-added (2000–15), 20–21
 high transaction costs, 50–52
 livestock and poultry, 18–22
 as local poverty reduction, 35–37
 macroeconomic constraints, 38–40
 modernization of sector, 40–47
 natural disasters, 57–59
 output growth, 15–17
 policy and governance issues,
 38–59
 poverty and, 30–35
 productivity growth, 25
 property rights reform, 55–57
 structural transformation.
 See structural transformation
 unequal access to social services,
 52–54
 productivity losses, 459
 “productivity–size inverse
 relationship”, 77
 project SARAI, 192
 property rights reform, 55–57
 provincial agricultural model, 296–97
 public agricultural spending, 541
 public institutions, 50–51
 public–private partnerships, 564
 public-sector debt, 39
 pulses, 455
- Q**
 Quick Response Fund, 288, 290
 Quilloy, K., 45, 271
- R**
 RA 6657, 56
 RA 9700, 56
 radiative forcing, 387
 rainfall, 382, 383
 from AR4 general circulation
 models, 395
 from AR5 general circulation
 models, 392, 394
 in Cagayan Valley, 422
 in driest three months, 387, 388
 in Mindanao, 384
 by region and percentile, 384
 in Visayas, 384
 in wettest three months, 384–86
 rain-fed bananas
 from AR5 general circulation
 models, 439, 440
 intensity and productivity of, 438
 rain-fed coconuts
 from AR5 general circulation
 models (2000–50), 435, 436
 climate impacts on, 435
 intensity and productivity of, 434
 median percentage change in, 436
 rain-fed maize
 harvested hectares, 415
 high fertilizer use, 420, 421
 intensity and productivity, 416

- low fertilizer use, 417–19
 in Mindanao, 415
 nitrogen-efficient varieties, 441
 projected improvements in, 442
 in Visayas, 415
- rain-fed rice, 475, 477
 harvested hectares, 405
 high fertilizer use, 413, 414
 intensity and productivity, 404
 low fertilizer use, 411, 412
 production, 402
 projected improvements in, 444
 in Visayas, 405, 545
- rain-fed sugarcane, 426
 climate impacts on, 433
 harvested hectares of, 429
 intensity and productivity of, 428
 losses, 429
 median percentage change in, 432
 yields for, 426
- rainwater harvesting, 194
 “real absorption value”, 549
 real wage rates, 268–69
 “rebound effect”, 75
- Reconstruction Assistance for
 Yolanda (RAY), 337
- Redondo, G., 233
- Reducing Emissions from
 Deforestation and Forest
 Degradation (REDD+), 75,
 115–18
- Reinert, K., 509
- renewable resources, 221, 222
- renewable water resources per capita,
 223
- representative concentration
 pathways (RCPs), 386–87, 451
- Republic Act 6657 (1988), 114–15
- Republic Act 8435 (1997), 113–14
- Republic Act 9700 (2009), 114
- Republic Act 9729, 140, 332
- research and development (R&D),
 313, 472, 496, 511, 512
- Research Development and Extension
 Programme, 45
- “Revised Forestry Code of 1975”, 78
- Revised Management Plan for
 Forestry Development, 110
- Revised National Action Plan to
 Combat Desertification, Land
 Degradation, and Drought
 (DA–DENR–DST–DAR 2010),
 106
- Reyes, Celia, 46
- rice. *See also* irrigated rice; rain-fed
 rice
 in agriculture’s budget, 41–42
 breeds, 233
 consumption, 455–56, 482
 cultivation, greenhouse gas
 emissions, 237
 genetic diversity, 232
 germplasm, 231
 imports, 238, 467
 modern rice varieties, 232–34
 post-IR8 varieties, 233
 prices, 48, 455, 478, 482
 production, 238, 243–45, 398, 405,
 452, 466, 467, 473, 482, 497, 542
 self-sufficiency in, 542
 spatial diversity, 233
 subsidy policy, 494, 496, 511, 512,
 549–50
 varieties, 231–32
- Ringler, C., 136
- risk assessment, 311, 555
- risk management, 550–51
 and coping strategy, 341–43
 disaster-management capacity,
 332–37, 340
 economic loss and damages, 333
ex ante, 345

- extreme intensity, natural events
 of, 346
 factors influencing recovery, 368–69
 farm-household. *See* farm-
 household risk management
 Haiyan (Yolanda) typhoon, 332, 333
 interventions, 360
 long-term, 355, 367
 measures by economic profile, 356
 National Disaster Risk Reduction
 and Management Council, 335,
 336
 natural disasters. *See* natural
 disasters, risk management
 optimal, 339
 precautionary measures, 356, 367
 and resilience, 326
 strategy, 360
 total value of damage, 330
 typhoon, damages to irrigation,
 331–32
 and vulnerability. *See* vulnerability
 World Risk Report (2013), 327
 river basin approach, 139
 road networks, 37
 Roca, D., 154, 155
 Rola, Agnes C., 221
 Rosegrant, M., 136, 451, 452
 rubber plantations, 86
 rural upper-income households, 507,
 510
- S**
 Safe AWD, 246, 253n9
 salinity stress, 190, 544
 Salvacion, Arnold R., 238
 Samar Island Rural Development
 Project, 159
 science-based decision support
 systems, 196
 science-based knowledge, 556
 seasonal climate variability, 184–85
 sedimentation, 220
 seed industry reforms, 562
 seed variety, 467
 Sen's theory, 122n1
 sex-disaggregated data, 271, 274, 275
 Shared Socioeconomic Pathways
 (SSP), 498
 Shepley, S., 154, 155
 shifting cultivation, 122n3
 deforestation and, 85
 forest fallows and, 83
 Shively, Gerald, 221
 shrublands, 82
 sink services, 239
 site-species suitability, 108–9
 small-farm reservoirs, 292
 “smart agriculture”, 300
 Smarter Approaches to Reinvigorate
 Agriculture as an Industry
 project, 300
 social isolation, 263
 social protection, farming and fishing
 communities, 301–4
 social services, unequal access to
 basic, 52–54
 social welfare, 464
 soil
 degradation, 215–21
 depletion, 221
 deposition, 221
 fertility, 220
 nutrients, 220
 productivity, 215, 543
 quality, 105–6, 215
 resources, 220, 221
 Soil and Terrain Database (SOTER),
 215
 Soil Degradation in South and
 Southeast Asia (ASSOD), 215
 soil erosion, 106, 220–21, 253n3

- gross and average, 219
 - severity of, 216, 218
 - Sombilla, M., 45, 271
 - sources of income, 261, 271, 552
 - Southern Philippines Irrigation Sector Project, 159
 - staple crop production, 504
 - Strategic Agricultural and Fisheries Development Zones (SAFDZ), 113, 114
 - Strategic National Action Plan (SNAP), 335
 - structural transformation, 3–4
 - agriculture context of, 4–6
 - “deindustrialization”, 5
 - economic forces behind, 4–5
 - in employment, 8–12
 - in output, 6–8
 - poverty reduction to, 6
 - process, 492–93, 503–4
 - in trade, 13–15
 - sugarcane, 92, 426, 455. *See also*
 - irrigated sugarcane; rain-fed sugarcane
 - “superlative index number”
 - procedure, 25
 - Super Typhoon Haiyan (Yolanda), 57, 76, 102
 - surface water
 - pollution, 227
 - stock, 222, 224
 - susceptibility, 327
 - sustainability of agricultural growth, 212
 - agri-environmental indicators, 241
 - agrobiodiversity, 230–36, 244
 - climate change, 236–39
 - incentives, 211
 - infrastructure, 211
 - innovation, 211
 - input-use efficiency, 211
 - institutions, 211
 - investing for sustainable farming systems, 245–47
 - land degradation, 215–21
 - linkages between agriculture and the environment, 240–41
 - measuring, 239–40
 - rice productivity, 244–45
 - soil degradation, 215–21
 - water availability, 221–27
 - water quality, 227–30
 - water resources, 241, 244
 - sustainable farming systems, 543
 - national R&D programme, 245–46
 - support systems, 246–47
 - swidden agriculture, 83, 122n3
 - Syrquin, Moises, 4
 - systemwide climate change programme, 297
- T**
- Tabios, G., 161, 162
 - temperature-related events, 184
 - Teruel, Romeo, 25, 239
 - Thurlow, J., 523
 - timber licence agreement (TLA), 84–85
 - timber, logging and demand for, 84–85
 - total factor productivity (TFP), 25, 27, 239–40, 244–45, 253n8, 542–43
 - trade
 - with major partners (2008–15), 14
 - policy scenarios, 496, 498
 - structural transformation in, 13–15
 - value and share of (1980–2015), 14
 - transaction costs, 50–52
 - transportation network, 561
 - transport infrastructure, investment in, 51–52
 - tree crops, 455

- tropical cyclones, 459
- tubers, 455
- Tulong para kay Lolo at Lola*
programmes, 54
- typhoons, 57, 238, 317, 459–61
Haiyan (Yolanda), 332, 333, 336
Milenyó (2006), 231
Ondoy, 331
Pablo, 331
- U**
- “underemployed”, 11
- “unemployed”, 11
- United Nations Convention to
Combat Desertification, 215
- United Nations Environment
Programme, 278
- United Nations Framework
Convention for Climate Change,
310, 553
- University of the Philippines Marine
Science Institute (UP-MSI 2012),
181
- upland migration, 89
- Upper Pampanga River Integrated
Irrigation System (UPRIIS), 137,
153
- urban upper-income households, 510,
517
- urbanization, 36, 37, 87
- urea fertilizer, 466
- V**
- varietal trait/seed technologies, 472
- Verma, R., 261
- Visayan earthquake, 57
- vulnerability
agricultural sector of Philippine
economy, 329–32
direct and indirect impacts, 329
growth performance, 329
- impacts, of climate change, 262
- natural disasters. *See* natural
disasters, risk management
- Philippines to climate change,
327–29
and resilience, 339, 370n4
- W**
- WA cytoplasm, 236
- waste sink, 214, 253n1
- water
abstraction, for irrigation, 226
agricultural production, 538, 541–42
availability, 221–27
consumption, 226, 251–52
demand for, 221, 226
governance, 286, 291
for irrigation, 226
management, 194, 196, 286
pollution, 227
quality, 221, 227–30, 543
quantity, 107
resources, 241, 244
retention, 215
sufficiency, 288
use, 221
- water harvesting, 136, 472, 475
- water-impounding projects, 292
- Water, Nutrient and Light Capture
in Agroforestry Systems
(WaNuLCAS), 401–2
- Water Resources Development
Project, 159
- water resources, for agriculture
agenda for, 163
competition for, 151–53
conventional interventions, 163
distribution of, 147, 149–50
during 1965–2015, 145
foreign-assisted projects, economic
performance of, 155–59

- hydropower generation, 151
 - investment projects, 147
 - irrigation sector. *See* irrigation systems
 - National Irrigation Administration.
See National Irrigation Administration
 - operation and maintenance, 153–55
 - policy implications, 161–63
 - preparedness of, 134
 - projects types, 140–45
 - public investment, 139–40, 145
 - system types, 140–45
 - water security challenges, 133
 - watersheds, climate variability on, 190–91
 - weather index-based insurance (WIBI) products, 198, 203, 561
 - welfare
 - gains, 465
 - losses, 458
 - wheat, 455, 489n1
 - Wilson, D., 175
 - women, climate change adaptation, 552–53
 - Women’s Empowerment, Development and Gender Equality Plan, 275
 - World Agroforestry Centre, 401
 - World Bank, 32, 50, 54, 120, 220, 294, 305, 307, 313, 459
 - World Economic Forum, 265
 - Global Competitiveness Report, 50
- Y**
- yearly precipitation, 388, 390–91
 - yield improvement, 475–78
 - yield trends, 398, 400
 - Yolanda (or Haiyan) typhoon, 57, 76, 102, 332, 333, 336
 - Yusof, Arief, 236
- Z**
- Zhai, Fan, 238
 - Zhuang, Juzhong, 238
 - Zhu, T., 136